Acoustic Associates Sussex Ltd

Discharge of Planning Condition.

Site: **65-71 Upper Bognor Road, Bognor Regis. PO21 1HR**
Client: **KJ Fox Limited**

Report by: Scott Castle BSc (Hons) CEnvH, MCIEH PGDip: Acoustics MIOA

Date: **27/05/2022**
Project: **J3392**
Issue 1

Acoustic Associates Sussex Ltd.

ANC THE ASSOCIATION OF NOISE CONSULTANTS
ATTMA Chartered Building Consultancy
CQMS Safety Scheme
Constructionline

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Acoustic Associates Sussex Ltd.

1 Introduction and Executive Summary

Acoustic Associates have been appointed to undertake an acoustic assessment to support a discharge of planning condition.

Standards and guidance referenced for this assessment include:

- World Health Organisation (WHO) - Guidelines for Community Noise 1999
- BS8233 (Sound insulation and noise reduction for buildings) 2014
- ISO9613 (Attenuation of sound during propagation outdoors) 1996
- National Planning Policy Guidance (NPPG)- Noise, July 2019.

The principal sound source is that of B2259 Upper Bognor Road which runs East to West at the South of the site. External sound pressure levels were measured between 1st to 6th April 2022 in suitable weather conditions for environmental monitoring. A class one sound level meter was positioned above the roadside wall representative of the principal road traffic noise source of the B2259 adjacent to the consented site. The measured daytime noise levels were 72dB $L_{Aeq,\ 16\ hours}$ (daytime) and 64dB $L_{Aeq,8\ hours}$ (night time).

IMMI Noise modelling software was used to replicate the site conditions. The new L shaped building was added into the model once it had been calibrated and receptor positions added for 67-69 Upper Bognor Road, 71 Upper Bognor Road and the new L-shaped building at representative positions for ground floor and first floor windows.

The predicted external sound pressure levels were then used to carry out numerous rigorous calculations to identify suitable glazing and/or ventilation for the room types. For the majority of the site, standard thermal double glazing may be used with acoustic passive through the wall ventilators to achieve high levels of air flow. For the two listed buildings, secondary glazing has been applied to protect the integrity of the existing glazing in situ.

Predictably, the highest impacted room is a first-floor bedroom which already exists at 67 Upper Bognor Road and has a direct view of the B2259. Due to the high noise levels, it may be necessary to consider mechanical ventilation for that particular room and discussions are suggested with the heritage/conservation teams. If mechanical ventilation is deemed not appropriate, then a slight exceedance of the daytime internal noise criterion is likely by 3dB(A).

Condition 7 of BR252/21/PL required two elements, a scheme of protection to achieve BS8233:2014 internal sound pressure levels for the rooms within the site and also an assessment of external amenity spaces. Both have been provided within the report.

Sufficient detail has been presented to allow the local planning authority to discharge condition 7 of BR252/21/PL.

2 Context, Noise Criteria & Noise Assessment Methodology

2.1 Context

Planning Permission has been granted by Arun District Council under BR252/21/PL. Specifically, and relating to sound, condition 7 requires as follows:

"Prior to the commencement of the development hereby approved, a scheme to demonstrate that:

(a) the internal noise levels within the residential units will conform to the 'Indoor ambient noise levels for dwellings' guideline values specified within Table 4 under section 7.7.2 of BS 8233:2014 shall be complied by a competent acoustician on sound insulation and noise reduction for buildings and shall be submitted to and approved in writing by the Local Planning Authority. The scheme should take into account the correct number of air changes required for noise affected rooms; and

(b) the external noise levels within the curtilage of residential units will conform to the 'Design criteria for external noise' upper guideline value of 55 dB $L_{Aeq,T}$ as specified within section 7.7.3.2 of BS 8233:2014 guidance on sound insulation and noise reduction for proposed developments shall be submitted to and approved in writing by the Local Planning Authority The works specified in the approved scheme shall then be carried out in accordance with the approved details prior to occupation of the premises and be retained thereafter."

In short, a scheme of glazing and ventilation is necessary to protect future residents under part (A), which also includes modifications to the listed buildings and for part (B), a review of the garden areas to review the daytime noise levels against World Health Organisation Guidelines for Community Noise dated 1999(revised 2018).

2.2 Location and Site Setting

The soundscape is dominated by Upper Bognor Road, running to the South of the site. The road is 30mph and feeds roundabouts to the East and West of the site. A large 2.5m brick wall separates the site from the road and footpath. An additional wall is located at the site's Eastern boundary, albeit somewhat reduced at 1.5m in height.

Listed buildings are present to the West and North of the site which are subject to the same planning consent and will be upgraded. Further north of the site is the University of Chichester, Barbara Smith Halls of residence and to the North East, the University of Chichester campus.

A site block plan can be seen in Figure 1 below with the building in question annotated. For ease of reference, the buildings will be referred to as 67-79 (White Building), 71 (Green Building) and New Build. Charlotte House remains outside the scope of the assessment.

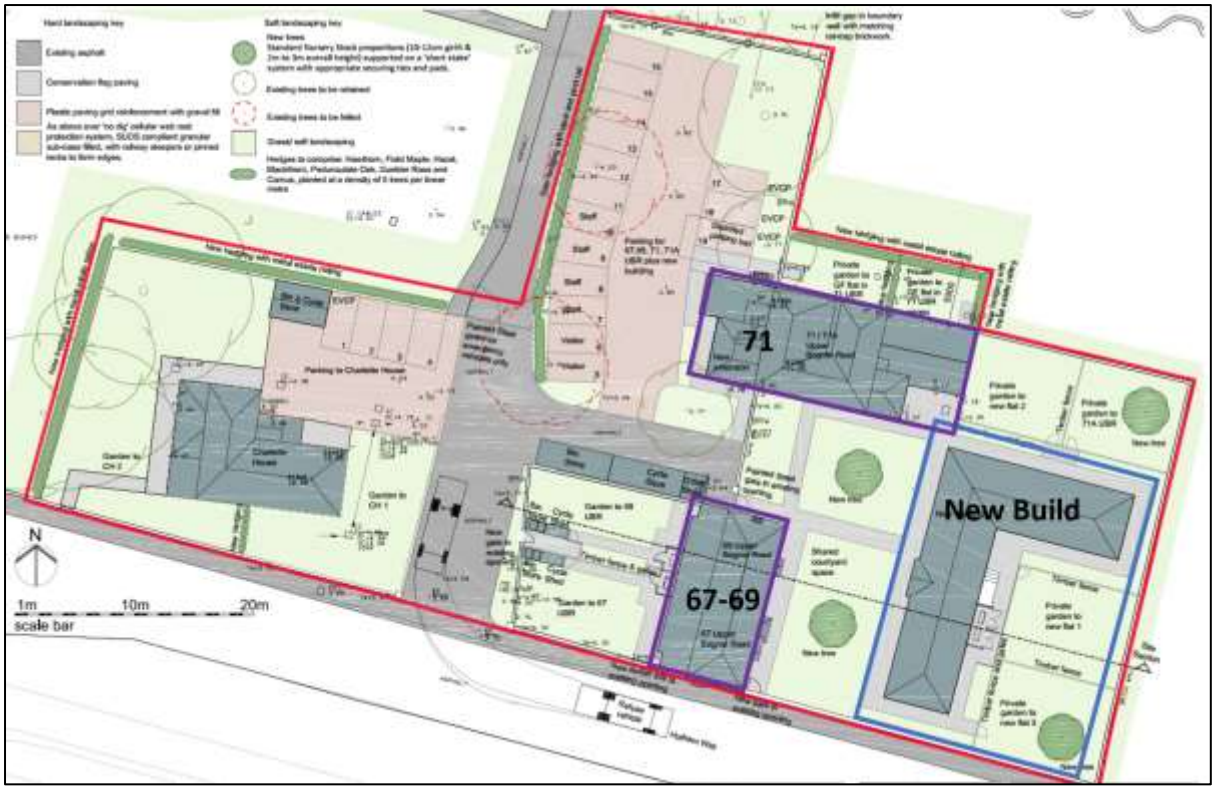

Figure 1. Site Location and Buildings Covered by Condition 7

2.3 Applicable Criteria

It is noted that condition 7 specifically references Table 4 values from BS8233:2014 which is reproduced below. Table 4 of BS8233:2014 provides the following guideline values:

Activity	Location	Time period of day	
		07:00-23:00	23:00-07:00
Resting	Living Rooms	35dB $L_{Aeq,16hour}$	-
Dining	Dining Room/Area	40dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35dB $L_{Aeq,16hour}$	30dB $L_{Aeq,8hour}$

Table 1. BS8233:2014 Criteria

Part B of the condition also makes reference to 7.7.3.2, also of BS8233:2014 which relates to the design criteria for external noise as follows:

"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB L Aeq,T, with an upper guideline value of 55 dB LAeq,T which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.

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

It is also relevant to note that Note 7 of BS8233:2014 and ProPG2017 both provide an indication that such guideline levels can be exceeded, which is relevant given the context of the refurbishment of two grade 2 listed buildings. BS8233:2014 states as follows:

"*Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.". ProPG2017 then also states:*

"NOTE 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal L_{Aeq} target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved. The more often internal L_{Aeq} levels start to exceed the internal L_{Aeq} target levels by more than 5 dB, the more that most people are likely to regard them as "unreasonable". Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has been kept to a minimum. Once internal L_{Aeq} levels exceed the target levels by more than 10 dB, they are highly likely to be regarded as "unacceptable" by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing "unacceptable" noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form."

2.4 Methodology and Approach

A class 1 sound level meter was placed in a representative location of the new build dwelling.

Simultaneous measurements were also made with a second tripod mounted freefield sound level meter of a potential garden area, in order to be able to compare the same 15-minute measurements and understand the influence of the 2.5m high wall along the roadside. During these measurements the clocks were synchronised on the two sound level meters.

A noise model was used to calibrate the sound levels generated by the B2259 (Upper Bognor Road) and then the client's proposed new building was overlaid into the IMMI noise modelling software.

Receptor points were then added into the model representing where windows of habitable rooms would be located in order that the model could then predict both ground floor and first floor receptors for the ten new building plots.

With the external sound pressures identified, calculations were then made to determine what, if any, mitigation measures might be needed to protect the future occupants. Rigorous calculations were also undertaken to understand how glazing sizing and façade sizes and ventilation systems would work together.

3 Sound Survey Baseline Conditions & Results

A single class 1 sound level meter was left at the site at a representative location, given the site layout plans provided by the client. A sound survey was carried out between 1st to 6th April 2022. The duration of the survey deliberately covered a weekend to ensure that the soundscape was properly understood. The data was - weighted and Fast time weighted and considered to be freefield. The sound level meters were calibrated before and after commencing the noise measurements (@94dB with no drift). All long-term measurements were taken with the time base set to record 1-minute intervals.

3.1 Sound Survey Details

Survey(s) carried out by	Scott Castle BSc (Hons) Env Health, MCIEH CEnvH PGDip Acoustics MIOA
Equipment Used	Castle Svantek Mirus – Pole Mounted – 3.7m above ground level (Unattended)- Freefield
Equipment Used	01dB Calibrator (CAL21) – Serial Number 50241778
Duration	1st April 2022 to 6th April 2022

Figure 2. Survey Details

The survey location is shown in Figure 3 below.

Figure 3. Survey Images and Site Plan of Survey Location

3.2 Measured External Sound Pressure Levels

Figure 4 below presents the measured external sound pressure levels on a day by day basis. These are the daily logarithmic averages for the daytime and night time periods. An arithmetic average has been applied at the bottom of the table.

Logarithmically Averaged Day and Night time Periods (External - Freefield)-dB(A)			
$L_{Aeq, 16\ hour-\ 07:00-23:00}$		$L_{Aeq, 8\ hour\ 23:00-07:00}$	
Day 1	72.4	Night 1	64.1
Day 2	71.7	Night 2	64.3
Day 3	73.4	Night 3	63.5
Day 4	72.2	Night 4	63.4
Arithmetic Average	**72.4**	Night 5	63.9
		Arithmetic Average	**63.8**

Figure 4. Measured Sound Pressure Levels at the Survey Position

The measured sound pressure levels are noted to be very consistent with only a 1dB difference in the daytime and night time periods. It is noted that these are only the sound pressure levels measured at the survey location and will be used to calibrate the noise model using the worst-case daytime and night time period, ie 73dB $L_{Aeq, 16\ hour}$ and 64dB $L_{Aeq, 8\ hour}$ respectively.

4 Noise Modelling Approach

In order to see how noise varies at different positions around the proposed development it is possible to produce a noise contour map. A computer noise model has been completed using the computer package IMMI. Drawings of the area have been used to complete the noise models and the topography of the location recreated. IMMI faithfully implements the propagation method of ISO-9613:1996; Acoustics – Attenuation of sound during propagation outdoors.

Using a noise modelling approach allows predictions to be made around the three buildings of interest.

4.1 Model Inputs

It is first necessary to calibrate the noise model and this was achieved by replicating the site plans for the existing site and adding into the model the existing buildings, the existing walls with their corresponding heights and the exact location that the survey was undertaken. Measurements of walls were made whilst present on site to facilitate the model building and ensure accuracy.

The model was then calibrated to the worst-case day and night time sound pressure levels by plotting in the road traffic line sources and increasing the sound power values of the line source until such time that the worst-case survey sound pressure levels were achieved. When the model was run and the same worst case sound pressure levels achieved at the survey position, the model was considered to be calibrated.

A new model was then saved, with the new building then entered into the model and receptor positions added to reflect window positions for habitable rooms. The process of adding receptor points was generated for the white, green and new buildings

For external amenity areas, a 1.8m privacy fence was applied into the model.

4.2 Model Outputs

The noise modelling outputs in terms of daytime and night time predictions for 2D noise contours can be seen in Figures 5 and 6 below. Receptor outputs which are sometimes listed within the model screen have not been presented as the output is difficult to read and untidy. The daytime and night time predictions can be seen in both the rigorous calculations and Appendix A.

IMMI predicts freefield sound pressure levels which are A weighted.

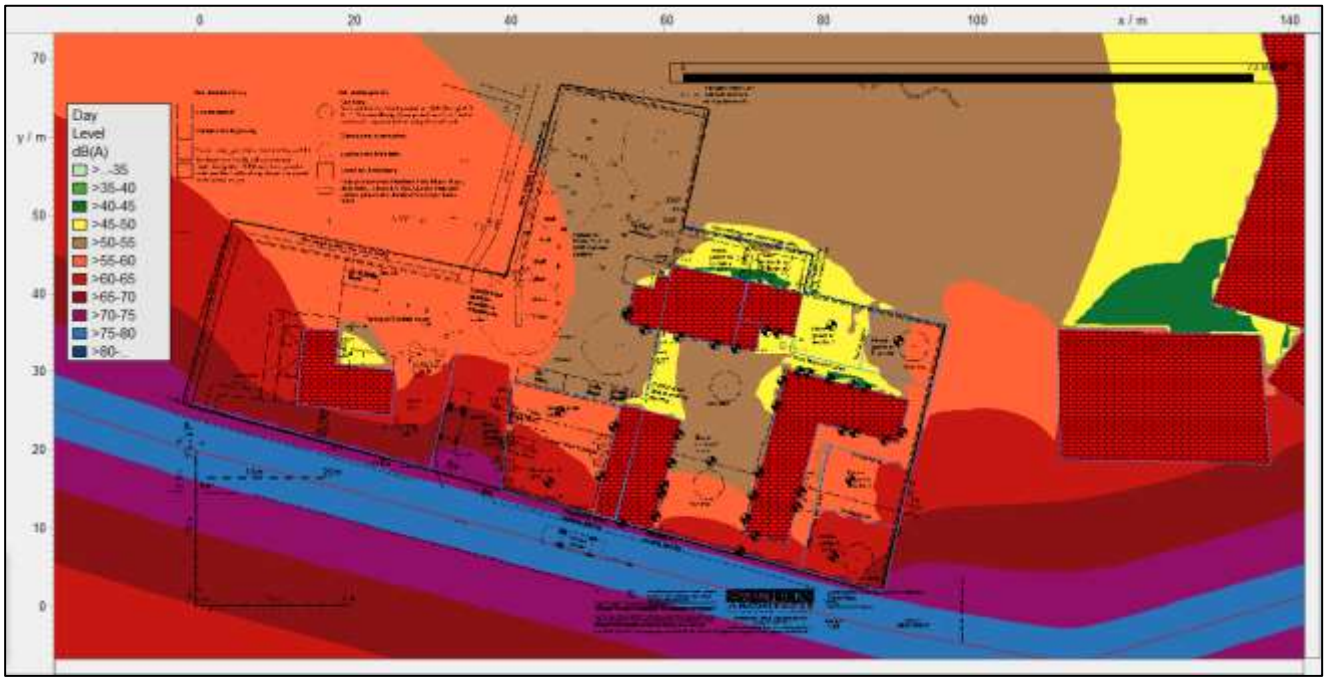

Figure 5. Daytime 2D Noise Contours

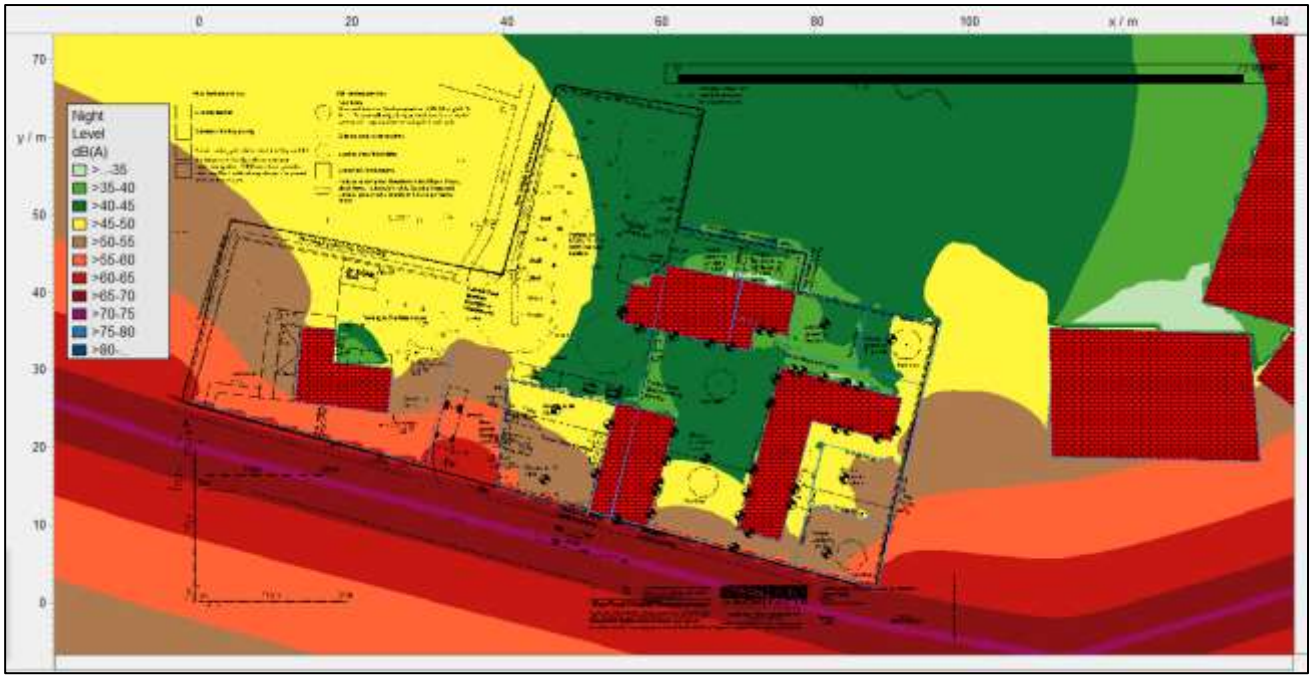

Figure 6. Night Time 2D Noise Contours

5 Discussion

The measured sound pressure levels from the survey data are consistent and a worst case day and night time period has been applied in order to calibrate the noise model. As stated, the predicted sound pressure level have not been included in Figures 5 and 6 above and are instead inserted below to demonstrate the required reduction/attenuation in sound energy to achieve BS8233:2014 internal sound pressure level criterion. These are broken down by the property numbers for ease of reference.

It is relevant to note that the condition requires an assessment of BS8233:2014 which provides for internal sound pressure levels as referenced in section 2.3 above. Whilst bedrooms have both a daytime and night time value to be achieved, living rooms, kitchens, diners etc are only assessed for the daytime, ie $L_{Aeq,\ 16\ hour}$.

Where there are multiple windows in a room, these are listed as a number, ie flat 2, Living Room (3).

5.1 New Building

New Building				
Location	Predicted Daytime $L_{Aeq, 16\ hour}$	Predicted Night time $L_{Aeq, 8\ hour}$	Daytime SRI	Night Time SRI
Flat 1 Bedroom South	62.8	53.6	28	24
Flat 1 Bedroom-East	62.7	53.5	28	24
Flat 1 Living Room 1	61.3	52.1	26	N/A
Flat 1 Living Room 2	60.4	51.2	25	N/A
Flat 1 Kitchen 1	48.4	39.2	13	N/A
Flat 1 Kitchen 2	47.8	38.6	13	N/A
Flat 2 Bedroom	47.3	38.1	12	8.1
Flat 2 Kitchen 1	47.1	37.9	12	N/A
Flat 2 Kitchen2	47.1	37.9	12	N/A
Flat 2 Kitchen 3	53.0	43.8	18	N/A
Flat 2 Kitchen 4	52.9	43.7	18	N/A
Flat 3 Bedroom 1	69.5	60.3	35	30
Flat 3 Bedroom 2	65.9	56.7	31	18
Flat 3 Living Room 1	60.2	51.0	25	N/A
Flat 3 Living Room 2	57.2	48.0	22	N/A
Flat 3 Living Room 3	62.9	53.7	28	N/A
Flat 3 Living Room 4	61.6	52.4	27	N/A
All predictions are freefield and A weighted external Sound Pressure Levels				

Figure 7. Predicted External Sound Pressure Levels - Freefield - NEW BUILD

5.2 67 and 69 Upper Bognor Road (White Building)

67 and 69 Upper Bognor Road				
Location	Predicted Daytime $L_{Aeq, 16\ hour}$	Predicted Night time $L_{Aeq, 8\ hour}$	Daytime SRI	Night Time SRI
67 Dining Room	59.1	49.9	24	N/A
67 Living room	57.2	48.0	22	N/A
67 Kitchen	59.4	50.2	24	N/A
67 Bedroom 1	67.5	58.3	32	28
67 Bedroom 2	61.9	52.7	27	23
67 Bedroom South	73.2	64.0	38	34
69 Living Room	54.2	45.0	19	N/A
69 Dining room	52.1	42.9	17	N/A
69 Kitchen	56.3	47.1	21	N/A
69 Bedroom 1	58.0	48.8	23	19
69 Bedroom 2	55.1	45.9	20	16
All predictions are freefield and A weighted external Sound Pressure Levels				

Figure 8. Predicted External Sound Pressure Levels - Freefield – 67-69 Upper Bognor Road

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5.3 71 Upper Bognor Road (Green Building)

71 Upper Bognor Road				
Location	Predicted Daytime $L_{Aeq, 16\ hour}$	Predicted Night time $L_{Aeq, 8\ hour}$	Daytime SRI	Night Time SRI
71 Living Room	50.1	40.9	15	N/A
71 Kitchen-Diner	50.8	41.6	16	N/A
71 Kitchen	50.8	41.6	16	N/A
71 Dining Room1	47.6	38.4	13	N/A
71 Dining Room2	47.9	38.7	13	N/A
71 New Office	52.2	43.0	7	N/A
71 New Office-West	52.6	43.4	8	N/A
71 Warden Bedroom	55.8	46.6	21	17
71 Warden Bedroom 2	56.2	47.0	21	17
71 FF Living Room	56.3	47.1	21	N/A
71 FF Bedroom	55.6	46.4	21	16
All predictions are freefield and A weighted external Sound Pressure Levels				

Figure 9. Predicted External Sound Pressure Levels - Freefield – 71 Upper Bognor Road

5.4 SRI Summary For Habitable Rooms

The greatest Sound Reduction Index (SRI) required for the daytime period is 38dB occurring at the bedroom window of 67 Upper Bognor Road, which already exists and overlooks the wall/road directly.

The greatest Sound Reduction Index (SRI) required for the night time period is also for the first-floor bedroom window overlooking the wall at 67 Upper Bognor Road.

The minimum SRI (12dB for daytime and 8dB for night time) is seen for the first-floor bedroom of Flat 2 in the new building, which is the only bedroom located on the Northern façade of the building and benefits from the building mass between the road sound source and the window.

Whilst the SRI is a simplistic reduction needed from the outside predicted sound pressure level to achieve the required sound pressure levels listed in table 4 values from BS8233:2014, a rigorous calculation takes this one step further.

6 Rigorous Calculations

The BS8233 “Rigorous Calculation” has been used to predict the sound insulation provided by the building envelope (Calculation detailed in BS8233 (Annex G.2). The below calculations have been completed to demonstrate how the required SRI can be achieved. Rather than a simplistic outside to inside subtraction, a rigorous calculation calculates the ratio of the glazed area to the facades to provide a greater degree of certainty as to the internal sound pressure levels achieved and accordingly the SRI of the proposed building envelope.

To ensure compliance with Building Regulations, the rigorous calculations have used passive through the wall acoustic ventilators with a high free space.

Titon units have been applied for bedrooms which have a freespace of 9800mm^2 and provide a D_{new} of 42dB and Rytons 9x9 Airliner vents has been applied for larger rooms such as living room/dining room/kitchens, providing a free space of 12800mm^2 and an open attenuation value of 38dB D_{new}.

Where rooms have more than one window, the glazed areas have been combined and considered against the worst-case façade external sound pressure level to ensure a worst case prediction.

Walls are standard brick/block cavity construction

The roof, which is entered as tiles on felt, pitched roof with 100mm of mineral wool on a plasterboard ceiling (in reality, a greater thickness of mineral wool will be provided).

For the majority of rooms, standard thermal double glazing (Pilkington 4\12\4) has been applied and will comfortably achieve BS8233:2014 table 4 values. However, there are a few windows which are located close to the B2259 which do not benefit from either a barrier or distance attenuation and options of upgraded double, triple or secondary glazing have been provided which achieve the required internal values.

Given that 67 to 69 Upper Bognor Road and 71 Upper Bognor Road are both existing grade 2 listed buildings, secondary glazing has been applied to ensure that the existing glazing is capable of remaining in place. As seen from Figures 10 and 11 below, the application of secondary glazing has positive results.

The only exception where passive through the wall ventilation was not achievable was the bedroom window in 67 Upper Bognor Road which directly overlooks the road due to the elevated measured sound pressure levels (ie 73dB $L_{Aeq,\ 16\ hour}$). For 67 Upper Bognor Road, it is strongly advised that MVHR be installed at this location. It is strongly advised that discussions take place with English Heritage and/or the conservation team at Arun District Council in this respect. An alternative solution is to consider a passive through the wall vent, but this will cause a slight increase in the daytime sound pressure level to 38dB $L_{Aeq,16\ hour}$. Attention is drawn to the aforementioned section in 2.3 of the report where exceedances are discussed. The exceedance would be for only 3dB during the daytime period and night time sleep remains protected for the future occupants. It is arguable that a first floor bedroom is not likely to be inhabited for long periods of the day, yet remains sufficiently robust to protect future occupants during the night time period.

6.1 67-69 Upper Bognor Road

Rigorous Calculations - 67 and 69 Upper Bognor Rpad						
Room Type and Orientation	**Worst Case Daytime-**	**SRI Required**	**Window**	**Ventilator**	**Internal Sound Pressure Level**	**SRI Achieved of Building Envelope**
67 Upper Bognor Road - Ground Floor						
Dining Room	59	24	6-100-4	Ryton 9x9 Airliner	26	33
Living Room	57	22	6-100-4	Ryton 9x9 Airliner	25	32
Kitchen	59	24	6-100-4	Ryton 9x9 Airliner	26	33
69 Upper Bognor Road - Ground Floor						
Dining Room	52.1	17.1	6-100-4	Ryton 9x9 Airliner	19	33
Living Room	54.2	19.2	6-100-4	Ryton 9x9 Airliner	21	33
Kitchen	56.3	21.3	6-100-4	Ryton 9x9 Airliner	23	33
67 Upper Bognor Road- First Floor						
Bedroom 1 (Secondary Glazing)	73.2	38.2	6-100-4	No Vent-MVHR	35	38
Bedroom 1 (Enhanced Double Glazing)	73.2	38.2	6-100-4	Rytons AAC125HP Look Ryt	38	35
Bedroom 1 (Triple Glazing)	73.2	38.2	8.8-14-6-14-12.8	No Vent-MVHR	35	38
Bedroom 2	61.9	26.9	4\12\4	Titon -9800mm2	26	37
69 Upper Bognor Road- First Floor						
Bedroom 1	58	23	6-100-4	Titon -9800mm2	22	37
Bedroom 2	55.1	20.1	6-100-4	Titon -9800mm2	19	36
Precited extenal values are freefield and dB(A)						

Figure 10. Rigorous Calculations - 67-69 Upper Bognor Road

6.2 71 Upper Bognor Road

Rigorous Calculations - 71 Upper Bognor Road						
Room Type and Orientation	**Worst Case Daytime-**	**SRI Required**	**Window**	**Ventilator**	**Internal Sound Pressure Level**	**SRI Achieved of Building Envelope**
71 Upper Bognor Road - Ground Floor						
Office	53	18	6-100-4	Ryton 9x9 Airliner	21	32
Living Room	50	15	6-100-4	Ryton 9x9 Airliner	17	33
Kitchen/Dining Room	51	16	6-100-4	Ryton 9x9 Airliner	18	33
Kitchen	51	16	6-100-4	Ryton 9x9 Airliner	18	33
Living/Dining Room	48	13	6-100-4	Ryton 9x9 Airliner	16	32
71 Upper Bognor Road - First Floor						
Warden Accomodation (Bedroom)	56	21	6-100-4	Titon-9800mm2	21	35
Living Room	56	21	6-100-4	Ryton 9x9 Airliner	23	33
Bedroom	56	21	6-100-4	Titon-9800mm2	20	36
Kitchen (West Facing)	55	20	6-100-4	Ryton 9x9 Airliner	22	33
Bedroom (East Facing)	50	15	6-100-4	Titon-9800mm2	14	36
Precited extenal values are freefield and dB(A)						

Figure 11. Rigorous Calculations - 71 Upper Bognor Road

6.3 New Build

Rigorous Calculations - New Build						
Room Type and Orientation	Worst Case Daytime- $L_{Aeq,16\ hour}$	SRI Required	Window	Ventilator	Internal Sound Pressure Level	SRI Achieved of Building Envelope
New Build Flat 1- First Floor						
Bedroom- First Floor	63	28	4\12\4	Titon-9800mm2	32	31
Living Room/Kitchen	61	26	4\12\4	Ryton 9x9 Airliner	34	28
New Build Flat 2- First Floor						
Bedroom- First Floor	47	12	4\12\4	Titon-9800mm2	15	32
Living Room/Kitchen	53	18	4\12\4	Ryton 9x9 Airliner	26	27
New Build - Flat 3 - First Floor						
Bedroom- First Floor	70	35	10\16\12.8	Titon-9800mm2	35	35
Bedroom- First Floor	70	35	10.8\24\16.8	Titon-9800mm2	35	36
Bedroom- First Floor	70	35	8.8\14\6\14\12.8	Titon-9800mm2	35	35
Living Room/Kitchen	63	28	4\12\4	Ryton 9x9 Airliner	35	28
Living Room/Kitchen	63	28	10\12\6	Ryton 9x9 Airliner	33	30
Precited extenal values are freefield and dB(A)						

Figure 12. Rigorous Calculations – New Build

7 External Amenity Areas

Whist section 6 above has provided a detailed schedule to ensure that BS8233:2014 Table 4 values may be achieved internally, it is noted that the second part of the condition requires an assessment of garden spaces. The condition requires as follows and the relevant section from BS8233:2014 was discussed in section 2.3 above:

(b) the external noise levels within the curtilage of residential units will conform to the 'Design criteria for external noise' upper guideline value of 55 dB $L_{Aeq,T}$ as specified within section 7.7.3.2 of BS 8233:2014 guidance on sound insulation and noise reduction for proposed developments shall be submitted to and approved in writing by the Local Planning Authority The works specified in the approved scheme shall then be carried out in accordance with the approved details prior to occupation of the premises and be retained thereafter."

The noise model was therefore used to place several receptor positions to replicate external amenity areas. Whilst present on site, a number of 15 minute simultaneous readings were taken to compare more sheltered areas with the roadside survey measured levels also. The short-term readings indicated that the roadside wall provided approximately 13-15dB of attenuation which is consistent with the modelling data.

Location	Daytime $L_{Aeq,\ 16\ hour}$
Garden 1	53.7
Garden 2	49.4
Garden 3	54.4
Garden 4	62.6
Garden 5	57.6
Garden 6	63.1
Garden 7	59.1

Figure 13. Assessment of External Amenity Spaces

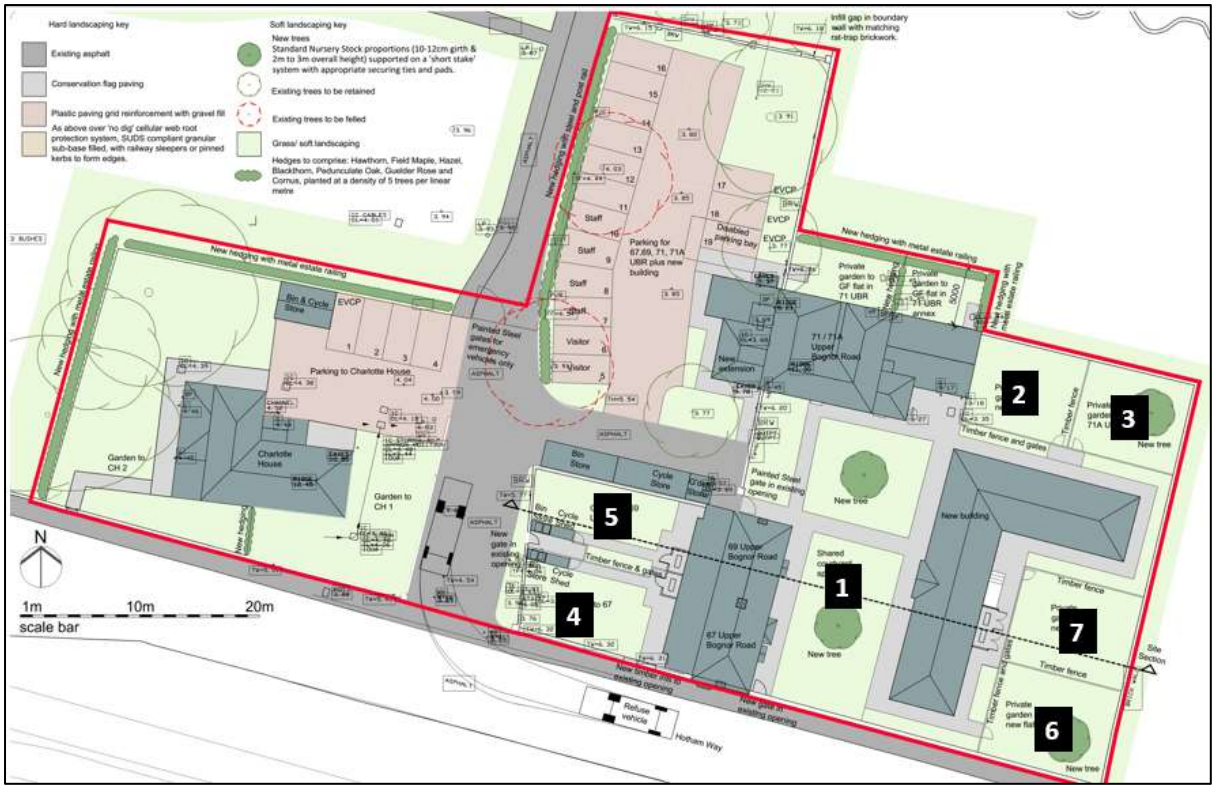

Figure 14. Garden Assessment Locations Used within the Noise Model

It is recognised within the British Standard that the predicted external values may not always be achieved within BS8233:2014 as follows:

"However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted."

The Noise Planning Policy Guidance (NPPG, 2019) states that the noise impact may be partially offset if residents have access to a relatively quiet, protected, external publically accessible amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minute walking distance).

It is noted that Hotham Park is a public park located to the West of the development approximately 250m away which may afford residents greater tranquillity from road traffic noise. Bognor beach is also located due South of the consented application site at approximately 430m in distance. Both would offer future residents increased tranquillity.

8 Recommendations

8.1 Glazing

From the rigorous calculations carried out it is apparent that the majority of the consented rooms are capable of being constructed with standard thermal double glazing, ie 4\12\4. Whilst Pilkington 4/12/4 glazing has been applied in the calculations, should alternative glazing providers be approached, it is the $R_{traffic}$ metric which must be compared to ensure a like for like comparison. The Rtraffic values of all glazing suggested can be seen below in Figure 15.

Sound Insulation Performace of Window Units			
Brand	**Window Specification**	**R_w**	**$R_{traffic}$**
Pilkington Double	4\12\4	31	25
Pilkington Double	10\12\6	38	32
Pilkington Double	10.8\24\16.8	52	46
Pilkington Double	10\16\12.8	44	39
Pilkington Secondary Glazing	6\100\4	46	37
Pilkington Secondary Glazing	10\200\6	49	45
Pilkington Triple	8.8\14\6\14\12.8	50	43

Figure 15. RTraffic Values- given in dB(A)

It is relevant to note that the rigorous calculations for the new build area also included the roof lights in the new build first floor living room areas. Whilst these were included in the glazed areas and used 4\12\4, as roof lights, these are likely to either include a laminate or be toughened glass and may perform better than standard thermal double glazing.

Where glazed doors are being introduced, these should not be any less than the specification of the suggested windows.

8.2 Ventilation

It is apparent that there are some instances where the practice of opening windows will cause internal sound pressure levels to exceed BS8233:2014 Table 4 values. There is only one bedroom which is likely to warrant MVHR and this is due to the window sizes and the high daytime and night time measured sound pressure levels.

If the developer installed MVHR or MEV ventilation systems, then the sound pressure level from the systems should be designed to meet the CIBSE Guidance Mechanical Ventilation Noise detailed below:

- *Bedrooms:* Mechanical services noise to be ≤ NR25dB
- *Lounges*: Mechanical services noise to be ≤ NR30dB

For all other rooms, the Approved Document F criterion for the rooms assessed ventilation has been exceeded using high performance passive through the wall vents. As stated, when considering alternative providers, for vents, it must be the vent open performance which is assessed.

For Titon, TALHMCW, 9x6, this is $D_{n,ew}$, of 42dB and for Ryton 9x9 Airliner, this is 38dB D_{new} (Plus CTr 35dB D_{new}).

Resident's will of course have the freedom to open windows as they please and this may be especially relevant for short term purge ventilation such as removing burnt toast odours etc.

8.3 Roadside Wall

For the gardens of 67 and 69 Upper Bognor Road, it was noted that the existing wall structure was deficient in a number of areas and should be repaired to ensure a suitable barrier and mass remains between the road traffic and the garden areas.

8.4 Refurbishment of Existing Dwellings

Attention to detail and workmanship is also necessary for details such as areas in Figure 16 below, where the tiled top edge of the window bay area could potentially act as a weak point for sound energy to enter the dwelling.

It is noted that both 67-69 and 71 Bognor Road are being upgraded as part of the consented proposal. It is strongly recommended that a survey be undertaken of the internal wall finishes to determine what, if any additional mitigation measures in terms of wall linings might benefit the future occupants.

Figure 16. Bay Window of 67 Upper Bognor Road

8.5 Non-Habitable Rooms

The report has carefully considered all habitable rooms for the purpose of assessment against the condition and BS8233:2014. However, it is apparent that there are also windows for areas such as bathrooms, landings, stairwells and hallways. Such areas are considered to be non-habitable and standard thermal double glazing (ie Pilkington 4\12\4) will suffice.

Similarly, there are areas in the new build ground floor such as laundrettes, offices, meeting rooms and workshops.

A rigorous calculation was undertaken to review the ground floor staff meeting room (new build) as the area had three windows and additionally a large double door providing increased space for sound energy to penetrate the building envelope. The assessment considered standard thermal double glazing (4\12\4) and a Rytons 9x9 passive vent. The internal sound pressure level was identified as 31dB $L_{Aeq,16\ hour}$. Within BS8233:2014, Table 2 provides for an open plan office design target of 45-50dB $L_{Aeq,T}$ which the staff meeting room is comfortably below.

Similarly, an additional rigorous calculation was carried out to assess the ground floor workshop area which was noted to have large wide opening doors. The assessment considered standard thermal double glazing (4\12\4) and a Rytons 9x9 passive vent. The resulting internal sound pressure level predicts 32dB $L_{Aeq,\ 16\ hour}$ being achieved, which is within the limits for a workshop space.

9 Conclusion

The principal sound source is that of B2259 Upper Bognor Road which runs East to West at the South of the site. External sound pressure levels were measured between 1st to 6th April 2022 in suitable weather conditions for environmental monitoring. A class one sound level meter was positioned above the roadside wall representative of the principal road traffic noise source of the B2259 adjacent to the consented site. The measured daytime noise levels were 72dB $L_{Aeq,\ 16\ hours}$ (daytime) and 64dB $L_{Aeq,8\ hours}$ (night time).

IMMI Noise modelling software was used to replicate the site conditions. The new L shaped building was added into the model once it had been calibrated and receptor positions added for 67-69 Upper Bognor Road, 71 Upper Bognor Road and the new L-shaped building at representative positions for ground floor and first floor windows.

The predicted external sound pressure levels were then used to carry out numerous rigorous calculations to identify suitable glazing and/or ventilation for the room types. For the majority of the site, standard thermal double glazing may be used with acoustic passive through the wall ventilators to achieve high levels of air flow. For the two listed buildings, secondary glazing has been applied to protect the integrity of the existing glazing in situ.

Predictably, the highest impacted room is a first-floor bedroom which already exists at 67 Upper Bognor Road and has a direct view of the B2259. Due to the high noise levels, it may be necessary to consider mechanical ventilation for that particular room and discussions are suggested with the heritage/conservation teams. If mechanical ventilation is deemed not appropriate, then a slight exceedance of the daytime internal noise criterion is likely by 3dB(A).

Condition 7 of BR252/21/PL required two elements, a scheme of protection to achieve BS8233:2014 internal sound pressure levels for the rooms within the site and also an assessment of external amenity spaces. Both have been provided within the report.

Sufficient detail has been presented to allow the local planning authority to discharge condition 7 of BR252/21/PL.