Chartered Building Consultancy

Acoustic South East

Environmental Noise Survey & Assessment

Site: **Shoreham Old Town Hall, High Street, Shoreham, BN43**
Client: **KSD Group**

Report by: Simon Barrett BSc(Hons) MSc MIOA

Date: 05/10/2023
Project: J1482
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Constructionline Part of Capita plc

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Report by: Simon Barrett BSc (Hons) MSc MIOA

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

Issue No.	Date	Comments:
Issue 1	27/09/2022	Initial Issue
Issue 2	05/10/2023	Includes a listening test and a sound insulation test relating to noise through the floor from ground floor to 1st floor in response to the request from the Local Authority. Amendments to Section 1. New sections (Section 10) added to report as addendum to the end. Original section headers renamed.

1 Introduction & Executive Summary

Acoustic South East have been appointed to undertake an acoustic assessment in support of a proposed planning application for the conversion of units at Shoreham Old Town Hall, High Street, Shoreham by Sea into residential dwellings.

A previous planning application was submitted some 7 years ago by a different developer but due to the time since the previous noise survey and assessment was carried out, the Local Planning Authority (LPA) has asked for a new road traffic noise assessment to be completed.

The purpose of this assessment is to assess the following:

- Measure the environmental noise levels at the location of the planned development.
- Provide mitigation measures (if necessary)

The noise levels for the day and the night time period have been assessed in terms of and following the guidelines of the documents listed below:

- ISO9613 (Attenuation of sound during propagation outdoors) 1996
- BS8233 (Sound insulation and noise reduction for buildings) 2014
- Pro-PG (Planning and Noise Guidance) 2017
- Planning Noise Advice Document: Sussex 2021

The ProPG Stage 1 Assessment of the location shows that sound pressure levels at the site are top of the medium risk category. Therefore, an in-depth assessment of the soundscape has been conducted to ascertain the mitigation methods needed for the proposed development to meet the relevant noise criteria.

The mitigation strategy for the development is summarised below:

The final calculated *minimum-required* SRIs for the rooms from the initial survey and assessment have been rounded up to the nearest whole number for ease of calculation.

- Front Façade (Lounges) SRI Required: **34dB**
- Side Façade (Lounges) SRI Required: **28dB**
- Side Façade (Bedrooms) SRI Required: **28dB**

Glazing + Frame to provide the RTra sound reduction performance as listed above.

Ventilation for the front façade should have a sound reduction performance of at least $D_{n,e,w}$ 38dB. Ventilation for the side façade should have a sound reduction performance of at least $D_{n,e,w}$ 33dB.

Further to the initial survey and assessment, the Local Authority requested additional information in terms of noise from the ground floor commercial space into the 1st floor space in terms of a sound insulation test through the floor as well as a listening test.

A Listening Test was conducted in July 2023 and a sound insulation test between ground and first conducted in September 2023.

The listening test highlighted nothing offensive in terms of internal ambient noise levels but recommendations have been made in terms of upgrading the rear windows to secondary glazing.

The sound insulation test highlighted that the performance would not comply with the typical enhanced requirements of the Local Authority for floor separating a dwelling from a commercial space and thus recommendations of improvements have been made.

If the mitigation methods detailed in the current report and those also discussed in the addendum are implemented by the developer, it is considered that from the perspective of acoustics, there is no reason for the planning permission to be withheld.

2 Context, Noise Criteria & Noise Assessment Methodology

2.1 Site Description

The proposal is to convert the existing building from unused commercial lettings into 6 self-contained residential dwellings but to keep one business unit. In addition, the existing ground floor restaurant will also remain.

The site, known as “The Annexe” is above and to the rear of the Chambers Bistro restaurant.

The site is situated to the south of the high street – a busy through-fare for road traffic and location of multiple shops.

The site is a grade 2 listed building and is located within the Shoreham Conservation Area. It is therefore likely that the heritage of this site will restrict the ability to carry out significant mitigation measures if required.

Properties adjacent to this site comprise of retail units with residential or office space above.

Road Traffic is the dominant sound source incident upon the site.

2.2 Site Location

The Site Location can be seen below in Figure 1

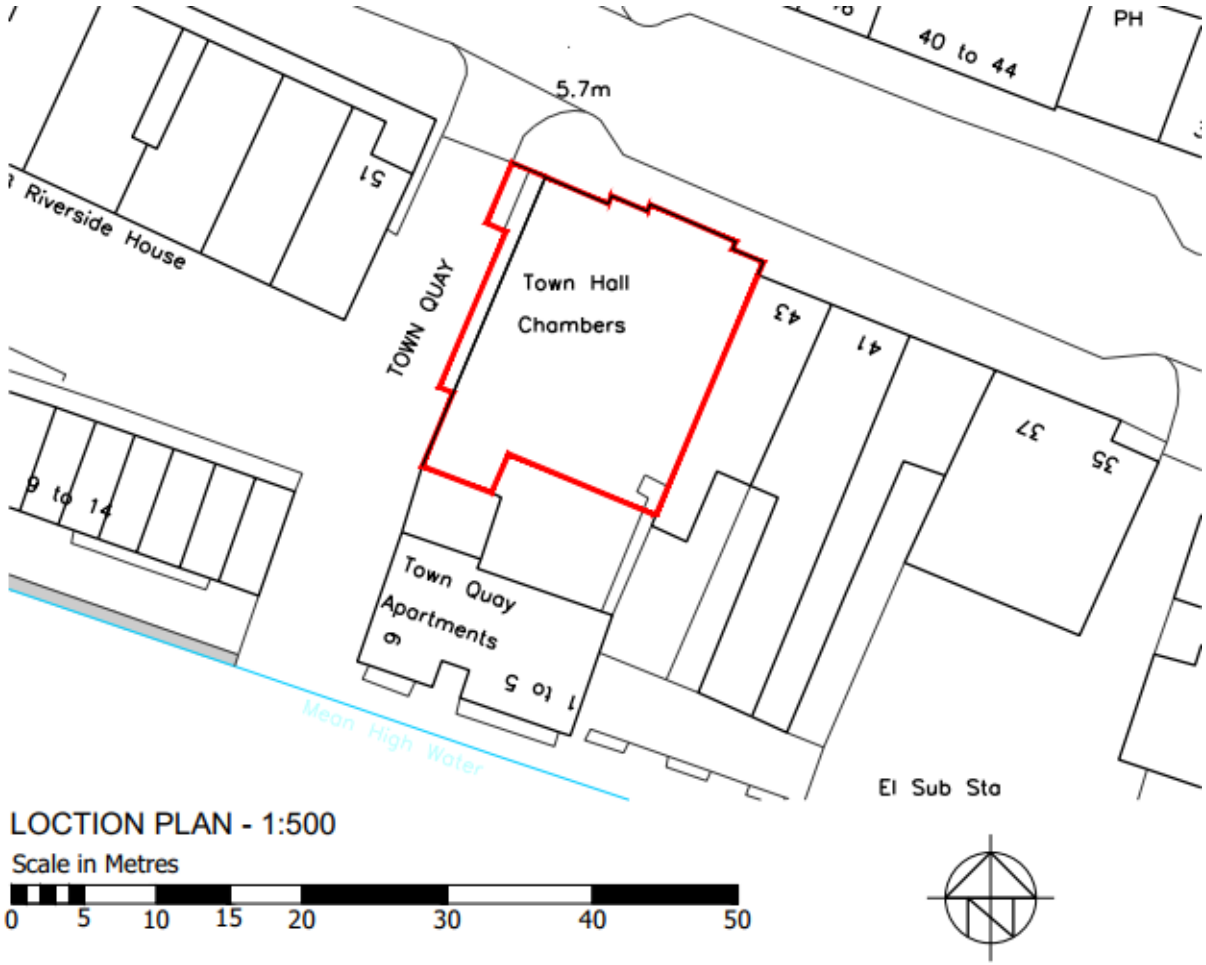


Figure 1: Site Location

2.3 Soundscape

The soundscape at the site is dominated by road traffic noise from the High Street (A259) that borders the north of the site.

2.4 Proposed Internal Layout

The proposal is to construct four self-contained maisonettes on the 1st and 2nd floors on the façade facing the High Street. The further two dwellings would be single-storey flats to the rear of "The Annexe": One on the 1st floor and one on the 2nd floor. The Business unit would be to the rear of "The Annexe" on the lower ground and upper ground floors.
The proposed *residential* floor plans can be seen below in figure 2.

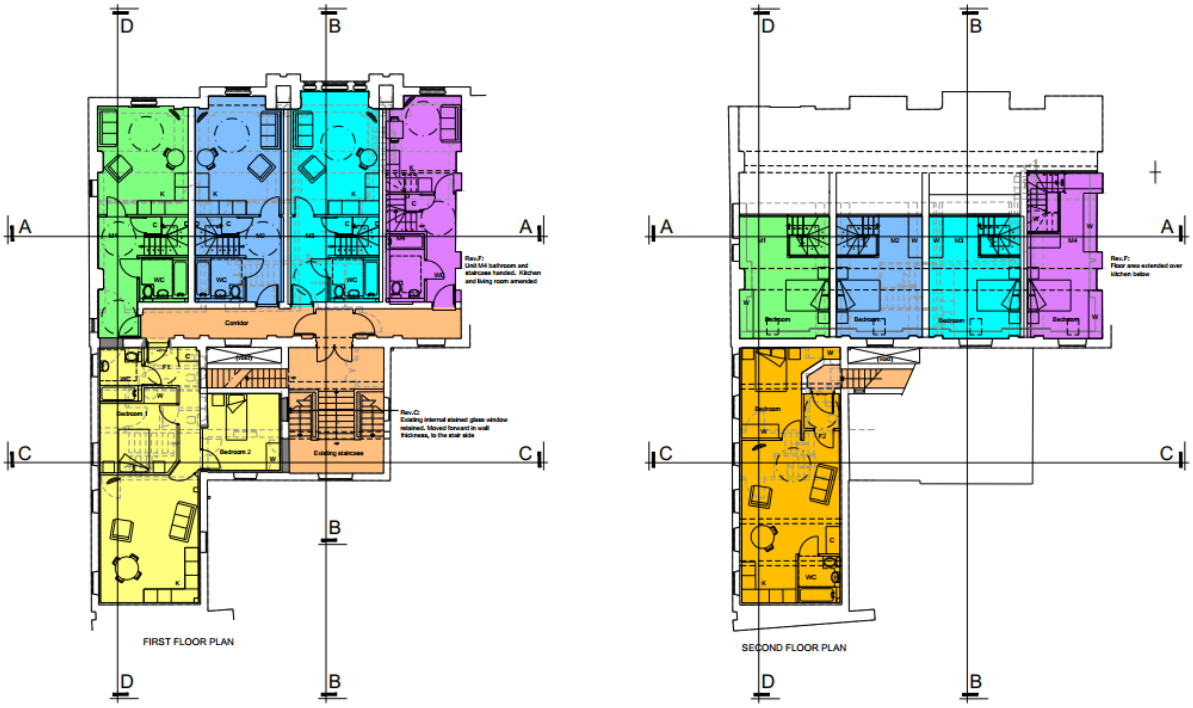


Figure 2: Proposed Residential Floor Plans

3 Standards and Guidance

3.1 BS8233: Sound insulation and noise reduction for buildings (2014) Noise Criteria

Table 4 of BS8233 provides the following guideline values: for maximum noise levels within habitable spaces

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 criteria

BS8233:2014, Note 7 which accompanies Table 4 also has the following narrative:

"NOTE 7 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."

3.2 BS8233: 2014 - Design criteria for external noise

With regard to outdoor amenity areas BS8233: 2014 states the following:

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 $L_{Aeq,T}$ 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.

3.3 ProPG –Planning and Noise: new residential development

The following has been copied from the Association of Noise Consultants' (ANC) website:

Over recent years, we have seen the introduction of the Noise Policy Statement for England, as well as substantial changes in national planning policy. But these developments have not been accompanied by detailed technical acoustic advice.

The lack of detailed guidance can lead to inconsistent application of policy, that may in turn result in unsatisfactory development and affect quality of life.

To fill that gap and facilitate efficient and consistent decision-making in the development control process, the Institute of Acoustics, the Association of Noise Consultants and the CIEH have joined to produce a Professional Practice Guidance (ProPG) focussing on noise sensitive development.

The following extract has been taken (Figure 2, Page 13) from the May 2017 ProPG document:

ACTIVITY	LOCATION	07:00 – 23:00 HRS	23:00 – 07:00 HRS
Resting	Living room	35 dB $L_{Aeq,16\ hr}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16\ hr}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16\ hr}$	30 dB $L_{Aeq,8\ hr}$ **45 dB $L_{Amax,F}$** (Note 4)

NOTE 1 The Table provides recommended internal L_{Aeq} target levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Ground-borne noise is assessed separately and is not included as part of these targets, as human response to ground-borne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.

NOTE 2 The internal L_{Aeq} target levels shown in the Table are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the internal L_{Aeq} target levels recommended in the Table.

NOTE 3 These internal L_{Aeq} target levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Year's Eve.

NOTE 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values. In most circumstances in noise-sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{Amax,F}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events (see Appendix A).

NOTE 5 Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded, subject to the further advice in Note 7.

NOTE 6 Attention is drawn to the requirements of the Building Regulations.

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 **(see Section 3.D)**.

Figure 3: ProPG Criteria

3.4 Relevant Standards Review and Noise Assessment Methodology.

A noise survey was set up to assess the road traffic noise affecting the site. The sound survey was installed to assess the impact of the A259 (High Street). Two microphone locations were used, due to the layout of the site:

Position 1 was at 1st floor level with the microphone mounted on a pole placed out of a window, 1 metre from the front façade.

Position 2 was at 2nd floor level in what is currently Unit 7, with the microphone mounted on a pole placed out of a window between 0.5 and 1m from the side façade.

The report assessed the collected data over a period of 6 days deliberately including a weekend period as well as week-days.

Due to the size of the site and the fact that two measurement locations were used, a computer noise model was not required.

The results of the survey were used to calculate mitigation methods to allow the proposed new residential dwellings to meet values specified within Table 4 under section 7.7.2 of BS 8233:2014. The report also considers the ProPG:2017 criterion of no more than 10 L_{Amax} events (over 45dB(A)) internally within a bedroom per night. In line with Sussex Planning Noise Advice Document $L_{Afmax,1\ minute}$ measurements were used for this section of the assessment.

4 Unattended Sound Surveys – Original Survey

The unmanned surveys were conducted between 21st – 27th September 2022. All measurements were conducted at "Façade – Level" conditions.

4.1 Unmanned Survey Locations

The unmanned Survey Locations were:

- **SP1**: Located 1m from the front façade of the building at 1st floor window height. The survey location will be treated as Façade – Level.
- **SP2**: Located 0.5 – 1m from the side façade of the building at 2nd floor window height. The survey location will be treated as Façade – Level.

The survey locations can be seen below in figures 4 and 5

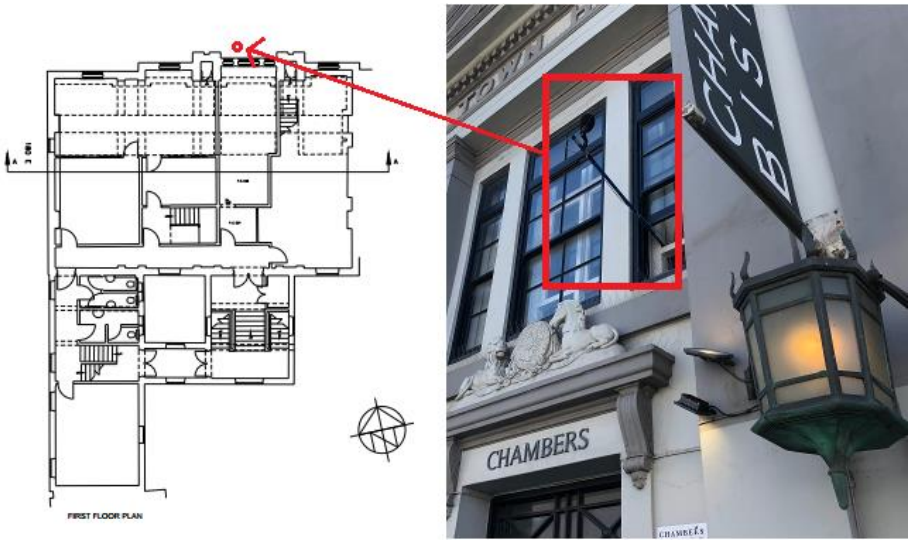


Figure 4:Survey Location SP1

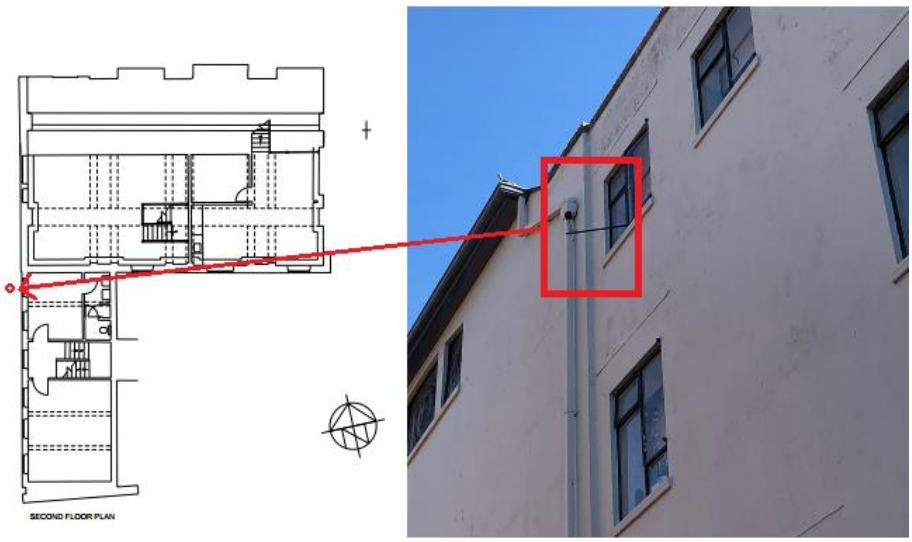


Figure 5: Survey Location SP2

4.1.1 Survey Details

- Survey carried out by:
  - Simon Barrett BSc(Hons) MSc MIOA
- Equipment used:
  - 1x 01dB Solo Class 1 sound level meter
  - 1x 01dB Symphonie System with a laptop running dBTrig software, connected to a Class 1 microphone held in a weather-proof microphone housing.

4.1.2 Unmanned Survey Results SP1

Date (2022) September	Time Period	Façade Level $L_{Aeq,16hr/8hr}$ – dB(A)	Freefield Level $L_{Aeq,16hr/8hr}$ – dB(A)
Day 1	07:00-23:00hrs	68.7	65.7
Day 2	07:00-23:00hrs	71.6	68.6
Day 3	07:00-23:00hrs	67.8	64.8
Day 4	07:00-23:00hrs	67.8	64.8
Day 5	07:00-23:00hrs	69.3	66.3
Day 6	07:00-23:00hrs	62.5	59.5
Arithmetic Average	**07:00-23:00hrs**	**68.0**	**65.0**
Night 1	23:00-07:00hrs	63.2	60.2
Night 2	23:00-07:00hrs	63.4	60.4
Night 3	23:00-07:00hrs	62.8	59.8
Night 4	23:00-07:00hrs	63.3	60.3
Night 5	23:00-07:00hrs	65.3	62.3
Night 6	23:00-07:00hrs	62.6	59.6
Arithmetic Average	**23:00-07:00hrs**	**63.4**	**60.4**

Table 2: Unmanned Survey $L_{Aeq,T}$ Results (SP1)

4.1.3 Unmanned Survey Results SP2

Date (2022) September	Time Period	Façade Level $L_{Aeq,16hr/8hr}$ – dB(A)	Freefield Level $L_{Aeq,16hr/8hr}$ – dB(A)
Day 1	07:00-23:00hrs	63.7	60.7
Day 2	07:00-23:00hrs	65.5	62.5
Day 3	07:00-23:00hrs	63.0	60.0
Day 4	07:00-23:00hrs	63.3	60.3
Day 5	07:00-23:00hrs	63.4	60.4
Day 6	07:00-23:00hrs	56.8	53.8
Arithmetic Average	**07:00-23:00hrs**	**62.6**	**59.6**
Night 1	23:00-07:00hrs	57.7	54.7
Night 2	23:00-07:00hrs	56.9	53.9
Night 3	23:00-07:00hrs	55.9	52.9
Night 4	23:00-07:00hrs	56.2	53.2
Night 5	23:00-07:00hrs	59.0	56.0
Night 6	23:00-07:00hrs	56.8	53.8
Arithmetic Average	**23:00-07:00hrs**	**57.1**	**54.1**

Table 3: Unmanned Survey $L_{Aeq,T}$ Results (SP2)

5 ProPG Stage 1 Assessment – Original Survey

The ProPG stage one risk assessment does not include a specific location or height which the indicative $L_{Aeq,16hr}$ and $L_{Aeq,8hr}$ should be assessed. The document does however state that a "typical worse case 24 hours" should be assessed. Therefore, the measured results from Survey Location SP1 were used for the ProPG Stage 1 Assessment using the worst-case Daytime $L_{Aeq,16hr}$ value and the worst-case Night-time $L_{Aeq,8hr}$ value. Figure 6, below, shows that the levels at the site are entering the high-risk category. Therefore, a more in-depth assessment of the sound pressure level has been conducted to ascertain the mitigation methods needed for the proposed development to meet the relevant noise criteria.

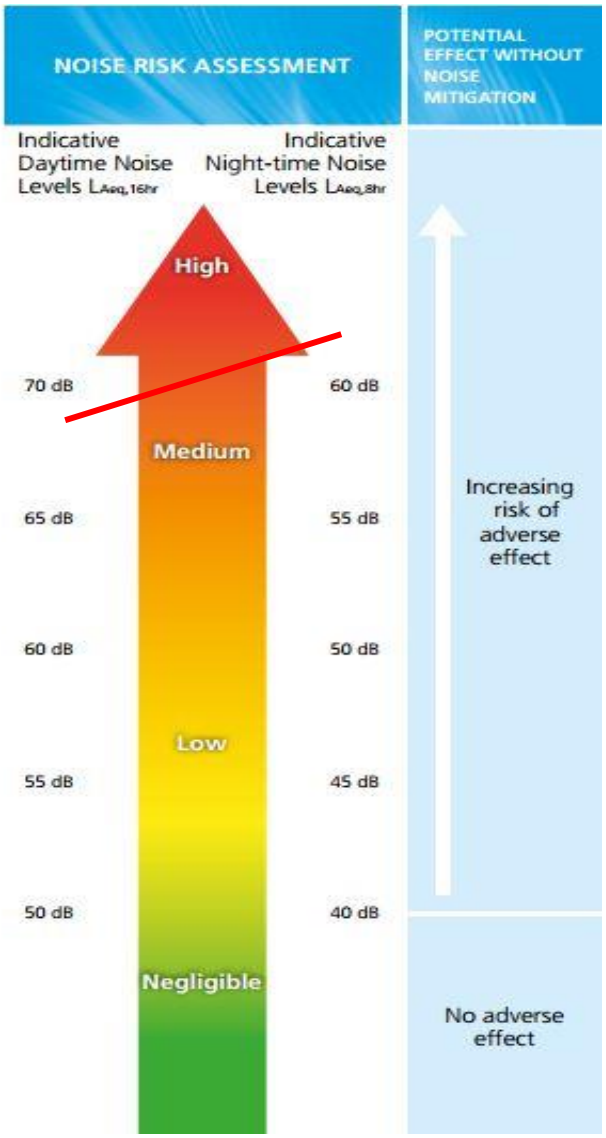


Figure 6: ProPG Stage 1 Assessment

6 Noise Mitigation Measures – Original Survey

6.1 Noise Criteria

6.1.1 $L_{Aeq'T}$ Noise Levels

The BS8233:2014 noise criteria will be used to specify the noise mitigation measures for all habitable rooms. The maximum internal noise level for each area is as follows:

- Bedrooms 35/30dB(A) Day/Night $L_{Aeq,\ 16\ hour/8\ Hour}$
- Lounges 35dB(A) Day $L_{Aeq,\ 16\ hour}$

6.1.2 Road Noise Maximum Noise Levels

For L_{Amax} events the ProPG noise L_{Amax} criterion will be used to specify the noise mitigation measures for bedrooms only:

For a reasonable standard in noise sensitive rooms at night (e.g. bedrooms) individual noise events should not normally exceed 45dB LAFmax more than 10 times a night.

The above is similar to guidance in the WHO Guidelines for Community Noise 1999 document. However, the ProPG criteria suggests limiting the number of LAmax events (over 45dB(A) to less than 10 times a night as opposed to less than 10-15 times a night as stipulated by the WHO.

6.2 Required Sound Reduction of Building Envelope – $L_{Aeq,T}$ levels

The Sound Reduction Index (SRI) has initially been calculated so that the $L_{Aeq,T}$ criteria can be achieved (The L_{Amax} events are discussed in the next sub section).

Table 4, below, shows the required SRI that will have to be achieved by the building envelope for both the 16-hour day time and the 8-hour night time periods.

Location	External Free-field Level Day: $L_{Aeq,16Hr}$	Criterion	ReqSRI	External Free-field Level Night $L_{Aeq,8Hr}$	Criterion	ReqSRI
Front Façade (All Lounges)	68.6	35	33.6	62.3	-	-
Side Façade (Lounges)	62.5	35	27.5	56	-	-
Side Façade (Bedrooms)	62.5	35	27.5	56	27	29

Table 4: Required SRI at Façades

N.B. based on the recommendation from ProPG 2017, worst-case daytime and worst-case night time periods were used. This is what is shown in Table 4, above.

6.3 Required Sound Reduction of Building Envelope – L_{Amax}

Table 4 in the above section shows the required SRI for $L_{Aeq,T}$ criteria. However, for this level of sound reduction to be acceptable there is also a requirement to meet the ProPG 2017: This suggests limiting the number of L_{Amax} events (over 45dBA) within a bedroom to no more than 10 occurrences per night-time period (23:00-07:00hrs).

The suggested SRIs for the relevant façade positions from Table 4 were used to see how many $L_{Amax,}$ above 45dBA there would be inside bedrooms over a night-time period (between 23:00 and 07:00). The results are shown below in Table 5.

Location	$L_{Aeq'T}$ SRI	Night 1	Night 2	Night 3	Night 4	Night 5	Night 6	Average
Side Façade (Bedrooms)	27.5	7	7	4	6	6	6	6

Table 5: $L_{Amax,\ 1min}$ Events with SRI derived from the continuous noise level for side façade

As can be seen from the results in table 5 at all assessed locations the SRI based on the $L_{Aeq'T}$ criterion would provide adequate attenuation in order to meet the ProPG:2017 L_{Amax} criteria of no more than 10 L_{Amax} events over 45dBA in a bedroom.

It should be noted that for the front façade, there are no bedrooms exposed – they are all on the 2nd floor, which is set back and with the bedroom on the rear façade, protected from road traffic noise by the building itself. This is good acoustic design.

6.3.1 SRI Requirement Summary

The final calculated *minimum-required* SRIs for the rooms have been rounded up to the nearest whole number for ease of calculation.

- Front Façade (Lounges) SRI Required: **34dB**
- Side Façade (Lounges) SRI Required: **28dB**
- Side Façade (Bedrooms) SRI Required: **28dB**

6.4 Glazing

Due to the “Listed” status of the building (Grade II), it is recommended that secondary glazing is used for this level of sound insulation.

It is, noted that the front façade already utilises secondary glazing, but the measured performance of the façade was, at best 31dB when both the secondary and primary glazing was all closed as best as possible. The secondary glazing did not, however, have an ability to be fastened closed and so this, along with the use of blade seals would be recommended for improvement measures. Changing the glass thickness of the secondary glazing to 6mm, if it is not already that thick would also be recommended if this is allowable by your Heritage officer.
In addition, it is recommended that absorptive window reveals between the primary and secondary glazing are introduced to further enhance the glazing’s sound reduction performance to reach 34dB.

For the side façade, again the introduction of secondary glazing is recommended. A cavity of 100mm should be introduced between the primary and secondary window frames and the secondary glazing should be 6mm thick glass.

6.5 Ventilation

Due to the sound pressure levels of the local soundscape, an alternative ventilation method to opening windows would be required.

Although it is noted that windows should remain openable upon the residents choosing, the required air changes to satisfy Approved Document F and overheating requirements to satisfy Approved Document O would need to be achieved with the windows closed.

If trickle vents or through wall ventilators were installed, they would need to be able to meet the required SRI.

The required air changes should be calculated by the client's ventilation engineer or M+E consultant. The $D_{n,e,w}$ value in table 7 is for the entirety of the equivalent area provided by the client's chosen ventilator.

If more than one ventilator per room was used, this would increase the required $D_{n,e,w}$ in line with the logarithmic scale. Note: There would be a 3dB increase for every doubling of the number of ventilators (this is assuming the ventilators were of the same size).

Ventilation for the front façade should have a sound reduction performance of at least $D_{n,e,w}$ 38dB.

Ventilation for the side façade should have a sound reduction performance of at least $D_{n,e,w}$ 33dB.

If the developer installed MVHR or MEV ventilation systems rather than a passive ventilation system, 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

Any ducting associated with an MVHR installation should be mounted on anti-vibration mounts.

7 Outdoor Amenity Spaces – Original Survey

It is noted that for THIS development, there are no outdoor amenity areas provided, due to the nature of the building.

However, within a short walk, there is access to Shoreham Beach where exists some more tranquil settings away from the busy High Street, which would provide suitable outdoor amenity space if required.

8 Uncertainty – Original Survey

The data set gathered to conduct the assessment detailed in the report was measured over a number of days that deliberately incorporated a weekend. The worst-case day and night time values were then used to calculate the mitigation methods required to satisfy the relevant criteria.

The sound level meters used were calibrated on site at both the site set up as well as the decommissioning of the equipment to ensure that it was operating as intended. No significant drift was noted.

Rounding of values has only occurred once, at the end of any calculation, to avoid a “double-rounding” issue.

9 Conclusion & Summary – Original Survey

The ProPG Stage 1 Assessment of the location shows that sound pressure levels at the site are top of the medium risk category. Therefore, an in-depth assessment of the soundscape has been conducted to ascertain the mitigation methods needed for the proposed development to meet the relevant noise criteria.

The mitigation strategy for the development is summarised below:

The final calculated *minimum-required* SRIs for the rooms have been rounded up to the nearest whole number for ease of calculation.

- Front Façade (Lounges) SRI Required: **34dB**
- Side Façade (Lounges) SRI Required: **28dB**
- Side Façade (Bedrooms) SRI Required: **28dB**

Glazing + Frame to provide the RTra sound reduction performance as listed above.

Ventilation for the front façade should have a sound reduction performance of at least $D_{n,e,w}$ 38dB.

Ventilation for the side façade should have a sound reduction performance of at least $D_{n,e,w}$ 33dB.

If these mitigation methods detailed in the current report are implemented by the developer, it is considered that from the perspective of acoustics, there is no reason for the planning permission to be withheld.

10 Addendum – Listening Test and Sound Insulation Test

10.1 General

Further to the original report (issue 1 of this report) comments were received from Adur and Worthing Local Authority. Whilst agreeing with the findings and recommendations of the report, they also requested additional an additional element of assessment in terms of noise from the ground floor commercial premises affecting the first floor. The following statement was raised in their communication:

There has been no assessment of the impact of noise from the operation of the ground floor commercial (A3) use on the proposed residential units, nor any external plant associated with the commercial unit. This must be looked at as the Agent of Change principle now enshrined in planning policy puts the responsibility for protecting new development from existing commercial noise sources firmly with the applicant.

A subsequent telephone conversation was had with Nadeem Shad (Team Leader of Environmental Protection at Adur and Worthing Council) explaining that the original survey will have obtained the all-encompassing sound level with plant included and it was agreed therefore that the remaining survey and assessment would include a listening test within a 1st floor space directly above the ground floor restaurant and an airborne sound insulation test through the floor between ground and first.

10.2 Listening Test

On Friday 7th July 2023, a listening test was conducted within a first-floor office space directly above the ground floor restaurant between the time of 19:00 – 21:00hrs: A prime time for the restaurant business.

During this time, listening was conducted for a 1-hour period in the rear office space (19:00 – 20:00 hrs). All windows were closed during the listening test.

Listening was then conducted for a 1-hour period in the front office space (20:05 – 21:05 hrs). Again, all windows were closed during the listening test including the secondary glazing to ensure that the listening test in this front office space was not tarnished by sound from the busy road outside.

A sound level meter was recording sound pressure levels during these two listening test periods and the results are shown in the table below. It can be seen that both internal LAeq ambient sound levels comply with the LAeq values of 35dB for habitable rooms within dwellings during daytime hours (see table 1 of this report in Section 3.1).

Test No.	Time Period	Location	Leq,1hr (dBA)
1	19:00 – 20:00	Rear Office Space	34.0
2	20:05 – 21:05	Front Office Space	31.9

Table 6: Listening Test LAeq Sound Pressure Level Readings

10.2.1 Listening Test 1 Observations

The following observations were noted during listening test 1 carried out between 19:00 – 20:00hrs in the rear office space.

- Rear Terrace chatting, audible via rear window
- Gentle whir of plant also audible
- Very occasional chair scrapes from below (with concentration) and the outside terrace
- Helicopter and aeroplane fly-passes audible (extraneous to restaurant)

10.2.2 Listening Test 2 Observations

The following observations were noted during listening test 2 carried out between 20:05 – 20:05hrs in the front office space.

- Very slight hint of talking voices from restaurant space but only with high levels of concentration
- Dominant noise source, despite all secondary glazing being closed is still road traffic and noise from the high street

From the above contextual listening tests, the front office space was essentially un-affected by noise from the ground floor restaurant. The rear office however, was impacted and this was due to the poor single glazing of the rear windows as this was the route of the noise into the space.

Mitigation Measures would be recommended, therefore, to improve the outside-to-inside sound insulation of the rear façade.

10.3 Sound Insulation Test

On Monday 25th September 2023, a vertical airborne sound insulation test was conducted between the ground floor restaurant space and a first-floor office space to check the performance of the separating floor.

The sound insulation test was conducted in full accordance with BS EN ISO 140-4 and rated in accordance with BS EN ISO 717-1.

10.3.1 Test Method

Two loudspeakers were placed in the relevant area of the ground floor restaurant space, separated from each other, at different heights in the source room and angled across the room to create a diffuse sound field. An amplifier was used to broadcast pink noise through the loudspeakers using two individual noise generators. The spectrum shape of the reverberant noise was checked to ensure that each 1/3 octave band was within 6 dB of its neighbouring bands, which it was.

Measurements were taken in the source room at each 1/3 octave band centre frequency between 100 Hz and 3.15 kHz using the “sweep” technique as described in ISO140 (30 secs.). Further measurements were then taken in the same way in the receiving room on the other side of the test element. The reverberation time was also obtained using the interrupt stationery method for each 1/3 octave centre frequency in the receiving room. This was spatially averaged over 6 positions in the room.

Ambient sound pressure levels (without the source operating) were also taken at each frequency in the receiving rooms using the “sweep” technique as described in ISO140 (30 secs) to check that ambient noise levels were at least 10 dB below the measured levels due to generated noise and thus did not contribute to the measured levels. These too were spatially-averaged. Type of noise radiated: Broadband pink noise. Dominant sources of background noise were as follows: Road Traffic

10.3.2 Equipment used:

Description	Type	Serial	Manufacturer	Calibration Expiry Date	Calibration Certificate No.
Type 1 SLM	NOR118(A)	31460	Norsonic	19/05/25	TCRT23/1388
Mic (118A)	1225	91973	Norsonic	16/05/25	TCRT23/1388
Pre-Amp (118A)	1206	30779	Norsonic	19/05/25	TCRT23/1388
SLM Calibrator	Type 1251 (Nor118A)	30974	Norsonic	16/05/25	TCAC23/05229
Sound Source	2 Speaker (RCF)	TCCI00033 / TCCI00031	ART SERIES 310-A MK4	-	-
Sound Source	Reverb 4	TCCI00033 / TCCI00031	RCF	-	-

Table 7: Equipment Used for Sound Insulation Testing

10.3.3 Test Result

Source Room	Vol (m^3)	Receiving Room	Vol (m^3)	Common Area (m^2)	DnT,w (dB)	DnT,w + Ctr (dB)	Minimum Pass Criterion (dB)	Test Reference J1482/
Ground Floor Restaurant Space	>100	1st Floor Office Space	>100	40	54	45	43*	1

Table 8: Sound Insulation Test Result

* In Table 8 above the minimum pass criterion shown is from Approved Document E 2003 (as amended 2015) of the Building Regulations 2010 for airborne sound insulation of floors between converted dwellings. However, the document also states that where a dwelling is separated from a non-dwelling, an enhanced criterion may be required. It is understood that the Local Authority typically require an enhancement of at least 5dB above the minimum requirement, thus the new minimum criterion would become DnTw + Ctr = 48dB, but there is often a call for the minimum requirement to be DnTw + Ctr = 50dB where the ground floor is a restaurant. The result falls short of both of these enhanced requirements.

A Graphical Representation of this result is shown in Section 10.4, below.

Mitigation Measures would be required in order to improve the airborne sound insulation between the ground floor and 1st floor space in the form of an upgrade to the sound insulation of the floor/ceiling.

10.4 Sound Insulation Test Graph

Standardized level difference according to ISO 140-4
Field measurements of airborne sound insulation between rooms

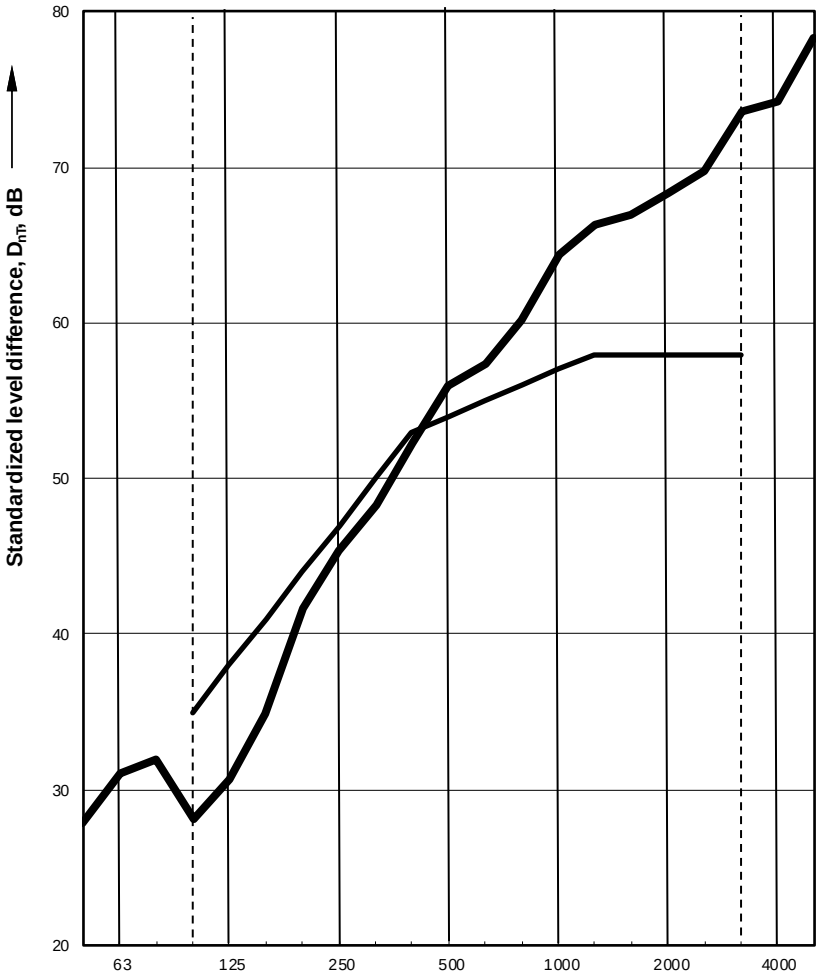
Client: KSD Group Date of test: 25/09/2023

Description and identification of the building construction and test arrangement, direction of measurement:
Shoreham Old Tow n Hall, Brighton Road, Shoreham by Sea, West Sussex, BN43
Ground Floor Restaurant Space - 1st Floor Office Space (Vertical)
Common Area: 40sq. m (Approx.)

Source room volume: >100 m³
Receiving room volume: >100 m³

Frequency range according to the curve of reference values (ISO 717-1)

Frequency *f* Hz	D_{nT} (one-third octave) dB
50	>= 27.9 *
63	31.0
80	31.9
100	28.1
125	30.7
160	34.9
200	41.6
250	45.3
315	48.3
400	52.3
500	55.9
630	57.4
800	60.2
1000	>= 64.4 *
1250	>= 66.3 *
1600	>= 66.9 *
2000	>= 68.3 *
2500	>= 69.8 *
3150	>= 73.6 *
4000	>= 74.2 *
5000	>= 78.3 *



* Result should be taken as limit of measurement due to low SNR in receiver room (<=6 dB)

Rating according to ISO 717-1

$D_{nT,w}$ (C;C_{tr}) = 54 (; -9) dB; $D_{nT,w} + C_{tr}$ = 45 dB

Evaluation based on field measurement
results obtained by an engineering method

No. of test report: J1482/1 Name of test institute: Acoustic South East
Date: 25/09/2023 Signature: Simon Barrett

10.5 Mitigation Measures – Listening and Sound Insulation Tests

10.5.1 Glazing

Whilst the measured internal ambient sound levels were shown to comply with the requirements of BS8233 for daytime hours, it is unknown if this plant operates during the night time (refrigeration plant etc).

It is therefore recommended that the glazing is upgraded from single-glazing units and the simplest way to do this would be to introduce secondary glazing to the rear window(s) in the same way that the front windows are already secondary-glazed. This glazing may be openable so that the occupier has a choice (from a ventilation point of view), but this will significantly reduce noise ingress from the rear terrace and the whir of the plant that is associated with the ground floor restaurant.

The secondary glazing should fit well, with perimeter seals around its frame and the glass should be between 6mm and 10mm. It is recommended that the cavity between the existing outer glass and the new secondary glazing is a minimum of 100mm.

10.5.2 Separating Floor/Ceiling

In terms of upgrading the airborne sound insulation of the separating floor, it is recommended that a suspended MF Grid ceiling is installed to the underside of the existing floor/ceiling separating the ground floor space from the 1st floor. This is now possible due to the restaurant having closed for business and the space becoming vacant. This would be the most appropriate, simplest and effective way to improve the sound insulation between ground and first floor levels and should be applied to the whole of the ground floor unit.

The following should be carried out:

- Keep the existing ceiling in place and make good where damaged
- Install a Gyproc Casoline MF grid on acoustic hangers (or other manufacturer's equivalent) below the existing ceiling creating a void of at least 150mm and incorporate 100mm Mineral Fibre (minimum density 15kg/m^3)
- 2 layers of 15mm Gyproc Soundbloc F or Fireline should be installed to the new MF Grid. Plasterboard layers should be staggered, taped and sealed (at each layer) with an acoustic mastic.

It would also be important to inspect any junctions at the perimeter to ensure that there is no weak transmission path around the edge of the ceiling. The new ceiling should cut into any perimeter wall linings if they exist and then the wall linings made good afterwards.

10.6 Uncertainty – Listening Test

Since the listening test was conducted in July 2023, the restaurant has now closed its business leaving the ground floor vacant. This means that currently, the plant associated with the restaurant is out of use and may not be used in the future or may be changed. It would, of course, be the responsibility of the new occupiers to alert the Local Authority if the plant was to change (or the use) but at present, the internal ambient sound levels will likely be lower in the rear office space, due to the non-operation of a ground floor business.

10.7 Conclusion – Listening and Sound Insulation Test

A Listening Test was conducted in July 2023 and a sound insulation test between ground and first floor conducted in September 2023.

The listening test highlighted nothing offensive in terms of internal ambient noise levels but recommendations have been made in terms of upgrading the rear windows to secondary glazing.

The sound insulation test highlighted that the performance would not comply with the typical enhanced requirements of the Local Authority for floor separating a dwelling from a commercial space and thus recommendations of improvements have been made.

If these mitigation measures are carried out it is considered that the Local Authority should not without planning consent on the basis of acoustics/noise.