

**Assessment of the Potential Sound Emission from the
Proposed Change of Use Relating to 24 Westgate, Huddersfield**

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1.0 Summary

Planning permission is being sought to permit the extension of the existing bar and restaurant premises located at 26 Westgate in Huddersfield into the adjacent former newsagent's premises, Westgate News, located at 24 Westgate in Huddersfield. As part of the change of use application a response has been received from Kirklees Council's Environmental Health department requiring a noise assessment to be conducted to assess what affect the proposal may have on the existing noise climate in the immediate vicinity of 24 Westgate.

In compliance with Kirklees Council's Environmental Health department's comments, Druk Limited has been commissioned to undertake an assessment of the potential noise emissions from the proposed new use of the former Westgate News premises at 24 Westgate. The assessment will include an evaluation of the potential internal noise transmission resulting from activity on the first floor of the premises at 24 Westgate to the residential flats above. This will be combined with a further assessment of the possible effect that any potential noise break-out from the premises at 24 Westgate may have on the existing external noise climate in the immediate vicinity. The assessments will be conducted according to the guidance contained within the West Yorkshire, Planning Consultation Guidance - Noise and Vibration and British Standard (BS) 8233:2014 "Guidance on sound insulation and noise reduction for buildings". As the development is in the relatively early stages of completion, the assessment will comprise a desktop assessment.

It should however be remembered that the assessment presented within this report is limited to evaluating the acoustic implications of the proposed change of use, including any suggested measures to limit the transmission of noise. The report will not consider any other aspects of the building including, but not limited to, structural integrity, electrical installation etc., of any of the proposed measures to limit noise transmission. It is therefore recommended that additional guidance as to the ability of the existing to accommodate the suggested sound insulation enhancement measures are sought from an appropriately qualified and experienced individual/organisation.

The existing noise climate in the immediate vicinity of 24 Westgate was considered as being typical of an urban environment comprising a range of commercial and entertainment uses. The potential noise emission assessments have indicated that the application of the proposed sound insulation measures to the existing floor/ceiling structure within 24 Westgate, should be sufficient to limit the transmission of noise to the residential flats above in accordance with the design targets. With reference to the potential break-out of noise from both the food preparation area and the seating area with 24 Westgate, the calculations have indicated that the break-out of noise from these areas would have no affect on the existing external noise climate. Finally, and with respect to the possible emission of noise from a kitchen extraction system, maximum noise emission levels have been specified.

Report Prepared by:



Robert Smith

2.0 Introduction

Planning permission is being sought to permit the extension of the existing bar and restaurant premises, located at 26 Westgate in Huddersfield, in to the adjacent former newsagent's premises, Westgate News, located at 24 Westgate in Huddersfield. As part of the change of use application, a response has been received from Kirklees Council's Environmental Health department requiring a noise assessment to be conducted to assess what affect the proposal may have on the existing noise climate.

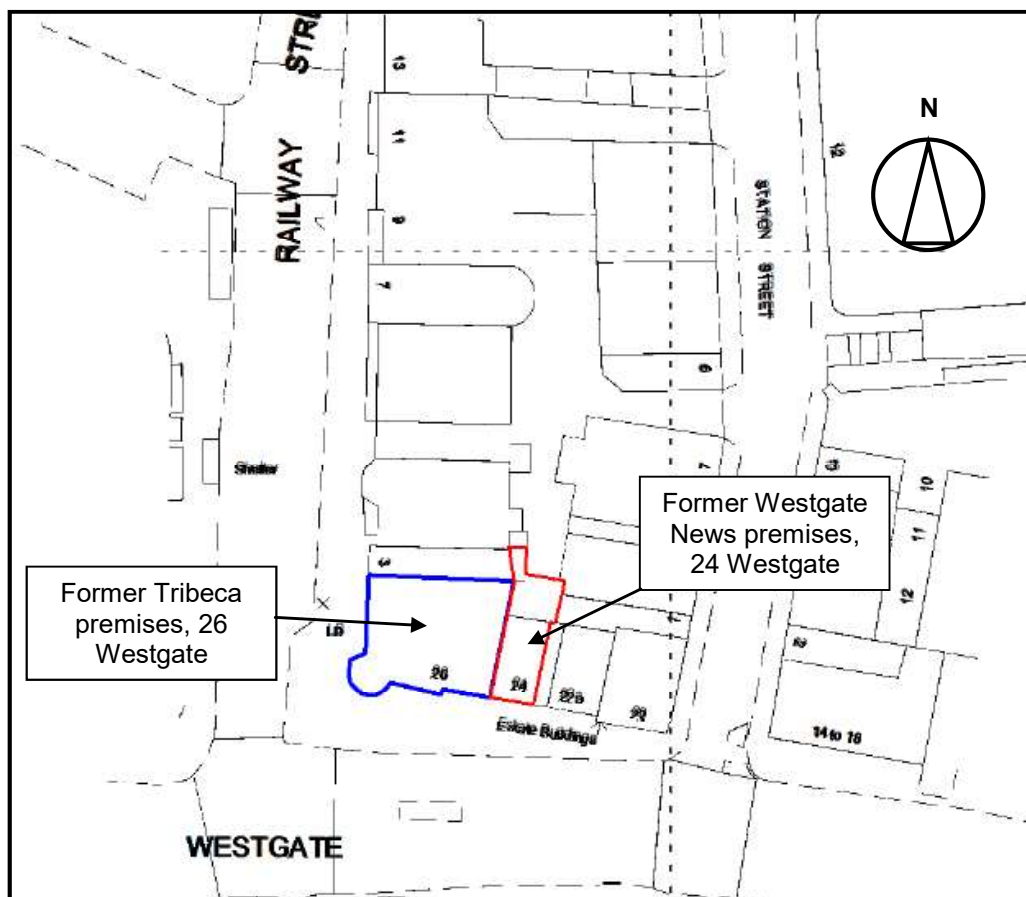
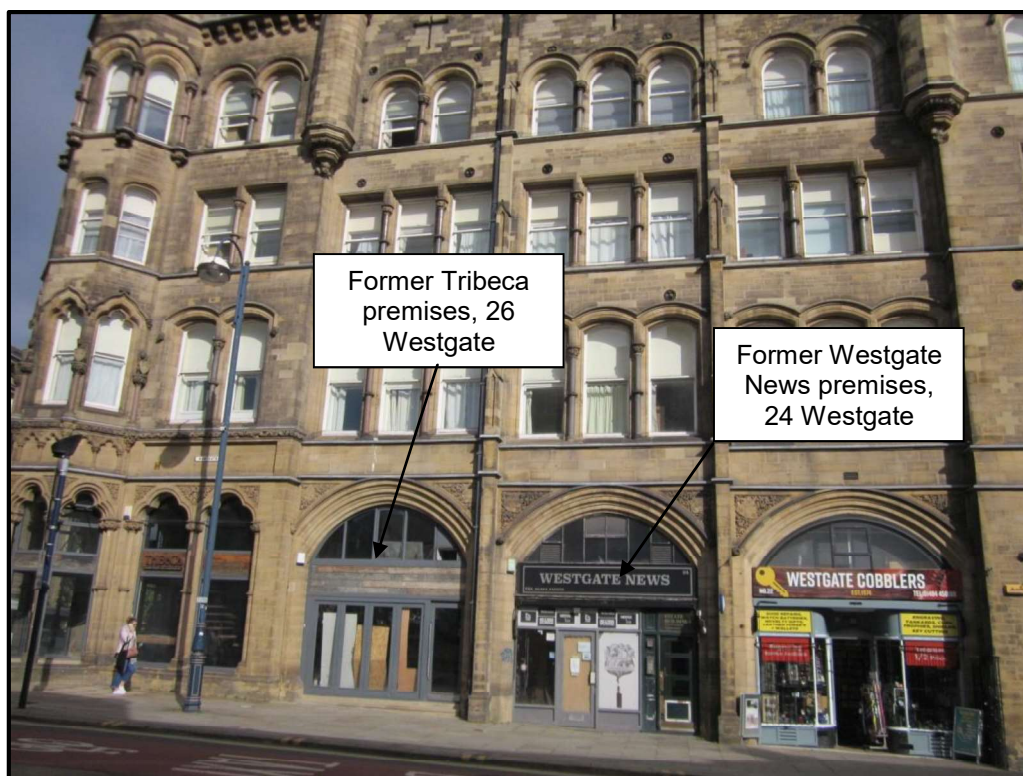
In compliance with Kirklees Council's Environmental Health department's comments, Druk Limited has been commissioned to undertake an assessment of the potential noise emissions from the proposed new use of the former Westgate News premises at 24 Westgate. The assessment will include an evaluation of the potential internal noise transmission resulting from activity on the first floor of the premises at 24 Westgate to the residential flats above. This will be combined with a further assessment of the possible effect that any potential noise break-out from the premises at 24 Westgate may have on the existing external noise climate in the immediate vicinity. The assessments will be conducted according to the guidance contained within the West Yorkshire, Planning Consultation Guidance - Noise and Vibration and British Standard (BS) 8233:2014 "Guidance on sound insulation and noise reduction for buildings". As the development is in the relatively early stages of completion, the assessment will comprise a desktop assessment.

With the respect to the evaluation of the emission of noise from 24 Westgate, this will be undertaken with reference to the guidance contained within the West Yorkshire, Planning Consultation Guidance - Noise and Vibration and BS 8233:2014 "Guidance on sound insulation and noise reduction for buildings". As the development is in the relatively early stages of completion, the assessment will comprise a desktop assessment.

It should be remembered that whilst every effort has been made to ensure that the advice contained within this report represents best practice with respect to achieving the desired guide values, the advice will not form a performance guarantee as the ultimate performance will depend on a number of contributory factors such as the selection and installation of the various components and the quality of workmanship, all of which are beyond the control of Druk Limited.

3.0 Site Description

The former Westgate News premises is located at 24 Westgate in Huddersfield town centre, directly adjacent to the former Tribeca bar and restaurant located at 26 Westgate in Huddersfield (figure 1 and photograph 1 overleaf). The surrounding area is characterised by a mix of commercial enterprises including retail shops and licensed premises (photograph 2 overleaf) with some residential flats above the commercial premises on both Westgate and Railway Street (photograph 3 overleaf).

Figure 1. Location of 24 Westgate in Huddersfield town centre**Photograph 1.** 24 and 26 Westgate, Huddersfield

Photograph 2. Commercial premises on Westgate (looking East)



Photograph 3. Residential flats directly above the commercial premises on Westgate



4.0 Assessment Criteria

The following sections detail the requirements and guidance that will inform the basis of the subsequent assessments of both the internal and external transmission of noise, resulting from the conversion of the former Westgate News building at 24 Westgate in Huddersfield.

4.1 Kirklees Council Environmental Health Consultation Response

In response to the proposal a consultation response was received from Kirklees Council's Environmental Health department requiring an assessment of the potential noise emission from the converted premises at 24 Westgate. The relevant parts of this response are detailed below.

Noise – the extension of the bar is likely to increase the potential for noise to affect the neighbouring premises so the following condition is recommended:

NA1 Noise Report Required Before Determining the Application (new noisy development near existing residential)

Before the application can be determined, details of a noise assessment by a suitably competent person must be submitted in writing to the Local Planning Authority. The report shall include:

- a) an assessment of all noise emissions from the proposed development
- b) details of existing background and predicted future noise levels at the boundary of all neighbouring premises.
- c) a written scheme of how the occupants of the above-mentioned noise sensitive premises will be protected from noise from the proposed development with noise attenuation measures as appropriate
- d) a written scheme of any necessary noise attenuation measures and demonstrate how nearby residents will be protected from noise from the proposed development

The assessment shall be appropriate for all times of day and night when the development will operate. The report should include any supporting calculations.

If the levels predicted in the report are unacceptable, it may be necessary to refuse the application. Otherwise, it may be necessary to specify attenuation measures as conditions of consent.

Footnote

If the flats above this development share a party floor the developer will need investigate and demonstrate that the airborne sound insulation performance of the party ceiling is to an acceptable standard. It will need to achieve a much higher level of Dntw + Ctr that is accepted for residential next to residential as the noise from the bar is likely to be much higher.

Noise/Odour – to ensure the noise and odour from the commercial kitchen extraction system does not affect the neighbouring premises the following condition is recommended:

OC1 Kitchen Extract Scheme - Condition

Before development commences details of a kitchen extract system shall be submitted to and approved in writing by the Local Planning Authority. The details shall provide the following information:

- A risk assessment for odour which considers amount and type of food that will be cooked together with the proposed dispersion of odours and proximity of receptors likely to be affected by any cooking odours.
- Based on the risk assessment, details of the proposed methods of odour control and dispersion of any extracted odours.
- Details showing the proposed location of all the major components of the extract system.
- The noise mitigation measures that will be incorporated in the extract system and details of the likely resulting noise levels that will be caused by operation of the extract system, in particular how loud it will be at nearby noise sensitive locations.
- The proposed ongoing maintenance schedule that will be carried out to ensure that the extract system continues to effectively control odours and not cause excessive noise.

Before the premises is brought in to use the approved extract system shall be installed and thereafter retained and maintained in accordance with the approved details.

Reason: To ensure the proposed development does not cause harmful odour pollution to neighbouring premises in the interest of amenity, to comply with the aims and objectives of Policies LP24 and LP52 of the Kirklees Local Plan and Chapters 12 and 15 of the National Planning Policy Framework.

As the consultation response requires an assessment to be made relating to the emission of noise from the proposed change of use at 24 Westgate, the subsequent evaluation of the likely internal noise and external transmission resulting from activity within 24 Westgate will be undertaken in accordance with the guidance contained within the West Yorkshire, Planning Consultation Guidance (Condensed Version) - Noise and Vibration issued in May 2016 and BS 8233:2014 "Guidance on sound insulation and noise reduction for buildings".

4.2 West Yorkshire, Planning Consultation Guidance - Noise and Vibration

This document was formulated and issued by the five West Yorkshire Local Authorities in order to provide additional guidance to Planners, Environmental Health Departments and applicants, on the aspects of noise and vibration issues pertinent to the determination of land use planning considerations. The intention of the document is to permit a determination of what effect, if any, the noise climate in the immediate vicinity of a proposed development may have on that development.

With regard to proposed new residential developments the guidance document attempts to expand on the guidance contained within the Noise Policy Statement for England (NPSE) document (originally released in 2010). The NPSE document provided guidance on 'acceptable' noise levels with particular reference to residential developments, and this was framed with reference to avoiding "significant adverse" impacts on health and quality of life and where necessary minimising such "adverse" impacts on health and quality of life.

In order to reflect these objectives the NPSE referenced concepts utilised by the World Health Organisation, which in turn employed two concepts from toxicology and applied them to noise impacts. These two concepts are:

- **NOEL – No Observed Effect Level.** This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.
- **LOAEL – Lowest Observed Adverse Effect Level** This is the level above which adverse effects on health and quality of life can be detected.

In addition the NPSE introduced the further concept of a Significant Observed Adverse Effect Level (SOAEL) and defined this as "the level above which significant adverse effects on health and quality of life occur".

The West Yorkshire, Planning Consultation Guidance - Noise and Vibration document provides additional guidance based on the potential source of the noise to which a development may be exposed. In this respect the document identifies the following main noise sources:

- Anonymous Noise Sources, such as Transportation Noise;
- Proposed Developments Containing Noise Generating Uses;
- Places of Worship;
- Entertainment Premises;
- Mixed Use Schemes;
- Wind Turbines;
- Multi-Use Games Areas;
- Nurseries;
- Schools;
- Taxi/Private Hire Premises;

With the above in mind the Planning Consultation Guidance document summarises the values for LOAEL for residential dwellings in noise environments that are primarily exposed to anonymous noise, in this case road traffic noise. This guidance is further condensed into a range of 'absolute' criteria for different internal and external areas and these 'absolute' criteria are summarised in table 2 overleaf.

Table 2. Recommended Maximum, LOAEL sound levels based upon an Absolute criterion. (reproduced from table 1, section 4.1 of the Planning Consultation Guidance Document)

Location	Time Period	Ambient Level (dB $L_{Aeq,T}$)	Maximum noise level (dB L_{AFmax})
External amenity areas	0700 - 2300	55	-
External amenity areas	2300 - 0700	45	60
Habitable room	0700 - 2300	35	-
Bedroom	2300 - 0700	30	45
Dining room	0700 - 2300	40	-

In addition the document contains further guidance relating to specific sources of noise, including:

4.4 Noise from Entertainment Premises

It is expected that all applications for this type of premises should properly address noise issues. As a general principle, music and noise from customers activity (talking, shouting and applauding) emanating from entertainment premises (including external areas such as balconies, gardens and smoking areas) should not be audible within any noise sensitive premises.

Developers should assess the likely impact of the new entertainment premises upon the noise environment. The premises must be designed so to ensure that music and associated noise is controlled, so as to be inaudible inside any residential premises within the vicinity.

Inaudibility is defined by the Institute of Acoustics' Good Practice Guide on the Control of Noise from Pubs and Clubs 2003:

- *Entertainment Noise Level, L_{Aeq} (1 minute) should not exceed Representative Background Noise Level, L_{A90} .*
- *Entertainment Noise Level, L_{10} (5 minutes) should not exceed Representative Background Noise Level, L_{90} , in any 1/3 octave band from 40Hz to 160Hz.*
or:

The use of Noise Rating (NR) curves, as discussed in the DEFRA document, from Pubs and Clubs, (2005), is an alternate way of establishing acceptable levels in noise sensitive premises where low frequency noise may be an issue:

- *NR 20 in bedrooms (23:00 to 07:00 hours).*
- *NR 25 in all habitable rooms (07:00 to 23:00 hours).*
- *Noise rating curves should be measured as a 15 minute linear L_{eq} at the octave band centre frequencies 31.5 to 8 KHz.*

All noise levels shall be taken with windows open or closed (whichever makes the music seem louder), or with alternatively provided acoustic ventilation over and Other noise sources from these developments, such as air conditioning plant and kitchen odour extraction systems shall be treated as industrial development: See Paragraph 3.1.2.

4.5 Proposed Developments Containing Noise Sensitive Users: Noise from Adjacent Entertainment Premises

Where a proposed noise sensitive development is to be located adjacent to an entertainment premises, the sound insulation performance of the party wall and/or ceiling should be at or above $55 \text{ dB } D_{nt,w} + C_{tr}$. The assessment methodology should conform to ISO 16283-1:2014 Acoustics -- Field measurement of sound insulation in buildings and of building elements -- Part 1: Airborne sound insulation, and should be carried out by a suitably qualified engineer.

4.3 BS 8233:2014 “Guidance on sound insulation and noise reduction for buildings”

BS 8233:2014 draws together research and best practice relating to building design, providing guidance to facilitate the development of buildings that have internal noise environments consistent with and appropriate for their intended use. The British Standard highlights methods for the control of noise from a number of sources including external noise and building services etc., as well as evaluating the effect that noise from these sources may have on the acoustics of the internal spaces.

With reference to the design guidance relating to the internal noise climate of residential dwellings, BS 8233:2014 summarises this guidance within table 4 of section 7.7.2. The main elements of this guidance are reproduced in table 3 below.

Table 3. Indoor noise levels for dwellings (reproduced from table 4 of BS8233:2014)

Activity	Location	0700 to 2300	2300 to 0700
Resting	Living room	35dB $L_{Aeq, 16 \text{ hour}}$	-
Dining	Dining room/area	40dB $L_{Aeq, 16 \text{ hour}}$	-
Sleeping (daytime resting)	Bedroom	35dB $L_{Aeq, 16 \text{ hour}}$	30dB $L_{Aeq, 8 \text{ hour}}$

With reference to the guidance contained within BS 8233:2014, it must be remembered that the advice contained within these documents is design guidance and the suggested levels are desirable. It does not represent a set of rigid criteria, below which a development ‘passes’ and above which a development ‘fails’.

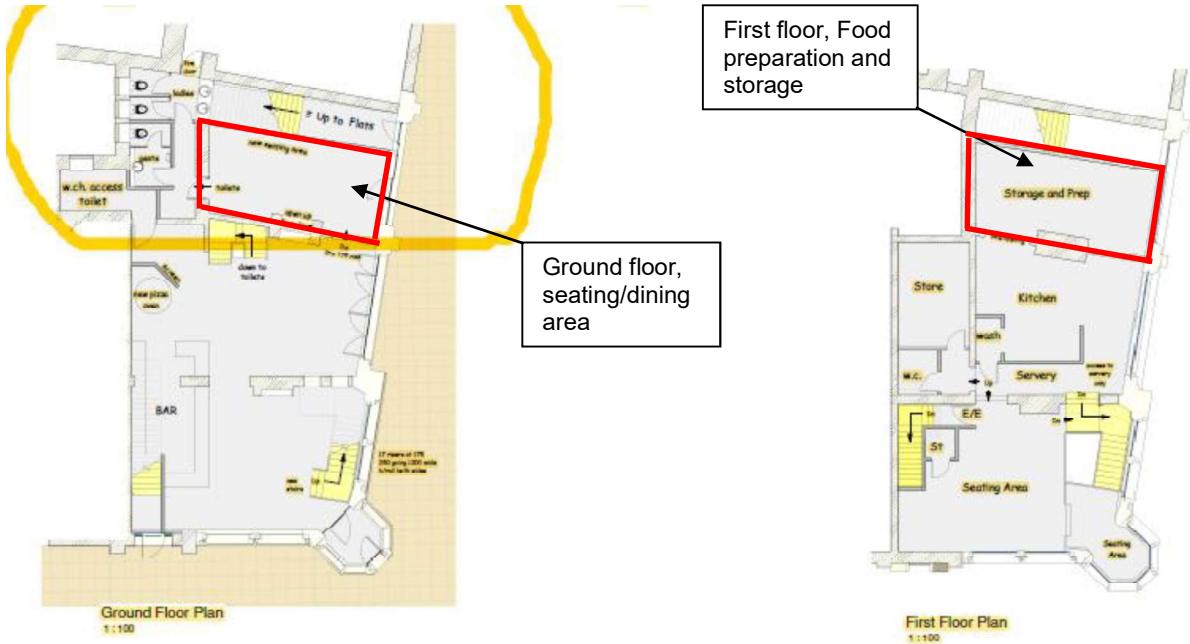
In accordance with the requirements of the consultation response this report details the assessments of both the internal and external transmission of noise, resulting from the conversion of the former Westgate News building at 24 Westgate and its incorporation in to the existing bar and restaurant building at 26 Westgate.

The internal transmission of noise relates to the potential for noise generated within 24 Westgate, to be transmitted to other parts of the existing building and in particular the residential flats on the second floor of the building. The external transmission of noise refers to the break-out of noise from activities within 24 Westgate and the effect that this may have on the existing noise climate in the immediate vicinity. This second element relates to both noise from activity within 24 Westgate and any associated kitchen extraction equipment.

5.0 Sound Source Level Assessment

The former newsagent's premises will be incorporated into the existing bar and restaurant premises at 26 Westgate. The converted newsagent's premises will provide accommodation over two floors with the ground floor being a seating area and the first floor being used as a storage and preparation area for the kitchen that will be located within the existing premises at 26 Westgate. The full extent of the conversion of 24 Westgate is detailed, edged in red, in figure 2 overleaf.

Figure 2. Proposed internal layout, 24 Westgate



The potential emission of noise from the proposed change of use at 24 Westgate may be regarded as falling into two main categories, namely: the emission of noise from activity within the ground floor seating/dining area and the emission of noise from the food preparation activity on the first floor, including any associated extraction equipment. With respect to these potential noise sources, the proposed ground floor activity may be regarded as potentially affecting the existing external noise climate and activity from the first floor may potentially affect the internal noise climate of the residential flats above and the existing external noise climate.

With reference to both possible scenarios, as the development is not yet operational, direct assessment of noise from this source was not possible. In the absence of direct measurements, recourse was had to sound measurements made within a seated dining area/restaurant and kitchen/preparation area of similar type to that which is envisaged for 24 Westgate. With reference to the sound measurements these were obtained from Harvey's Bar and Kitchen at Fennay Bridge, which is in the same ownership as 24 - 26 Westgate, will be operated on very similar lines and is of similar size. As a consequence, it is anticipated that the obtained sound source measurements will provide a very suitable basis for the subsequent assessments. The measured sound source levels are presented in table 4 below, full details may be found in Appendix 1. The sound source measurements were obtained on a busy Saturday night and were spatial average measurements made within the establishment.

Table 4. Measured noise levels from a similar restaurant to that permitted at 24 Westgate

OBCF, Hz*	63	125	250	500	1k	2k	4k	8k	Overall, dB(A)
Harvey's Bar and Kitchen, dining area, L_{eq}	71	69	70	74	72	69	63	55	76
Harvey's Bar and Kitchen, kitchen/food preparation area, L_{eq}	76	74	72	74	71	69	67	61	77

* Octave Band Centre Frequency

6.0 Assessment of the Existing Noise Climate in the Vicinity of 24 Westgate

The following paragraphs detail the assessment of the existing noise climate in the immediate vicinity of 24 Westgate. With reference to the evaluation of the existing noise climate, measurements were made during a late morning period (10:15 - 12:15 hours) and a late evening/early night time period (21:00 - 00:15 hours). These time periods were selected as the late morning period would correspond with the first period of food preparation, to be undertaken on the first floor of 24 Westgate, and the late evening/early night time period would correspond with notionally the busiest period within both the kitchen and dining areas.

6.1 Survey Times and Personnel

As detailed, the surveys to evaluate the existing noise climate in the vicinity of 24 Westgate, were undertaken between: 21:00 - 00:15 hours on Friday 1st October 2021 and between 10:15 - 12:15 hours on Thursday 7th October 2021.

All measurements were fully attended for the duration of the surveys and all survey work was conducted by Mr. R Smith of Druk Limited.

6.2 Weather

Throughout the noise surveys the weather conditions were as follows:

1st October 2021

All surfaces were dry, the sky was clear, the temperature was approximately 14°C, the wind speed was approximately 0.4m/s and the barometric pressure was 996mb.

7th October 2021

All surfaces were dry, cloud cover was approximately 30%, the temperature was approximately 18°C, the wind speed was approximately 0.5m/s and the barometric pressure was 1010mb.

6.3 Equipment

The noise surveys were conducted using the equipment detailed in the table 5 below.

Table 5. Equipment used during the existing noise climate surveys

Equipment description	Manufacturer	Model number	Serial number
Acoustic calibrator	Norsonic AS	Nor 1251	31522
Sound level meter	NTI Audio	XL2-TA	A2A-10232-E
Microphone pre-amplifier	NTI Audio	MA220	5537
Microphone	NTI Audio	M2230	8636

The sound level meter was field calibrated before, after and during the surveys as necessary, during which time no significant deviation in the calibrated levels were observed.

All the equipment used is calibrated by a UKAS accredited calibration laboratory and the calibration certificates are available on request.

6.4 Measurement Procedure

As the only external elevation of 24 Westgate is the front elevation on Westgate itself, surveys were undertaken to evaluate the existing external noise climate on Westgate in the immediate vicinity of number 24. During the course of the surveys the measurements were made by extending the sound level meter microphone on a boom from a window on the first floor of the existing premises at 26 Westgate. This position was adopted as the windows at the first floor of 24 Westgate did not open. In this position the microphone was approximately 1.0 metre from the front façade of the existing building and approximately 3.5 - 4.0 metres above ground level.

For the duration of the noise surveys the measurement time interval was 15 minutes, all the measurements were attended for the duration of the surveys and all the measurements were made with the fast time weighting engaged.

6.5 Basic Results

The existing noise climate in the immediate vicinity of 24 Westgate was considered as being typical of an urban environment comprising a range of commercial and entertainment uses. The measured levels from the existing noise climate surveys are detailed in tables 6 and 7 overleaf. With reference to measured noise levels as these were obtained from positions approximately 1 metre from the existing metre building façade, a 3dB façade correction has been applied in order to establish representative free field noise levels.

Where any noise events departed from what could be regarded as the normal noise climate for the area, these events have been summarised in the comments column of the tables. The façade corrected noise levels from both positions are presented in terms of the L_{Aeq} , L_{Amax} , L_{A10} and L_{A90} parameters. Full data are presented in Appendix 1.

Table 6. Façade corrected noise levels, Friday 1st October

Start time	dB L_{Aeq}, (15 minutes)	dB L_{Amax}, (15 minutes)	dB L_{A190}, (15 minutes)	dB L_{A90}, (15 minutes)	Comment
21:00	66	89	65	52	People shouting on Westgate
21:15	66	84	67	54	
21:30	64	90	65	54	People shouting on Westgate
21:45	63	83	65	52	
22:00	63	85	64	53	
22:15	63	84	65	53	
22:30	64	91	65	52	Speeding car with noisy exhaust
22:45	62	84	63	52	
23:00	60	80	62	50	23:05 fireworks clearly audible
23:15	61	84	63	51	
23:30	61	83	64	52	
23:45	60	76	63	50	
00:00	63	88	64	53	People shouting on Westgate
Standard deviation	1.85	4.14	1.26	1.34	
Minimum levels	60	76	62	50	

Table 7. Façade corrected noise levels, Thursday 7th October

Start time	dB L_{Aeq} , (15 minutes)	dB L_{Amax} , (15 minutes)	dB L_{A190} , (15 minutes)	dB L_{A90} , (15 minutes)	Comment
10:15	66	92	68	55	
10:30	67	93	68	56	Speeding car with noisy exhaust
10:45	65	92	67	56	
11:00	66	90	68	56	
11:15	66	88	67	54	
11:30	65	83	68	55	
11:45	67	94	68	57	Motorcycle with noisy exhaust
12:00	66	86	69	58	
Standard deviation	0.84	3.67	0.63	1.21	
Minimum levels	65	83	67	54	

6.6 Qualitative Assessment

During the night time period the principal contributor to the existing noise climate was road vehicles, primarily cars, on Westgate itself, a number of which were being driven at speeds that appeared to exceed the prescribed speed limit. Additionally, when stopped at the traffic lights a number of cars could be heard revving their engines noisily and playing their car stereos at high noise levels. Other road vehicles included relatively frequent buses, the number of which significantly reduced after 23:30 hours, and a few light goods vehicles.

Additional noise sources during the night time period included the emission of noise from the Jules Verne public house, pedestrians talking a number of whom appeared to be inebriated and engaged in frequent shouted exchanges with each other and some noise from pedestrians waiting at the pedestrian lights on Westgate.

During the daytime period the principal contributor to the existing noise climate was again road traffic, although at this time there were a many more buses than were observed during the night time period. With respect to the cars using Westgate, these tended to be driven at much lower speeds than was the case during the night time period.

Additional noise sources during the daytime period included conversation noise from pedestrians walking along Westgate, some noise from the erection of scaffolding to the rear of the existing building and the façade along Railway Street.

7.0 Evaluation of the Potential Sound Transmission

As previously discussed the potential emission of noise from the former newsagent's shop at 24 Westgate may be regarded as falling into two main categories, namely: internal transmission of noise from activity within 24 Westgate to the residential flats on the second floor of the existing building, subsequently referred to as internal noise transmission, and the emission of noise from activity within 24 Westgate to the wider noise environment outside the existing building, referred to as external noise transmission.

7.1 Internal Noise Transmission

The assessment of the likely internal noise levels within the second floor residential flats above will be undertaken with reference to the design criteria detailed in section 4.0 above. With respect to the transmission of noise from 24 Westgate to the second floor flats above, this will take the form of vertical transmission via the separating floor/ceiling structure. With this in mind the following sections will investigate the existing constructions, evaluate the likely levels of sound insulation provided by the elements and assess the potential sound transmission via the vertical and horizontal routes.

As it was not possible to gain access to the residential flats above 24 Westgate, a direct assessment of the airborne sound insulation of the separating floor could not be obtained by measurement. This being the case, the following assessment is based on a desktop assessment of the airborne sound insulation of the floor and the possible transmission of noise from 24 Westgate via this route.

The existing building is believed to date from the mid nineteenth century and is of masonry construction with a timber joist separating floor. Site inspection suggested that the floor/ceiling structure separating 24 Westgate from the second floor flats comprised: 200mm solid timber joists with mineral fibre in the inter-joist space, with floorboards above and a lath and plaster ceiling below (photograph 4 overleaf). The lath and plaster ceiling also incorporated an elaborate plastered detail (photograph 5 overleaf).

In the absence of a direct measurement of the airborne sound insulation of the floor separating the first floor of 24 Westgate from the second floor flats, comparative evaluation of the sound insulation of the floor will be made with reference to sound test data from a similar floor. The comparison floor was of the same general construction, with similar dimensions was obtained from a building of very similar age that was also located in the West Yorkshire region. The measured airborne sound insulation of the comparison floor was 47dB $D_{nT'w} + C_{tr}$ and the octave band D_{nT} values are detailed in table 8 below.

Table 8. Measured octave band D_{nT} values for the comparison floor

OBCF, Hz*	63	125	250	500	1k	2k	4k	Overall, $D_{nT'w} + C_{tr}$ dB
Sound Insulation, dB	30	35	40	50	59	64	69	47

* Octave Band Centre Frequency

Photograph 4. Existing ceiling structure, 24 Westgate**Photograph 5.** Existing floor construction, 24 Westgate

In order to calculate the likely sound level in the residential flats above the first floor food preparation area in 24 Westgate, the measured octave band D_{nT} results from the comparison floor will be combined with a number of assumptions relating to the source room, namely;

- The area of the floor separating the first floor of 24 Westgate from the second floor flats above was approximately 63m^2 ,
- The volume of the receiving room would be in the region of 30m^3 ,
- The reverberation time within the receiving room would be approximately 0.5 seconds,
- The amount of acoustic absorption within the source room would be approximately 9.8m^2 .
- The noise source levels detailed in table 4 above would prevail at the room perimeters.

Applying the measured airborne sound insulation with the above assumptions and combining these with the noise source data for the kitchen/food preparation area, the resulting sound levels within the residential flat are summarised in table 9 below. Full details may be found within Appendix 2.

Table 9. Calculated food preparation/kitchen activity sound level within the residential flats - existing ceiling

OBCF, Hz*	63	125	250	500	1k	2k	4k	Overall sound level, dB
Calculated level, dB	46	39	32	24	12	5	-2	28

* Octave Band Centre Frequency

A comparison of the calculated sound transmission levels will be undertaken with the design guide values for bedrooms at night. In this case the night time situation has been selected as it is likely that the new bar/restaurant will trade until at least 23:00 hours. The selection of the night time criteria also ensures that the most stringent comparison criteria are utilised.

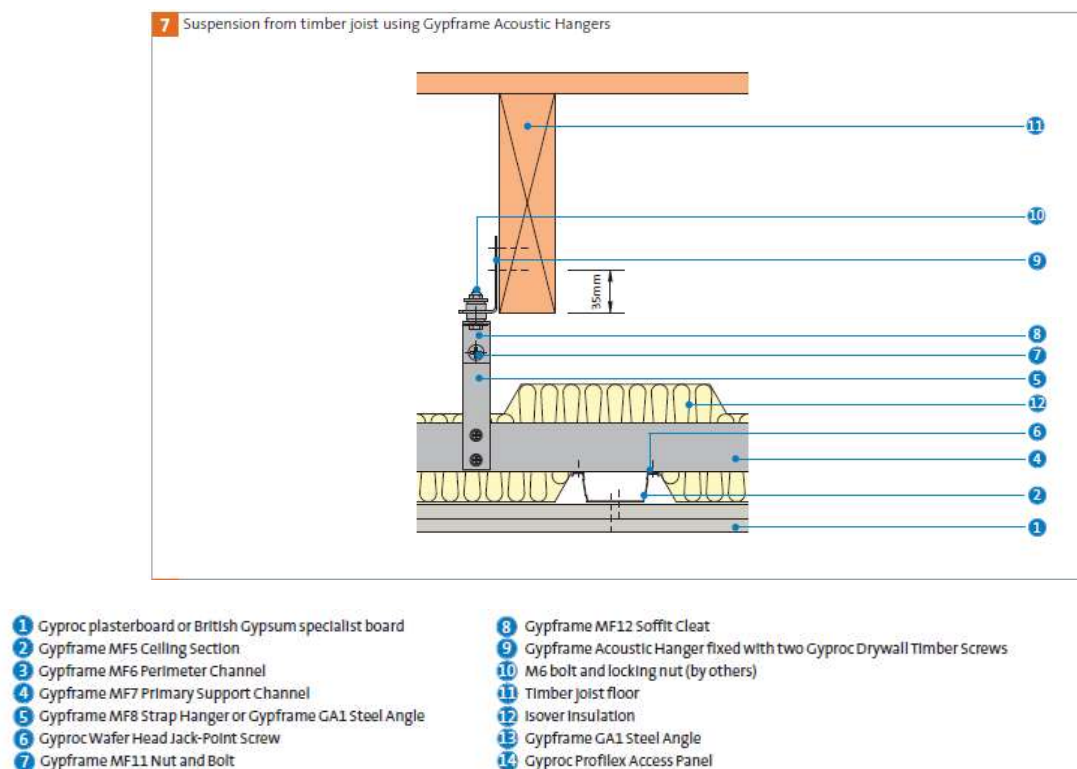
The calculated sound levels presented within table 9 demonstrate compliance with the 30dB design guide value, contained within both the West Yorkshire, Planning Consultation Guidance and BS 8233:2014. Despite this the calculated levels would be equivalent to an NR value of 22 and so would not comply with the NR 20 value detailed within the West Yorkshire, Planning Consultation Guidance. As a consequence, it is suggested that the airborne sound insulation of the existing floor would need to be improved.

Currently the floor to ceiling height within the first floor space of 24 Westgate is approximately 2.44 metres to the ceiling and approximately 2.14 metres to the underside of the central beam/joist detailed in photograph 4 above. With this in mind it is recommended that a suspended ceiling is installed to enhance the airborne sound insulation of the existing floor. Such a ceiling would ensure that a good degree of acoustic separation exists between first floor food preparation area within 24 Westgate and the residential flats above.

It should however be remembered that the assessment presented within the subsequent paragraphs is limited to enhancing the sound insulation of the existing building. The report does not consider any other aspects of the building including, but not limited to, structural integrity, electrical installation etc. It is therefore recommended that additional guidance as to the ability of the existing to accommodate the suggested sound insulation enhancement measures are sought from an appropriately qualified and experienced individual/organisation.

In this case a significant improvement in the airborne sound insulation would result from the use of new ceiling supported on acoustic hangers. Such a ceiling would be suspended from the existing ceiling joists by acoustic hangers only, so creating a partially independent ceiling system. In this system it is quite acceptable to fix the new ceiling boards to either timber ceiling joists or an MF system. Typical details of the partially independent MF ceiling system are detailed in figure 3 below. Acoustic hangers are available from a variety of manufacturers/suppliers and these vary in complexity of manufacture and or installation.

Figure 3. Suspended ceiling on acoustic hangers



Source: British Gypsum

In the case of the partially independent ceiling detailed in figure 3 above, metal furring channels are suspended from the existing joists via acoustic hangers to support the ceiling. The complete system, from inside to outside would be as follows:

- Acoustic hangers fixed to the existing joists to provide intermediate support to the metal furring channels.
- At least 100mm of mineral fibre in the new ceiling void.
- Metal furring primary channel fixed to the acoustic hangers.
- Metal furring ceiling channel fixed to the primary channel.
- Ideally two layers of 12.5mm SoundBloc board (or equivalent) on staggered joints fixed to the ceiling channels.

It is recommended that the new suspended ceiling is dropped to at least the level of the bottom surface of the existing central beam/joist, although the ideal scenario would be for the ceiling to fall below this level such that a new flat ceiling is created throughout. Bearing in mind the current floor to under beam/joist height, this may not be possible. With reference to the two layer plasterboard ceiling it is recommended that before the second layer of board is fixed, the perimeter of the ceiling is sealed with a non-hardening acoustic mastic or similar.

As the current ornate plaster ceiling would not be regarded as being suitable for a food preparation area, the intention would be to install a new 'hygienic' ceiling that was capable of being cleaned and so would be more suitable for use in a food preparation area. As a result the proposed acoustic ceiling could be used to fulfil both functions

Again, in order to assess what level of airborne sound insulation may be achieved from the suggested suspended ceiling, a comparison will be made with a floor of very similar construction that had been augmented by the addition of a ceiling suspended on acoustic hangers. Again this data was obtained from a building of very similar age in the West Yorkshire region and the measured overall airborne sound insulation performance was 55dB $D_{nT'w} + C_{tr}$. The octave band D_{nT} values are detailed in table 10 below.

Table 10. Measured octave band D_{nT} values for the enhanced comparison floor

OBCF, Hz*	63	125	250	500	1k	2k	4k	Overall, $D_{nT'w} + C_{tr}$ dB
Sound Insulation, dB	34	39	56	65	68	66	71	55

* Octave Band Centre Frequency

With reference to the likely noise levels within the second floor flats resulting from the installation of the suspended ceiling, these have again been evaluated based on the application of the previous calculation assumptions. The calculated noise levels are summarised in table 11 below.

Table 11. Calculated food preparation/kitchen activity sound level within the residential flats - enhanced ceiling

OBCF, Hz*	63	125	250	500	1k	2k	4k	Overall sound level, dB
Calculated level, dB	42	34	17	9	4	3	-4	21

* Octave Band Centre Frequency

The calculated sound levels presented within table 11 demonstrate compliance with the 30dB design guide value, contained within both the West Yorkshire, Planning Consultation Guidance and BS 8233:2014. In addition the calculated sound levels would be equivalent to an NR value of 14 and would therefore comply with this requirement as well. Finally, assuming the enhanced ceiling structure within 24 Westgate equals the airborne sound insulation performance of the comparison floor/ceiling structure, the airborne sound insulation performance would comply with the requirement detailed within section 4.5 of the West Yorkshire Planning Consultation Guidance. As such, the proposed remedial ceiling would be sufficient to limit the

transmission of noise between the food preparation area within 24 Westgate and the residential flats above.

7.2 Noise Transmission to the Exterior – Activity Noise

The transmission of sound from within 24 Westgate to the external areas will include the potential break-out of sound from both the ground floor seating/dining area from the first floor preparation area. In addition the issue of the emission of noise from any external plant and equipment associated with the food preparation area. In both cases, the resulting sound levels will be evaluated with reference to the existing noise climate in the noise sensitive locations.

Using the source noise levels detailed in table 4 above, calculations have been undertaken to assess the likely break-out noise level from activity within 24 Westgate at the nearest noise sensitive premises. In this case the nearest noise sensitive premises would be the residential flats directly above. Consequently, the calculated sound levels at the front façade of 24 Westgate will be regarded as representative of the likely sound levels at the front façade of the flats.

The break-out of sound from both the ground floor seating/dining area and the first floor food preparation area will be via the front, largely glazed, elevation of 24 Westgate. In order to complete these calculations, a number of assumptions have been made and these assumptions are as follows:

- The external wall of the existing building is solid masonry with a depth of at least 240mm and as such would be likely to provide a sound insulation value of around 53dB R_w .
- The glazing to the front elevation comprises single glazing around 6mm thick which would have a notional sound insulation value of around 30dB R_w .
- The surface area of the ground floor front elevation is around 24m².
- The surface area of the first floor front elevation is around 14m².
- The nearest noise sensitive dwellings would be the flats on the second floor of the building directly above 24 Westgate.
- The noise source levels detailed in table 4 above will prevail at the room perimeters.

Using the source data, calculations have been undertaken to assess the likely resulting noise levels at the three nearest noise sensitive locations. The calculations have been based on noise breakout via the existing front elevation comprising both the masonry and glazed elements detailed above.

The sound insulation values for both the masonry and glazed elements combined with their respective surfaces areas; result in a composite sound reduction value for the element as a whole. In addition, the propagation calculations will be performed by assessing the 'break' points at which plane wave radiation, line source and point source radiation conditions would occur, from the front elevation of the restaurant.

In the calculations, the appropriate composite sound reduction value for the ground and first floor front elevations of 24 Westgate have been utilised. The results of the noise transmission calculations, in terms of the likely resulting L_{Aeq} level just outside the front elevation of 24 Westgate may be found within table 12 below. The tables also contain an indication of the lowest measured L_{Aeq} and L_{A90} levels from the surveys of the existing noise climate on Westgate. With reference to the lowest measured noise levels from the noise surveys, these occurred during the evening/night time period, with the daytime noise climate being a little higher. Full details of the calculations may be found within Appendix 3.

Table 12. Transmission of internally generated noise from 24 Westgate to the exterior

Noise Source location	Calculated noise level at external façade dB L_{Aeq}	Lowest measured L_{Aeq} , dB, night time	Lowest measured L_{A90} , dB, night time	Lowest measured L_{Aeq} , dB, daytime	Lowest measured L_{A90} , dB, daytime
Ground floor, 24 Westgate	39	60	50	65	54
First floor, 24 Westgate	38	60	50	65	54

The calculated L_{Aeq} sound levels detailed within table 12 above, resulting from internal noise break-out from 24 Westgate, would be considerably lower than the existing noise climate on Westgate during both the day and night time periods. Consequently, it is suggested that the noise from activities inside 24 Westgate would not affect the existing noise climate at the nearest noise sensitive premises and no additional noise attenuation measures would be necessary.

7.3 Noise Transmission from External Plant

It is anticipated that the food preparation area on the first floor will be provided with an extraction system which will exhaust on to Westgate itself, as was the case with the operation of the former Tribeca establishment.

At present, no firm details as to what type of extraction system will be employed, therefore calculation of the emission of noise from the system will not be possible. Despite this and in order to provide an indication of the maximum sound emission levels from a kitchen extraction system, reference will be made to the additional guidance contained within the West Yorkshire Planning Consultation Guidance. In this respect the guidance contained within section 4.2 Proposed Developments Containing Noise Generating Uses, will be employed and this is summarised below.

Recommended Maximum sound levels should be based upon a Comparative Criterion:

- *The Rating Level (calculated in accordance to BS 4142: 2014) is at least 10 dB below the existing Ambient noise level (L_{Aeq});*
- *The Rating Level (calculated in accordance to BS 4142: 2014) is at least 0-5* dB below the exiting Background noise level (L_{A90});*
- *Between the hours of 19:00 and 07:00, the maximum noise levels (L_{AFmax})*

from the guidance document shall not exceed the L_{A90} by more than 10 dB; however, where the existing background noise level is 45 dB L_{A90} or less, the maximum noise levels shall not exceed 60 dB L_{AFmax} .

With reference to the existing noise surveys the mean (log) ambient sound level was 63dB L_{Aeq} during the evening/night period and 66dB L_{Aeq} during the day. Therefore in order to comply with the guidance contained within the West Yorkshire Planning Consultation Guidance it is recommended that the emission of noise from the extraction equipment does not exceed the rating level, calculated according to the procedure detailed in BS 4142:2014, stated within table 13 below.

Table 13. Maximum noise emission levels from the kitchen extraction system

Noise Source	Maximum sound level, dB L_{Aeq}
Kitchen extraction system, daytime	56
Kitchen extraction system, evening/night time	53

8.0 Conclusion

The existing noise climate in the immediate vicinity of 24 Westgate was considered as being typical of an urban environment comprising a range of commercial and entertainment uses.

The assessments have indicated that the application of the proposed sound insulation measures to the existing floor/ceiling structure within 24 Westgate, would be sufficient to limit the transmission of noise to the residential flats above in accordance with the design targets. With reference to the potential break-out of noise from both the food preparation area and the seating area with 24 Westgate, the calculations have indicated that the break-out of noise from these areas would have no affect on the existing external noise climate. Finally, and with respect to the possible emission of noise from a kitchen extraction system, maximum noise emission levels have been specified which should be achieved at the external elevation of the existing building at 24 Westgate.

Appendix 1. Measured Sound Levels

Source sound levels

Harvey's Bar and Kitchen												
Existing noise climate survey.												
<u>2nd October 2021</u>												
Octave Band Centre Frequency, Hz.	dB(A)	31.5	63	125	250	500	1k	2k	4k	8k	16k	
Dining area												
L_{eq}	76	74	71	69	70	74	72	69	63	55	46	
Kitchen												
L_{eq}	77	80	76	74	72	74	71	69	67	61	54	

Existing noise climate measurements

24 - 26 Westgate, Huddersfield												
Existing noise climate survey.												
<u>1st October 2021 (façade corrected)</u>												
Octave Band Centre Frequency, Hz.	dB(A)	31.5	63	125	250	500	1k	2k	4k	8k	16k	
21:00												
L_{eq}	66	68	70	68	66	64	60	56	50	44	42	
L_{max}	89	81	91	92	90	89	83	79	71	69	73	
L_{10}	65	72	72	66	63	61	61	57	53	45	33	
L_{90}	52	59	60	53	50	49	48	45	39	28	13	
21:15												
L_{eq}	66	74	71	68	66	62	61	57	53	49	38	
L_{max}	84	87	89	88	86	80	76	74	70	76	63	
L_{10}	67	75	74	70	66	63	63	60	55	48	35	
L_{90}	54	61	61	55	52	51	50	47	41	32	17	
21:30												
L_{eq}	64	69	70	65	62	61	60	56	52	46	43	
L_{max}	90	86	93	89	84	88	85	83	78	72	74	
L_{10}	65	73	73	66	63	62	61	58	54	47	34	
L_{90}	54	61	61	54	51	51	50	47	41	32	16	
21:45												
L_{eq}	63	68	68	61	62	60	59	56	50	44	43	
L_{max}	83	84	84	79	83	80	77	76	72	65	71	
L_{10}	65	72	71	64	62	61	61	58	53	46	33	
L_{90}	52	58	59	52	49	49	48	45	38	29	14	
22:00												
L_{eq}	63	66	67	60	62	59	58	55	50	43	33	
L_{max}	85	84	84	79	86	82	80	78	74	66	61	
L_{10}	64	70	71	62	60	59	60	57	52	45	32	
L_{90}	53	57	59	52	49	49	49	46	39	29	13	
22:15												
L_{eq}	63	70	71	65	64	60	59	55	50	43	33	
L_{max}	84	84	89	90	88	79	77	72	71	69	59	
L_{10}	65	73	73	68	64	60	61	58	53	46	33	
L_{90}	53	60	61	54	51	49	49	46	40	32	16	
22:30												
L_{eq}	64	69	69	63	61	60	60	57	51	47	47	
L_{max}	91	84	91	84	88	87	87	83	77	77	78	
L_{10}	65	72	72	65	62	61	61	58	53	46	35	
L_{90}	52	59	60	53	49	49	48	44	39	29	13	
22:45												
L_{eq}	62	67	68	62	62	60	58	54	49	43	44	
L_{max}	84	83	86	83	86	82	78	75	70	64	74	
L_{10}	63	69	70	63	61	59	60	56	51	44	32	
L_{90}	52	60	62	55	49	49	48	45	39	30	14	

23:00												
L_{eq}		60	66	66	59	59	56	56	53	47	40	27
L_{max}		80	80	79	77	83	77	74	71	66	64	47
L_{10}		62	69	70	61	59	57	59	56	50	43	30
L_{90}		50	55	59	52	47	46	46	43	36	26	11
23:15												
L_{eq}		61	68	71	63	59	57	56	53	48	42	30
L_{max}		84	85	93	85	84	83	79	75	69	67	52
L_{10}		63	70	72	64	60	58	59	56	51	44	32
L_{90}		51	58	58	51	48	48	47	44	39	29	14
23:30												
L_{eq}		61	67	67	62	58	57	57	54	49	42	44
L_{max}		83	82	89	85	80	74	76	79	72	66	77
L_{10}		64	70	70	63	61	59	60	57	51	44	32
L_{90}		52	58	59	50	48	48	48	45	39	28	13
23:45												
L_{eq}		60	64	66	58	56	55	56	53	47	40	33
L_{max}		76	79	82	74	72	71	73	65	65	65	61
L_{10}		63	68	70	61	60	58	60	57	51	43	31
L_{90}		50	54	57	48	47	47	46	42	36	25	10
00:00												
L_{eq}		63	68	71	66	63	62	58	54	48	41	29
L_{max}		88	82	91	84	88	89	80	70	65	61	52
L_{10}		64	70	74	67	62	59	60	57	51	44	32
L_{90}		53	59	59	51	50	50	49	46	39	30	15

7th October 2021 (not facade corrected)											
Octave Band Centre Frequency, Hz.	dB(A)	31.5	63	125	250	500	1k	2k	4k	8k	16k
10:15											
<i>L</i> _{eq}	66	73	70	64	63	61	60	58	58	56	52
<i>L</i> _{max}	92	87	86	81	80	78	76	80	86	89	87
<i>L</i> ₁₀	68	76	72	66	65	63	62	61	59	53	40
<i>L</i> ₉₀	55	62	61	54	52	51	50	48	43	35	20
10:30											
<i>L</i> _{eq}	67	74	71	64	64	63	61	60	58	56	48
<i>L</i> _{max}	93	87	86	81	82	80	80	87	88	86	78
<i>L</i> ₁₀	68	77	75	66	65	65	63	61	58	53	40
<i>L</i> ₉₀	56	64	62	55	54	52	52	50	45	37	22
10:45											
<i>L</i> _{eq}	65	74	72	64	63	60	59	58	57	54	47
<i>L</i> _{max}	92	93	87	80	79	75	77	86	88	85	79
<i>L</i> ₁₀	67	77	74	67	65	63	62	60	56	51	40
<i>L</i> ₉₀	56	65	62	54	53	52	51	49	43	35	22
11:00											
<i>L</i> _{eq}	66	75	73	66	64	63	61	59	56	52	43
<i>L</i> _{max}	90	88	89	79	81	80	77	82	85	82	73
<i>L</i> ₁₀	68	79	76	69	66	65	63	61	57	52	40
<i>L</i> ₉₀	56	67	63	55	54	53	52	49	44	37	25
11:15											
<i>L</i> _{eq}	66	74	71	64	65	62	60	58	56	54	48
<i>L</i> _{max}	88	88	87	80	88	82	80	80	82	81	75
<i>L</i> ₁₀	67	78	74	67	66	64	62	60	56	50	39
<i>L</i> ₉₀	54	61	61	53	51	51	50	47	41	33	20
11:30											
<i>L</i> _{eq}	65	76	72	64	64	61	60	57	54	52	43
<i>L</i> _{max}	83	88	87	82	82	77	75	74	77	77	73
<i>L</i> ₁₀	68	77	75	68	66	64	63	61	57	52	40
<i>L</i> ₉₀	55	64	63	54	53	52	50	47	42	35	21
11:45											
<i>L</i> _{eq}	67	75	72	67	67	64	61	59	58	55	47
<i>L</i> _{max}	94	91	87	86	89	83	80	88	90	87	80
<i>L</i> ₁₀	68	78	75	69	68	65	62	60	56	51	41
<i>L</i> ₉₀	57	65	66	57	54	53	53	49	44	36	21
12:00											
<i>L</i> _{eq}	66	75	75	65	65	62	61	58	57	55	50
<i>L</i> _{max}	86	90	89	78	84	74	71	73	81	84	80
<i>L</i> ₁₀	69	78	77	68	66	65	64	62	59	53	43
<i>L</i> ₉₀	58	68	68	57	55	55	53	50	45	38	23

Appendix 2. Calculation Results

24 Westgate, Huddersfield											
First floor food preparation area transmission											
Noise source measurements											
Octave Band Centre Frequency, Hz.	dB(A)	31.5	63	125	250	500	1k	2k	4k	8k	16k
Noise source level, Harveys Bar and Restaurant, Fennay Bridge. Saturday 2nd October											
Measured noise level, busy kitchen, Saturday night, dB L_{eq}	77	80	76	74	72	74	71	69	67	61	54
Transmission between kitchen/storage/prep area and adjacent residential											
Octave Band Centre Frequency, Hz.	dB(A)	31.5	63	125	250	500	1k	2k	4k	8k	16k
level difference (D_{nT}) (obtained from similar floor/ceiling structure) 47 dB $D_{nT,w} + C_{tr}$ Red values = extrapolated values		25	30	35	40	50	59	64	69	74	79
measured noise source, kitchen, dB L_{eq}	77	80	76	74	72	74	71	69	67	61	54
Area of partition, m ²	67.6	18.30	18.30	18.30	18.30	18.30	18.30	18.30	18.30	18.30	18.30
Volume of receiving room, m ³	30										
Amount of absorption, m ²	9.78	9.90	9.90	9.90	9.90	9.90	9.90	9.90	9.90	9.90	9.90
Noise source level - measured D_{nT}	28	55	46	39	32	24	12	5	-2	-13	-25
BS8233:2014 guide value, dB (bedrooms, daytime - resting)	35										
NR 20		69	51	39	31	24	20	17	14	13	
NR 25		72	55	44	35	29	25	22	20	18	
Transmission between kitchen/storage/prep area and adjacent residential - enhanced ceiling											
Octave Band Centre Frequency, Hz.	dB(A)	31.5	63	125	250	500	1k	2k	4k	8k	16k
level difference (D_{nT}) (obtained from similar floor/ceiling structure - enhanced) 54 dB $D_{nT,w} + C_{tr}$ Red values = extrapolated values		29	34	39	56	65	68	66	71	76	81
measured noise source, kitchen, dB L_{eq}		80	76	74	72	74	71	69	67	61	54
Area of partition, m ²		18.30	18.30	18.30	18.30	18.30	18.30	18.30	18.30	18.30	18.30
Volume of receiving room, m ³											
Amount of absorption, m ²		9.90	9.90	9.90	9.90	9.90	9.90	9.90	9.90	9.90	9.90
Noise source level - measured D_{nT}	21	51	42	34	17	9	4	3	-4	-15	-27
BS8233:2014 guide value, dB (bedrooms, daytime - resting)											
NR 20		69	51	39	31	24	20	17	14	13	
NR 25		72	55	44	35	29	25	22	20	18	
Transmission from indoors to outdoors											
Octave Band Centre Frequency, Hz.	dB(A)	31.5	63	125	250	500	1k	2k	4k	8k	16k
Measured noise level, busy kitchen, Saturday night, dB L_{eq}	77	80	76	74	72	74	71	69	67	61	54
Composite sound insulation of front elevation -6 dB		11	16	21	27	33	38	30	35	40	45
		-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0
LP just outside superstructure	39	63	54	46	39	35	27	33	26	15	3
height of element, front elevation, 2.4 (a), m											
Length of element, front elevation, 5.8 (b), m											
Distance attenuation											
Octave Band Centre Frequency, Hz.	dB(A)	31.5	63	125	250	500	1k	2k	4k	8k	16k
Nearest proposed elevation, opposite 24 Westgate, m	19										
Plane wave		39	63	54	46	39	35	27	33	26	15
height of element, front elevation, 2.44 (a), m											
Length of element, front elevation, 5.8 (b), m											
break point (a/ π) (a = 2.44m) 0.78		35	59	50	42	36	31	24	30	22	11
break point (b/ π) (b = 5.8m) 1.85		25	49	40	32	25	21	13	19	12	1
L_p at relevant façade		25	49	40	32	25	21	13	19	12	1