RS Acoustic Engineering

Parkside, Llay
Noise Assessment Report



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Client: Geraint Lewis

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Signature	[redacted]

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1. Introduction

1.1 RS Acoustic Engineering Ltd has been appointed by Geraint Lewis to undertake a noise assessment with regard to a residential development at Parkside, Market Square, Fifth Avenue, Llay, LL12.

1.2 An application for retrospective planning permission was submitted in January 2024 for two self-contained dwellings (planning ref: P/2024/1133). The existing property has been partially converted to provide two single storey dwellings, which are accessed via the rear elevation.

1.3 Wrexham County Borough Council have requested that a noise assessment is undertaken to determine the noise levels impacting on the dwellings and to identify appropriate mitigation measures.

1.4 A noise assessment has been undertaken taking into consideration the guidance contained within British Standard 8233:2014 *Guidance on sound insulation and noise reduction for building,* ProPG's *Planning & Noise* and Technical Advice Note (Wales) 11 *Noise*.

1.5 Continuous sound level monitoring was conducted at the property to establish the ambient sound pressure levels during the daytime and night-time period.

1.6 The dominant source of noise at the site is intermittent road traffic on Fifth Avenue and vehicles parking at adjacent commercial premises.

1.7 The measured sound level data has been used to determine the acoustic performance requirements for the building envelope construction and to determine whether it will be suitable to naturally ventilate habitable rooms via opening windows alone.

1.8 An assessment of noise ingress through the building envelope with windows open and closed has been undertaken to determine the resulting sound levels.

1.9 The guidance given within Approved Document F *Ventilation* and Approved Document O *Overheating* has also been taken into consideration regarding noise ingress and opening windows.

1.10 The survey and assessment was conducted by Mr Ryan Swales ($BSc_{(Hons)}$, MIOA), Principal Acoustic Consultant and Member of the Institute of Acoustics.

1.11 The results of the noise survey have been presented, along with the assessment criteria and a discussion of the results with respect to the appropriate guidance and targets.

1.12 Recommendations regarding sound insulation, ventilation and noise mitigation are also provided within this report.

2. Assessment Guidance & Acoustic Criteria

Wrexham County Borough Council Requirements

2.1 Wrexham County Borough Council provided the following comments in June 2024 with regard to noise impacting on the dwellings (ref: P/2024/1133):

ZP09 - Soundproofing of a Building (between Floors/Walls)

No part of the development shall commence until a scheme of noise insulation and attenuation measures between floors and walls of any neighbouring commercial use, in compliance with Building Regulations Guidance: Part E - Resistance to the Passage of Sound, has been submitted to, and approved in writing by, the Local Planning Authority.

The measures as are approved shall be fully implemented in strict accordance with the scheme prior to first occupation / use of the development and shall thereafter be permanently retained.

RPT 2 - Report Required

The noise survey shall determine noise levels for both Day (07:00 – 23:00 hours) and Night (23:00 – 07:00 hours), having regard to Planning Policy Wales (PPW) Guidance, Technical Advice Note (TAN) 11 – Noise.

The report of the noise survey findings shall include:

a) Noise levels arising from day / nighttime activities in the vicinity of the proposed development site and the impact upon the proposed accommodation, and

b) A detailed scheme of noise insulation and / or attenuation measures so designed to safeguard the amenity of the occupants of the proposed accommodation hereby approved.

The measures as are approved shall be fully implemented prior to the first occupation / use of the development.

The assessment should also consider the impact from any air handling plant used by the neighbouring commercial premises.

Technical Advice Note (Wales) 11: Noise

2.2 Paragraph 10 of TAN 11 states the following:

Local planning authorities should consider whether proposals for new noise-sensitive development would be incompatible with existing activities, taking into account the likely level of noise exposure at the time of the application and any increase that may reasonably be expected in the foreseeable future. Such development should not normally be permitted in areas which are, or are expected to become, subject to unacceptably high levels of noise and should not normally be permitted where high levels of noise will continue throughout the night.

2.3 With regard to mitigating the impact of noise, Paragraph 11 states the following:

Measures introduced to control the source of, or limit exposure to, noise should be proportionate and reasonable, and may include:

i. engineering: reduction of noise at point of generation (e.g. using quiet machines and/or quiet methods of working); containment of noise generated (e.g. insulating buildings which house machinery and/or providing purpose-built barriers around sites); protection of surrounding noise-sensitive buildings (e.g. improving sound insulation in these buildings and/or screening them by purpose-built barriers);

ii. lay-out: adequate distance between noise source and noise-sensitive building or area; screening by natural barriers, other buildings, or non-critical rooms in a building;

iii. administrative: limiting operating time of noise source; restricting activities allowed on the site; specifying an acceptable noise limit.

2.4 When assessing a proposal for a new residential development near a source of noise, TAN 11 also states local planning authorities should determine into which of the four Noise Exposure Categories (NECs) the proposed site falls, taking into account both daytime and night-time noise levels.

2.5 A recommended range of noise levels is given for each of the NECs for dwellings exposed to noise from road, rail, air and mixed sources. Based on the measured sound pressure levels, it is worth noting that the property falls within NEC A.

2.6 The following guidance is given regarding NEC A:

Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as desirable.

British Standard 8233:2014: Guidance on sound insulation and noise reduction for buildings

2.7 BS 8233 provides guidance regarding acoustic criteria and noise levels appropriate for various types of space that have different functions.

2.8 With regard to dwellings, appropriate internal ambient sound levels are given for bedrooms, living rooms and dining rooms (habitable rooms). The guidelines take into consideration the effect of internal noise on sleep and also the effect of noise on resting, listening and communicating.

2.9 The internal sound level targets presented in Table 2.1 have been reproduced directly from the standard.

Table 2.1 - Indoor ambient noise levels for dwellings

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	---
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	---
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

2.10 Note 7 of the standard also suggests that in some circumstances it may be appropriate to relax the indoor ambient noise level targets by up to 5 dB:

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.

2.11 Note 5 of the standard states *If relying on closed windows to meet the guide values, there needs to be appropriate alternative ventilation that does not compromise the facade insulation or the resulting noise level. If applicable, any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment*.

World Health Organisation: Guidelines for community noise (1999)

2.12 To help avoid sleep disturbance within bedrooms, this historical guidance document recommends that the night-time internal ambient sound level should not exceed 30 dB $L_{Aeq,T}$ and the maximum sound level should not typically exceed 45 dB $L_{AFmax,T}$.

2.13 The corresponding values directly outside of bedroom windows are therefore 45 dB $L_{Aeq,8hour}$ and 60 dB $L_{AFmax,T}$. This is based on the assumption that a partially open window provides approximately 15 dB of sound attenuation (from external noise).

2.14 With regard to sleep disturbance and maximum L_{AFmax} sound levels, the study undertaken by Vallet & Vernet (1991) suggests that for good sleep, indoor sound pressure levels should not exceed approximately 45 dB L_{Amax} more than 10-15 times per night.

Professional Practice Guidance on Planning & Noise (2017)

2.15 Professional Practice Guidance on Planning and Noise (ProPG) has been produced in order to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England.

2.16 The NPPF encourages improved standards of design. This guidance document encourages better acoustic design for new residential development and aims to protect people from the harmful effects of noise.

2.17 The scope of ProPG is restricted to the consideration of new residential development that will be exposed predominantly to airborne noise from transportation sources.

Internal noise level guidelines

2.18 The recommended ProPG internal noise level guidelines are presented in Table 2.2. The guidelines reflect and extend current practice contained within BS 8233:2014.

Table 2.2 - ProPG internal noise level guidelines

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	---
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	---
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$ 45 dB $L_{Amax,F}$

2.19 Where the local planning authority accepts that there is a justification that the internal target noise levels can only be practically achieved with windows closed, which may be the case in urban areas and at sites adjacent to transportation noise sources, special care must be taken to design the accommodation so that it provides good standards of acoustics, ventilation and thermal comfort without unduly compromising other aspects of the living environment.

2.20 In such circumstances, internal noise levels can be assessed with windows closed but with any façade openings used to provide "*whole dwelling ventilation*" in accordance with Building Regulations Approved Document F (e.g. trickle ventilators) in the open position.

2.21 It should also be noted that the internal noise level guidelines are generally not applicable under "*purge ventilation*" conditions as defined by Building Regulations Approved Document F, as this should only occur occasionally (e.g. to remove odour from painting and decorating or from burnt food).

Building Regulations 2010 – Approved Document E

2.22 The Building Regulations 2010, Approved Document E *Resistance to the passage of sound*, provides minimum sound insulation standards for separating wall and floor constructions between adjacent dwellings (houses, flats and rooms for residential purposes).

2.23 The current acoustic performance standards for new-build dwellings and those that have been formed by a material change of use are presented in Table 2.3.

Table 2.3 - Performance standards of Approved Document E

Dwelling-house and flats - performance standards for separating walls, separating floors, and stairs that have a separating function		
	Airborne sound insulation $D_{nT,w}+C_{tr}$ dB (Minimum values)	Impact sound insulation $L'_{nT,w}$ dB (Maximum values)
Purpose built dwelling-houses and flats		
Walls	45	--
Floors and stairs	45	62
Dwelling-houses and flats formed by material change of use		
Walls	43	--
Floors and stairs	43	64

2.24 In this instance, the separating party wall needs to achieve a minimum airborne sound insulation performance of 43 dB $D_{nT,w}+C_{tr}$.

3. Environmental Noise Survey

Survey methodology

3.1 Continuous sound level monitoring was conducted over a 24-hour period on the rear south facing elevation. The survey equipment was installed within the property and the microphone was fixed to the roof guttering, approximately 3 metres from the ground.

3.2 Measurements were performed from approximately 14:00 hours on Tuesday 17th through to 14:00 hours on Wednesday 18th September 2024.

3.3 A measurement interval of 5-minutes was used during the survey and measurements were subject to sound reflections from the façade (as opposed to free-field). One-third octave band and A-weighted broadband sound pressure levels were recorded during the survey.

3.4 The site location, surrounding area and survey measurement position are shown in Figure 3.1 and Figure 3.2. The floor plans and elevations are presented in Appendix A.

Figure 3.1 - Site location and survey measurement position (source: Google Earth)

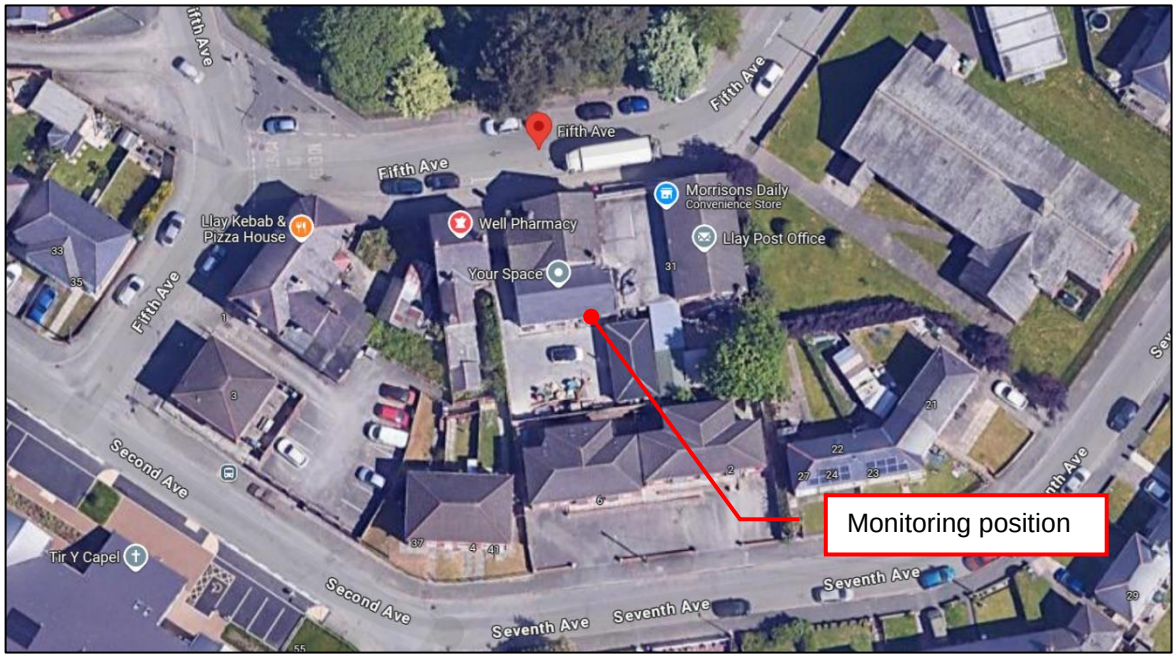


Figure 3.2 - Photographs showing survey measurement position



Survey equipment

3.5 The survey was conducted using the following Class-1 specification equipment:

- Brüel & Kjaer 2250-Light sound level meter, microphone type 4189, pre-amplifier type ZC0032.
- CEL-120/1 Acoustic calibrator.

3.6 Calibration of the sound level meter and microphone used for the measurements are traceable to UKAS accredited laboratories (calibration certificates are available upon request).

3.7 The calibration of both sound level meter and microphone was checked using a 1 kHz tone at 94 dB prior to and following the measurements performed. Calibration drift was less than 0.1 dB.

Weather conditions

3.8 The weather conditions during the survey were generally dry, sunny and fine with a light cloud cover. Wind speed measurements taken outside of the building were between 0.3 and 1.2 m/s^{-1}.

3.9 The air temperature during the survey ranged between 6°C and 14°C. The overall weather conditions were considered suitable to obtain representative measurements.

Subjective observations of the acoustic environment

3.10 The most notable sources of noise at the site are vehicle movements along Fifth Avenue and vehicles parking directly outside of the neighbouring commercial premises.

3.11 Other noted sources of noise include passing pedestrians, high altitude aircraft and domestic activity at neighbouring dwellings.

3.12 Operational noise associated with the adjacent hair and beauty salon was generally inaudible within the dwelling.

3.13 Operational noise associated with the neighbouring Post Office and Morrisons Daily was also inaudible within the dwelling.

3.14 There is a single condensing unit on the rear elevation of the Post Office that serves the air-conditioning system. Low level plant noise is just audible in the yard outside of the dwellings but is inaudible within the property with the window open and closed. The unit does not appear to operate during the night-time period, which is to be expected since the Post Office is closed.

Measured indices

3.15 Although a wide range of statistical sound level data was recorded during the survey, the L_{Aeq} and L_{AFmax} indices are of most interest in this instance:

- $L_{Aeq,T}$ - The A-weighted equivalent continuous sound pressure level over a period of time, T. Representative of the 'average' sound pressure level over a given period and commonly used to describe the 'ambient' sound level.
- $L_{AFmax,T}$ - The A-weighted 'maximum' sound pressure level that occurred during a given period, T. Commonly used for the assessment of occasional or intermittent loud noises.

3.16 Sound pressure level measurements are taken with an A-weighting (denoted by a subscript 'A', e.g. L_{Aeq}) to approximate the frequency response of the human ear.

Results summary

3.17 Table 3.1 presents a summary of the continuously measured sound pressure levels at the rear of the property. Measured values have been rounded to the nearest whole number.

Table 3.1 - Summary of continuously measured sound pressure levels

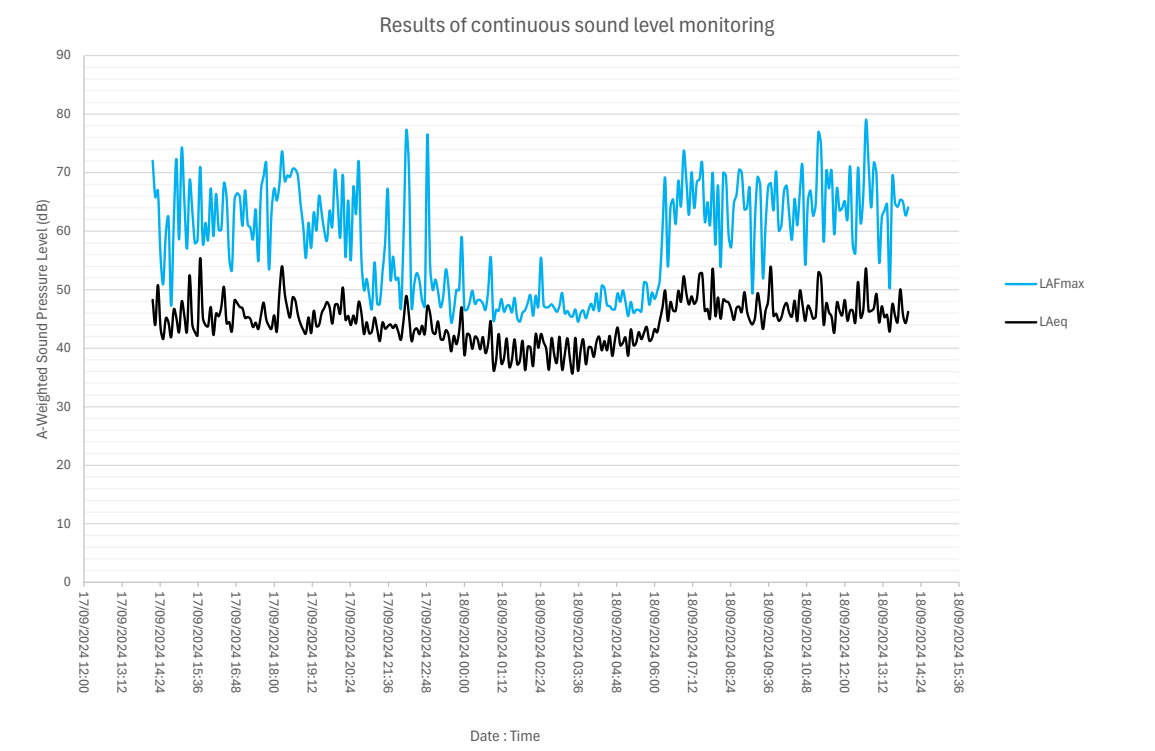
Date	Period	Duration, T (hours)	$L_{Aeq,T}$ dB	10th Highest[1] $L_{AFmax,T}$ dB	15th Highest[2] $L_{AFmax,T}$ dB
Tuesday 17/09/2024 to Wednesday 18/09/2024	Daytime (07:00-23:00)	16	47	---	---
	Night-time (23:00-07:00)	8	43	56	52

[1]The 10th highest value from 96 measurements. [2]The 15th highest value from 96 measurements - indoor sound pressure levels should ideally not exceed 45 dB L_{Amax} more than 10 to 15 times per night.

3.18 The daytime ambient sound pressure level was 47 dB $L_{Aeq,16hour}$ and the night-time ambient sound pressure level was 43 dB $L_{Aeq,8hour}$.

3.19 The results of the sound level monitoring are presented graphically in Figure 3.3. Additional tabulated survey data can be made available upon request.

Figure 3.3 - Graph showing results of continuous sound level monitoring



4. Assessment & Discussion

Building envelope construction and acoustic performance

4.1 The external walls are of a traditional double-leaf masonry/brickwork construction. The sound insulation performance is expected to be approximately 50 to 60 dB R_w.

4.2 The roof and ceiling construction consists of a pitched tiled roof, mineral wool (loft) insulation and plasterboard ceiling. The sound insulation performance is expected to be approximately 40 to 50 dB R_w.

4.3 The windows to the rear elevation are currently standard thermal double-glazed units fixed within uPVC frames. The construction appears to be 4 mm glass / 16 to 18 mm cavity / 4 mm glass. External doors appear to be of a composite construction. The sound insulation performance is expected to be approximately 27 to 32 dB R_w.

4.4 Purge and background ventilation of the lounge/kitchen is currently achieved via natural means (opening windows). There are no trickle vents within the window frames or vents within the external wall.

Noise ingress with windows closed

4.5 Table 4.1 presents the noise ingress calculation results for the living room/kitchen on the rear elevation. The daytime sound pressure level has been used in the calculation (47 dB $L_{Aeq,16hour}$).

4.6 The calculations take into account the sound insulation performance of each building element, surface area and internal room dimensions. The floor plans and elevations are presented in Appendix A.

4.7 The measured octave-band sound levels and typical reverberation time for a habitable room have also been taken into consideration.

Table 4.1 - Noise ingress calculation results: living/kitchen

Title: Living Room/Kitchen **Noise Break In (ISO 12354-3)**												
Formula/Comment	***Single Value***		***63***	***125***	***250***	***500***	***1000***	***2000***	***4000***	***8000***	***Rw***	***(C,C_{tr})***
				24.2	25.1	31.8	32.8	34.1	35.0			
L_{in}				27.8	24.9	10.2	8.2	5.9	-9.0			
Materials												
4mm glass/12 - 20 mm cavity/4mm glass		1.2		21.0	17.0	25.0	35.0	37.0	31.0		**29**	**(-1,-4)**
Double-leaf brickwork wall		9.2		40.0	44.0	45.0	51.0	56.0	60.0		**51**	**(-1,-4)**
Tiled roof, insulation, plasterboard ceiling		14.8		28.0	34.0	40.0	45.0	49.0	50.0		**44**	**(-2,-5)**
Composite door		1.6		22.0	25.0	29.0	25.0	26.0	28.0		**27**	**(-1,-1)**
$L_{out,s}$												
$L_{out,2m}$	Add Element			52.0	50.0	42.0	41.0	40.0	26.0		**47**	
$L_{out,free\ field}$				49.0	47.0	39.0	38.0	37.0	23.0		**44**	
Element 1				24.2	25.1	31.8	32.8	34.1	35.0			
Plane façade	ΔL_{fs}	26.8		0.0	0.0	0.0	0.0	0.0	0.0			
Visible	x_{fs}	0.0		24.2	25.1	31.8	32.8	34.1	35.0			
$L_{p,out,2m}$				52.0	50.0	42.0	41.0	40.0	26.0		**47**	
$L_{p,in}$				27.8	24.9	10.2	8.2	5.9	-9.0		**19**	**dBA**

4.8 The calculation results indicate a daytime internal sound level of approximately 19 dB $L_{Aeq,16hour}$.

4.9 The daytime sound level target of 35 dB $L_{Aeq,16hour}$ will therefore be easily achieved with the window closed.

4.10 The night-time sound level target of 30 dB $L_{Aeq,8hour}$ applies to bedrooms and does not apply to lounges/living rooms, kitchens and dining rooms.

4.11 It is however worth noting that the night-time sound level target of 30 dB $L_{Aeq,8hour}$ for bedrooms will also be easily achieved, since the night-time ambient sound level is approximately 4 dB lower than the daytime ambient sound level.

4.12 With regard to the maximum L_{AFmax} internal sound levels, the recommended target of 45 dB L_{AFmax} will also be achieved for the majority of the night-time period.

4.13 Since the acoustic design targets will be easily achieved during the daytime and night-time period with windows closed, acoustic enhancement is unnecessary (i.e. such as installing acoustically laminated glazing or secondary glazing).

Noise ingress with windows open

4.14 The level of sound attenuation through an open window is dependent on the type and size of window, the extent of opening, the angle of sound incidence and the characteristics of the noise source in question.

4.15 It is reasonable to assume a sound attenuation performance of approximately 15 dB for a partially open window. Partially open windows will provide background ventilation only, as opposed to rapid/purge ventilation.

4.16 BS 8233 provides the following guidance regarding the sound insulation from an open window:

If partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15 dB[3]. [3)] Note that the level difference through a window partially open for ventilation can vary significantly depending on the window type and the frequency content of the external noise. If the specific details of the window and external noise are known the value for insulation may be adjusted accordingly.

4.17 Daytime façade sound pressure levels are approximately 47 dB $L_{Aeq,16hour}$ and night-time sound pressure levels are approximately 43 dB $L_{Aeq,8hour}$.

4.18 When assessing noise ingress through an open window, it is appropriate to correct the measured sound levels at the façade by approximately -3 dB to give an equivalent free-field sound level.

4.19 The corresponding 'free-field' sound pressure levels are therefore 44 dB $L_{Aeq,16hour}$ during the daytime and 40 dB $L_{Aeq,8hour}$ during the night-time.

4.20 Assuming a partially open window provides 15 dB of sound attenuation, the resulting internal sound level is approximately 29 dB $L_{Aeq,16hour}$ during the daytime and 25 dB $L_{Aeq,8hour}$ during the night-time.

Daytime

- 44 dB $L_{Aeq,16hour}$ – 15 dB = 29 dB $L_{Aeq,16hour}$

Night-time

- 40 dB $L_{Aeq,8hour}$ – 15 dB = 25 dB $L_{Aeq,8hour}$

4.21 The daytime sound level target of 35 dB $L_{Aeq,16hour}$ and the night-time target of 30 dB $L_{Aeq,8hour}$ will therefore be achieved with windows open.

4.22 BS 8233 states where occupants rely on closed windows to meet the internal noise limits, there needs to be appropriate *alternative ventilation* that does not compromise the facade sound insulation or resulting internal sound level.

4.23 BS 8233 also provides the following comment with regard to ventilation:

The Building Regulations' supporting documents on ventilation recommend that habitable rooms in dwellings have background ventilation. Where openable windows cannot be relied upon for this ventilation, trickle ventilators can be used and sound attenuating types are available. However, windows may remain openable for rapid or purge ventilation, or at the occupant's choice.

4.24 Since the recommended internal sound level targets will be achieved with windows open, an alternative method of ventilation such as sound attenuating (acoustic) wall or frame-mounted ventilator units is unnecessary.

Overheating and opening windows

4.25 Approved Document O *Overheating* applies to new-build residential dwellings, however the guidance is also worth noting for existing dwellings and those undergoing a material change of use.

4.26 With regard to noise at night and opening windows, the document states the following:

In locations where external noise may be an issue (for example, where the local planning authority considered external noise to be an issue at the planning stage), the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11pm to 7am).

Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.

a. 40 dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am).

b. 55 dB L_{AFmax}, more than 10 times a night (between 11pm and 7am).

4.27 The predicted internal sound levels are notably below the noise limits given within Approved Document O. This indicates that occupants are likely to open the window during the night to help cool and remove excess heat from the room (due to the quiet conditions).

Internal sound insulation and acoustic separation

Party wall construction and acoustic performance

4.28 The separating party wall between the dwellings and the neighbouring commercial units (hair and beauty salon and Post Office) consists of a double-leaf brickwork construction with a plasterboard finish.

4.29 Based on our experience of testing similar constructions, the airborne sound insulation performance is expected to be approximately 50 to 55 dB $D_{nT,w}+C_{tr}$.

4.30 The airborne sound insulation of the party wall therefore easily achieves the performance standard of Approved Document E (minimum of 43 dB $D_{nT,w}+C_{tr}$).

Sound transmission from commercial unit

4.31 Sample measurements previously conducted within a hair and beauty salon indicate typical ambient sound levels in the region of 60 to 70 dB $L_{Aeq,60sec}$. Ambient sound levels within a retail unit such as a shop or Post Office are typically lower than a salon.

4.32 Taking into consideration the sound insulation of the party wall, the corresponding sound level within the neighbouring habitable rooms is approximately 10 to 20 dB $L_{Aeq,60sec}$.

- 70 dB $L_{Aeq,60sec}$ - 50 dB $D_{nT,w}+C_{tr}$ = 20 dB $L_{Aeq,60sec}$

4.33 In this instance, the resulting internal sound level due to commercial related noise would be notably below the recommended daytime noise limit of 35 dB $L_{Aeq,16hour}$.

4.34 Noise related disturbance due to the operation of the neighbouring commercial units is considered unlikely.

4.35 Based on this assessment, acoustic enhancement of the party wall is unnecessary.

Ambient sound level in outdoor living areas

4.36 With regard to outdoor living areas (gardens), BS 8233 provides the following guidelines:

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 recognised 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.

4.37 The measured daytime ambient sound pressure level was 47 dB $L_{Aeq,16hour}$.

4.38 The ambient sound pressure level within the external area to the rear of the property will therefore easily achieve the guideline values of 50 to 55 dB $L_{Aeq,16hour}$.

4.39 Noise mitigation measures regarding the external yard/amenity area are therefore unnecessary.

5. Conclusion

5.1 The external walls and roof construction will provide sufficient sound insulation from external noise and do not require acoustic enhancement.

5.2 The recommended sound level targets will be achieved within all habitable rooms with the existing standard thermal double glazing.

5.3 Noise mitigation measures such as installing acoustically laminated double glazing or secondary glazed units in addition to the existing units are unnecessary.

5.4 An alternative method of ventilation to habitable rooms is unnecessary, since the internal sound level targets will be achieved with windows open.

5.5 The party wall between the dwellings and the neighbouring commercial units is expected to provide a sufficient sound insulation performance and does not require acoustic enhancement.

Appendix A
Floor plans and elevations

Figure A.1 - Site location plan

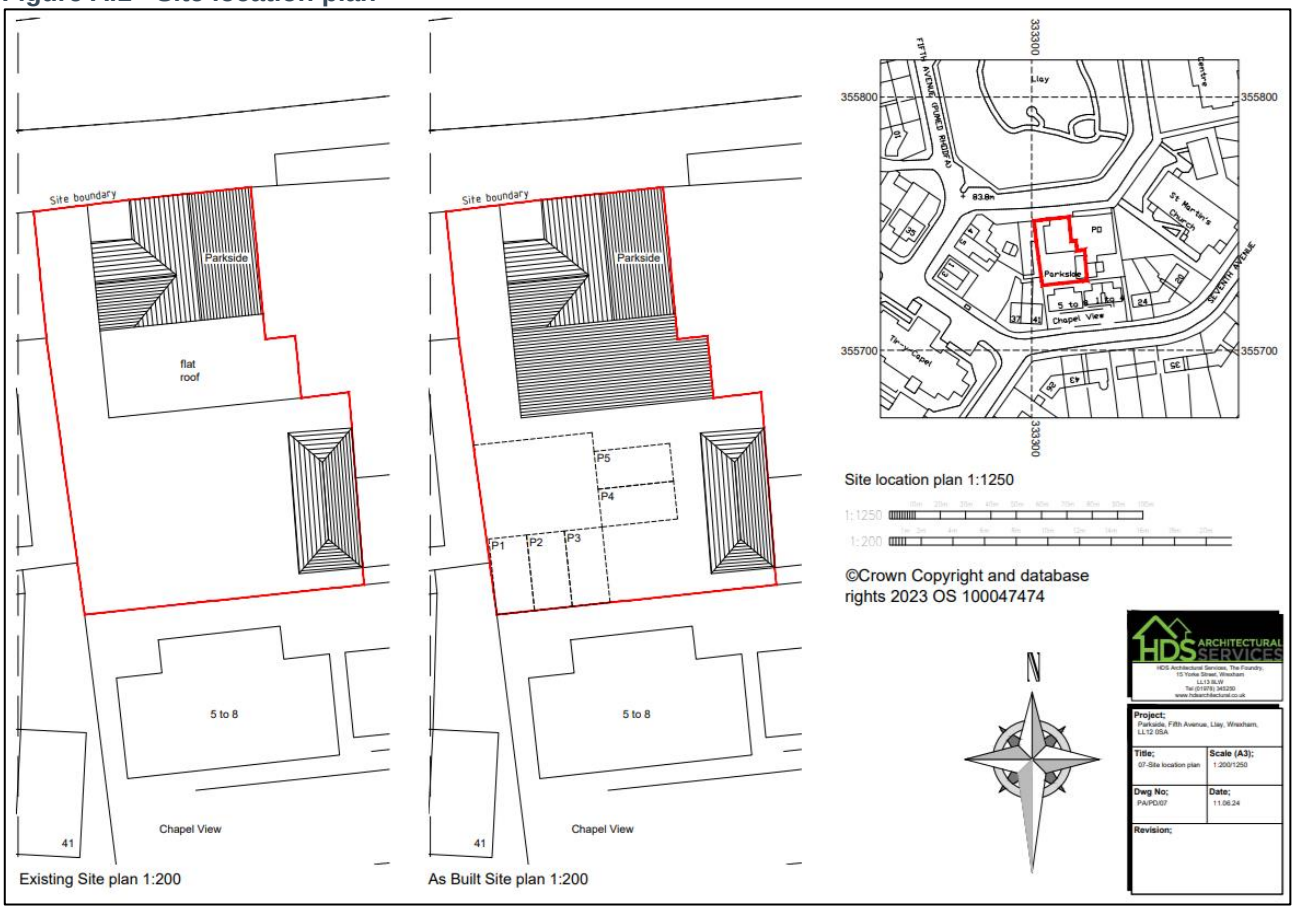


Figure A.2 - Ground floor plan (as built)

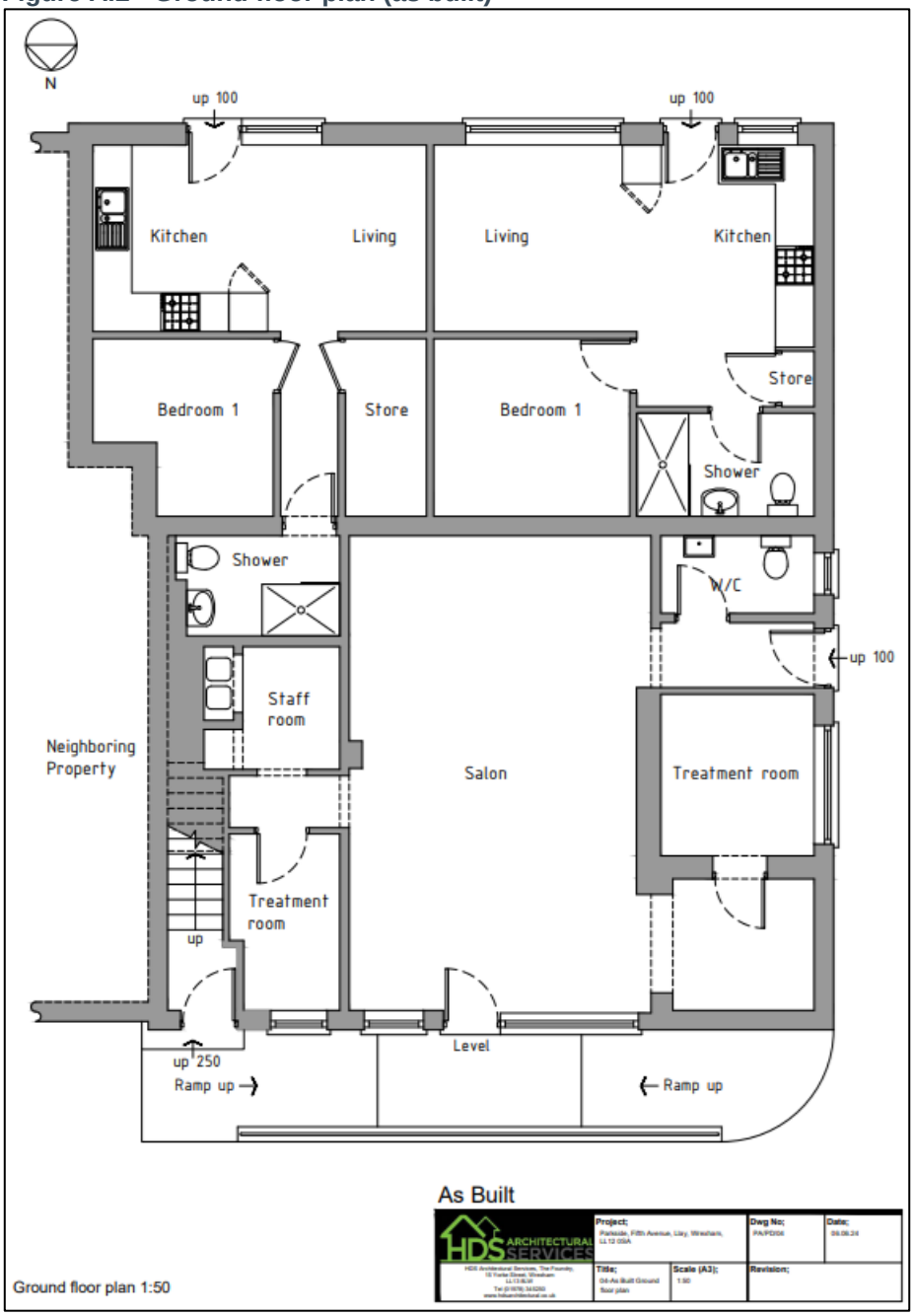


Figure A.3 - First floor plan (as built)

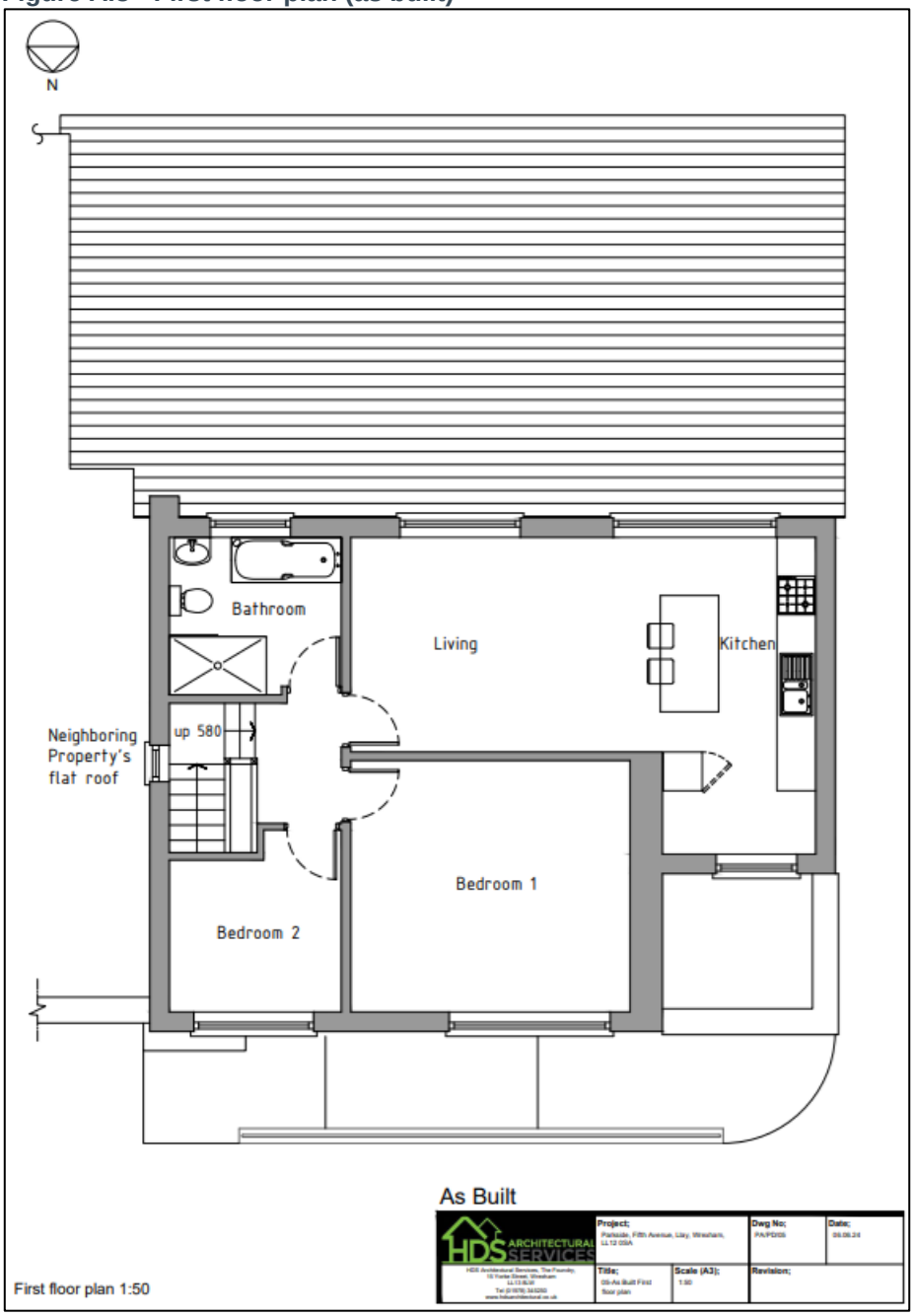


Figure A.4 - Elevations (as built)

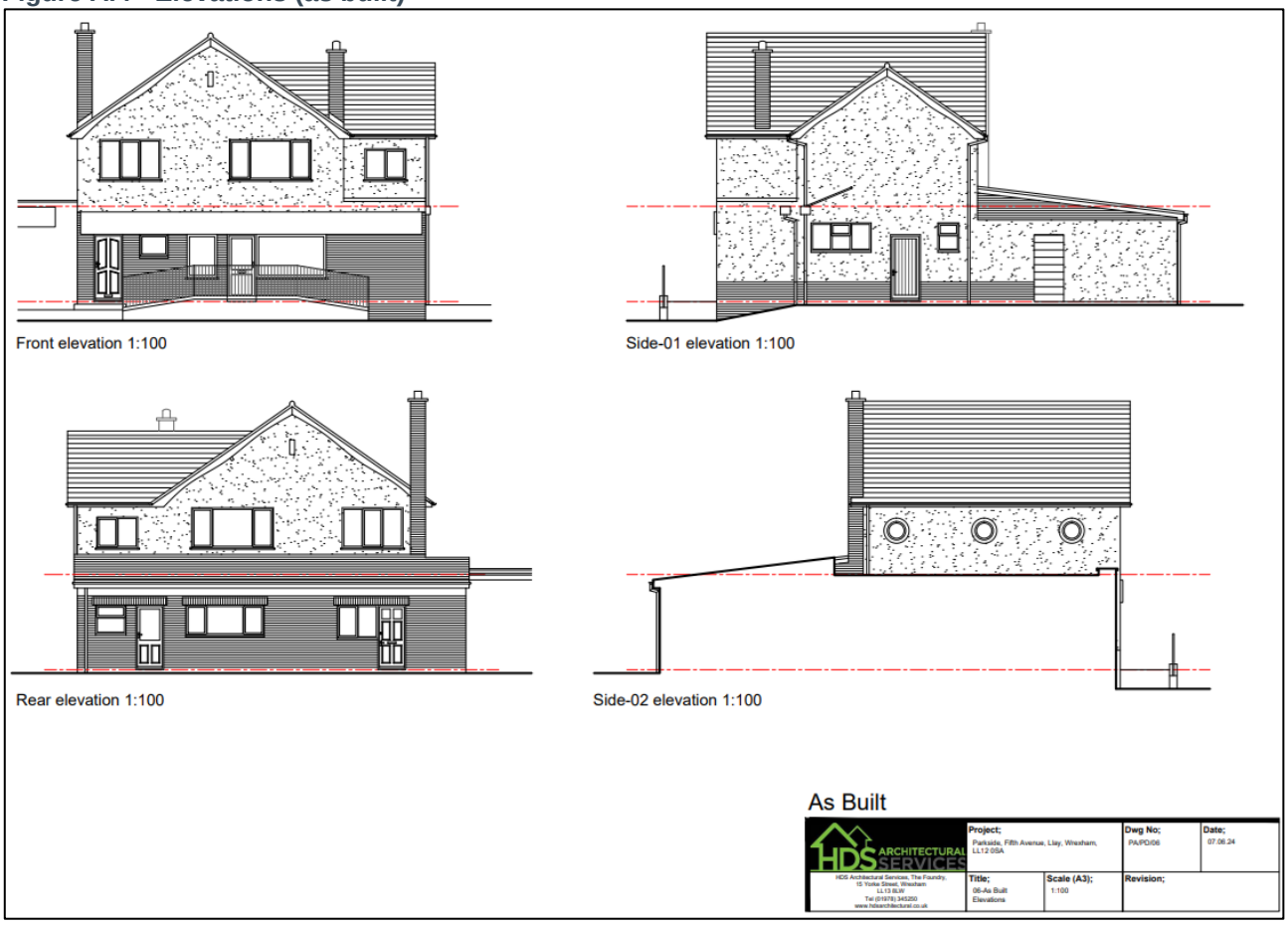


Figure A.5 - Ground floor plan (as previous)

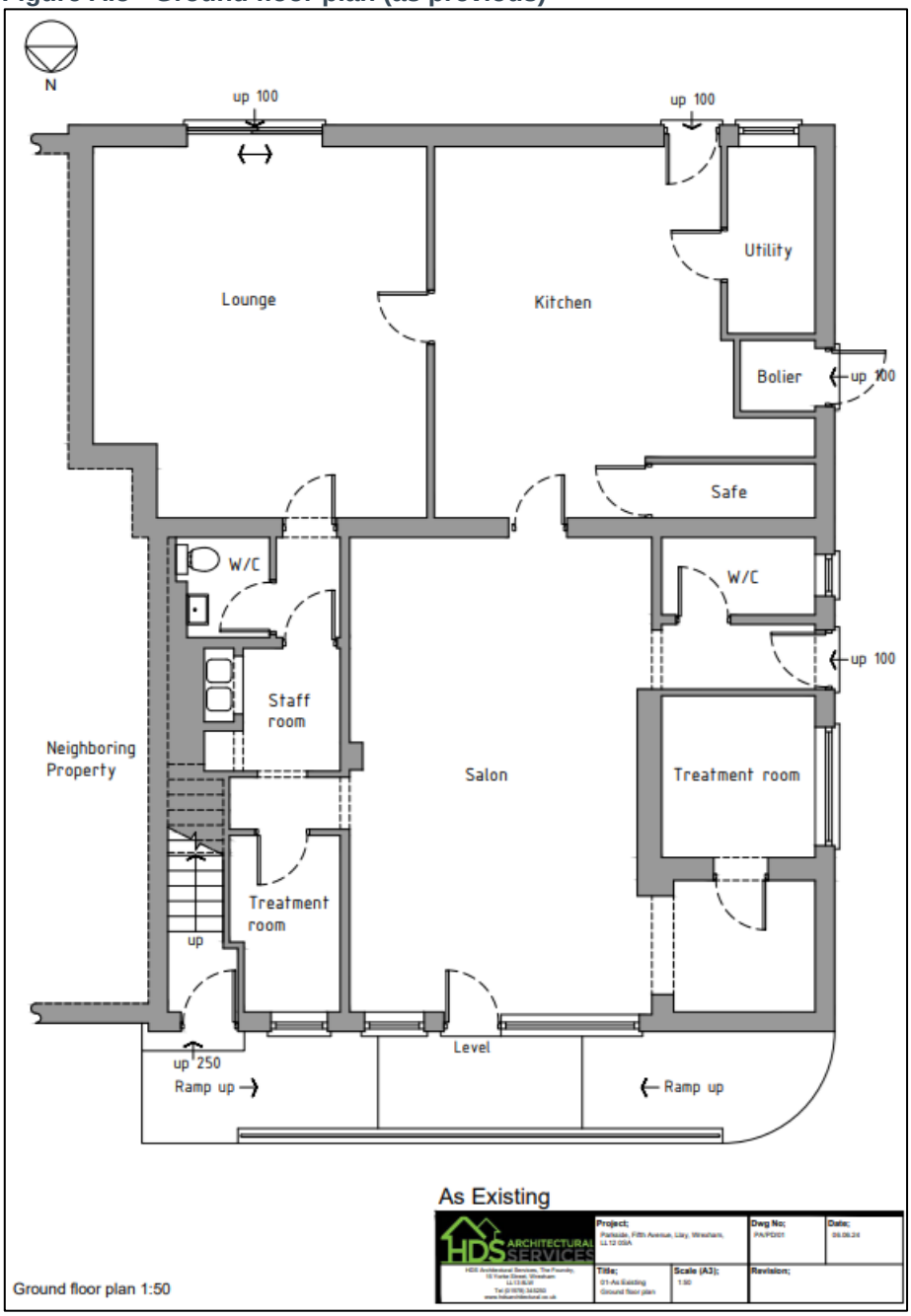


Figure A.6 - First floor plan (as previous)

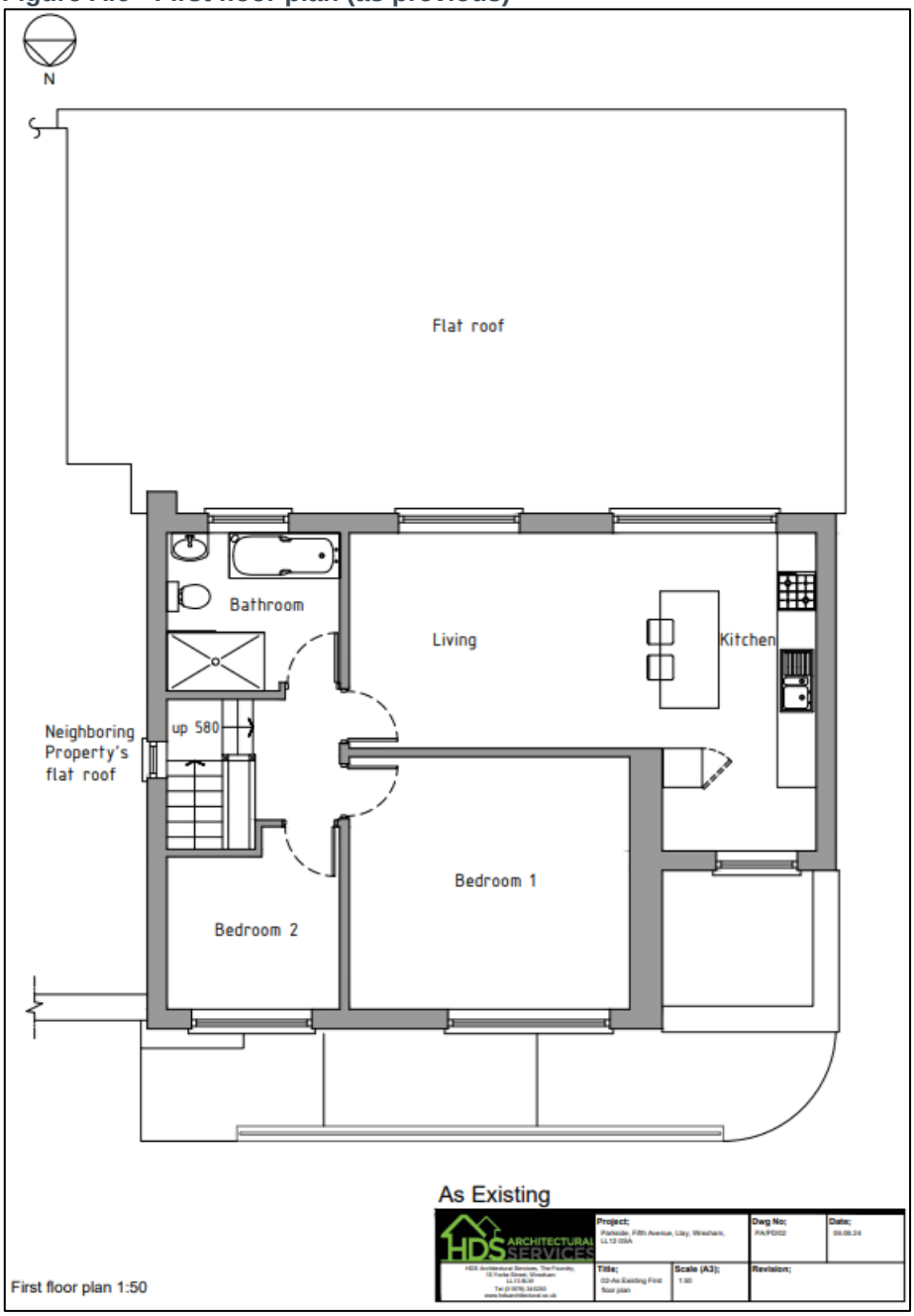
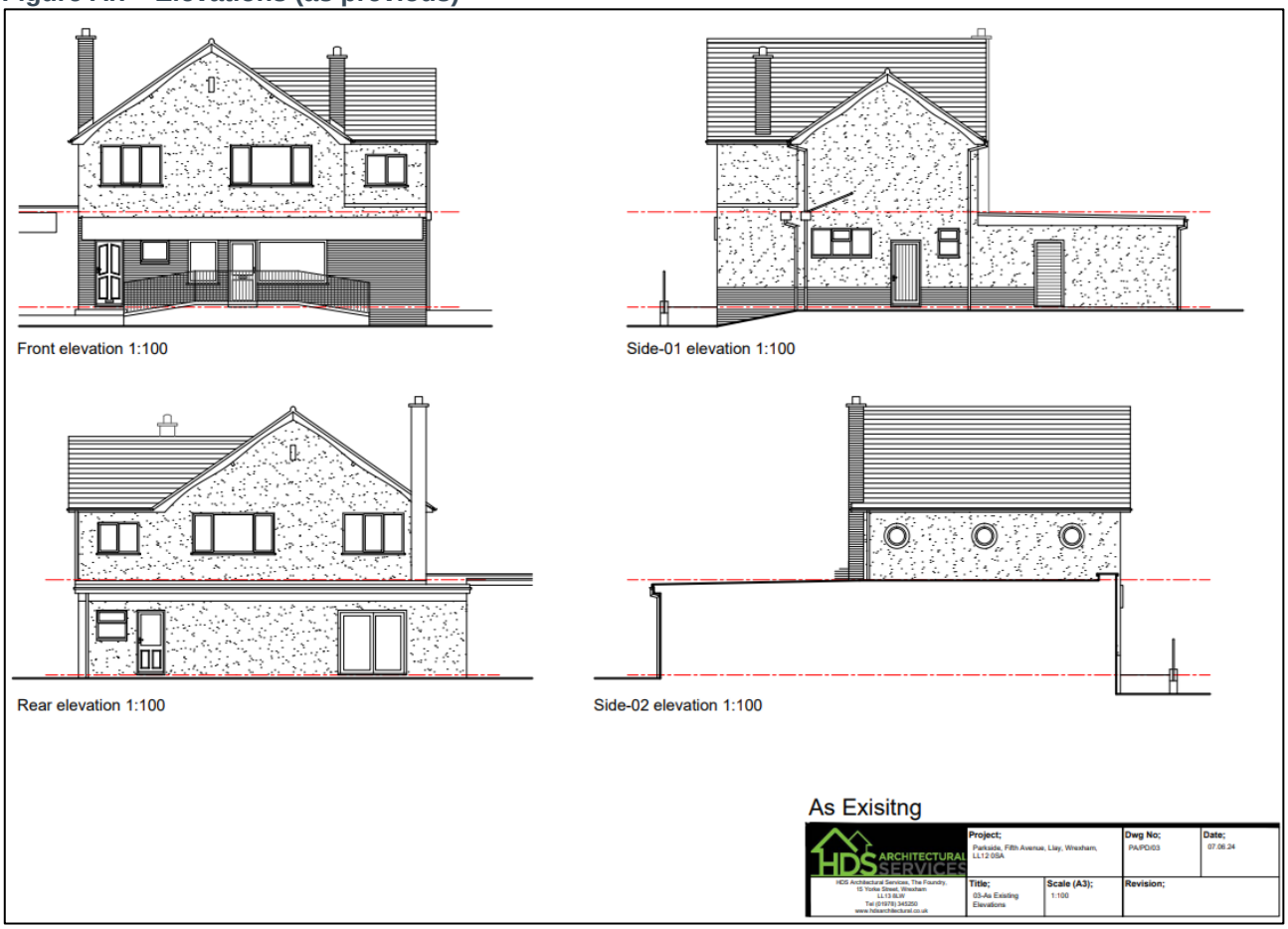


Figure A.7 - Elevations (as previous)



Appendix B
Assessment terminology

Assessment terminology

Term	Description
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure ($2x10^{-5}$Pa).
dB(A)	The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq}, L_{A90} etc, according to the parameter being measured.
Acoustic environment	Sound from all sources as modified by the environment.
Ambient sound level	The totally encompassing sound in a given situation at a given time; it is usually composed of sound from many sources, near and far.
Equivalent continuous sound level - $L_{Aeq,T}$	The A-weighted equivalent continuous sound pressure level over a period of time, T. Representative of the 'average' sound pressure level over a given period (commonly used to describe the 'ambient' sound level).
Maximum sound level - $L_{AFmax,T}$	The A-weighted 'maximum' sound pressure level that occurred during a given period, T (commonly used for the assessment of intermittent loud noises).
Background sound level - $L_{A90,T}$	The sound pressure level that is exceeded for 90% of the measurement time interval, T. $L_{A90,T}$ is often used to describe the 'background' sound level.
Habitable room	Any room used or intended to be used for sleeping, cooking, living or eating purposes (enclosed spaces such as bath or toilet facilities, service rooms, corridors, laundries, hallways, utility rooms or similar spaces are excluded from this definition).
R_w	The weighted sound reduction index expressed in dB. A single number quantity for airborne sound insulation rating.
Free-field level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other significant reflective surfaces. Generally as measured outside and away from buildings (>3.5metres).