Sixis Group Ltd

ALEXANDER HOUSE, RUISLIP

Commercial noise assessment

Report No. 20-0033-0 R01b

♦ PROTECT ♦ ENHANCE ♦ CONNECT

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Report No.:	20-0033-0 R01b
Date:	17 March 2020

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1 INTRODUCTION

Prior Approval is sought under The Town & Country Planning (General Permitted Development) (England) Order 2015 as amended (Amendment Order 2016), for the conversion of 106 Pembroke Road, Ruislip Manor, Ruislip, HA4 8NW from offices to residential accommodation, with the exception of the existing retail units at ground floor level to the front of the property (Pembroke Road). Under the current legislation the developer must apply to the local planning authority for a determination as to whether the prior approval of the authority will be required with regard to "impacts of noise from commercial premises on the intended occupiers of the development."

This report provides an assessment of commercial noise impacts on the future occupiers at 106 Pembroke Road in accordance with the GDPO 2015.

Non-commercial noise sources are not assessed.

Ventilation requirements and any recommendations in respect of ventilation have been excluded from the scope of this assessment. A separate assessment of ventilation requirements will need to be made.

1.1 Context

The site location is shown in the Google Earth image below. The site is located on 106 Pembroke Road, adjacent to the Windmill Centre (to the west of the site). The front units at ground floor level are to be kept as commercial units. There is a car service centre and tyre shop opposite on Pembroke Road, a restaurant on the next block to the east and a pub to the southeast whose service yard is in the area in between the site and back of the pub. Surrounding the service yard at first and second floor level is existing residential accommodation. No other major commercial units were observed in the area. The railway line runs to the south of the site.

Figure 1: Site Location with site marked in blue, Windmill Centre in purple, pub in green, restaurant in yellow and car service centre in red

2 POLICY AND GUIDANCE ON NOISE

National planning policy is provided in the National Planning Policy Framework (NPPF), which supports a presumption in favour of development, unless the adverse impacts of that development would outweigh the benefits when assessed against the policies in the Framework, taken as a whole. Policy on noise implications is to *avoid* significant adverse impacts, *mitigate* and reduce other adverse impacts and to *recognise* the need for development. This is further qualified in the Noise Policy Statement for England (NPSE). Further government advice on how planning can manage potential noise impact in new development is given in PPG: Noise.

Local planning policy is contained in the London Borough of Hillingdon Local Plan (Part 2, Adopted Version 16 January 2020). Policy DMH 3 in this document refers to considerations for office conversions. The document makes reference to NPPF.

Commercial and industrial noise sources should normally be assessed using the methodology in BS4142: 2014, which compares the rating noise from the source with the existing background noise level to determine the likelihood of adverse impact.

Design criteria for internal and external noise levels, based on the recommendations of the World Health Organisation are provided in the British Standard BS 8233: 2014.

Further information on the national policy and guidance and local policy DMH 3 is provided in Appendix 2 of this report.

3 AMBIENT NOISE SURVEY

A noise survey was carried out at 106 Pembroke Road between 27th February and 5th March 2020. Three unattended positions were chosen to capture continuous noise levels in 15 minute intervals over the duration of the survey. A further attended position was chosen to establish noise levels from the kitchen extract belonging to the restaurant. Figure 2 shows the measurement positions.

Figure 2: Site Location with marked measurement positions (unattended measurement positions 1-3 in red and attended position in blue)

During the survey the weather was cold with temperatures between 0-12°C. Wind was generally in the south westerly direction until the night of the 4th March, when it changed to north-easterly direction for the last day of the survey. Wind speeds were below 5m/s for most of the survey other than Saturday 29th February, when they were just over 5m/s. There was rainfall just before setting up the equipment on Thursday 27th February, on the evening of the 28th February, light rain on the afternoon of the 4th March and drizzle on the morning of the 5th March. The effect of rainfall has been considered when analysing the noise data.

3.1 Instrumentation

The measurement equipment used is shown in the table below. Prior to and on completion of the survey the calibration was check with the field calibrator and no changes occurred.

Equipment	Type	Serial Number	Calibration	
			Date	Certificate no
Svantek Class 1 Sound and Vibration Analyser	958A	34551	05/04/19	050419
Microphone	7052E	55952	20/02/19	200219
Preamplifier	SV 12L	33537	05/04/19	050419
Svantek Class 1 Sound and Vibration Analyser	958A	59101	17/12/18	14010568-2b
Microphone	MK 255	12579	17/12/18	14010568-2b
Preamplifier	SV 12L	57969	17/12/18	14010568-2b
Svantek Class 1 Sound Level Meter	971	60684	24/05/19	14013087-2
Preamplifier	SV18	62752	24/05/19	14013087-2
Microphone	7052E	66699	24/05/19	14013087-2
Svantek SV33	SV33	58228	24/05/19	14013087-1

Table 1: Equipment used for the noise survey 27th February – 5th March 2020

3.2 Measured noise levels

The measurement positions were chosen to capture noise levels from different sources around the site. Figure 2 showed the location of the three unattended positions and the results for each one are shown below:

Unattended position 1

This position was chosen to measure noise levels at the façade overlooking the Windmill Centre. The logging sound level meter was located at first floor level. It was observed that there were two heat pump units in the space between the site and the Windmill Centre, shown in Figure 3 (photo taken at second floor level).

The results from the logging sound level meter at this position are shown in graphical form in Figure 4 and numerically in Table 2.

Figure 3: Photo of plant serving Windmill Centre (operational during the survey) – photo from 2nd floor level

There was no audible noise from inside the Windmill Centre. It is understood that this centre has several rooms that can be booked for different events, including children's parties. No activities from the centre have been noticed at the current offices.

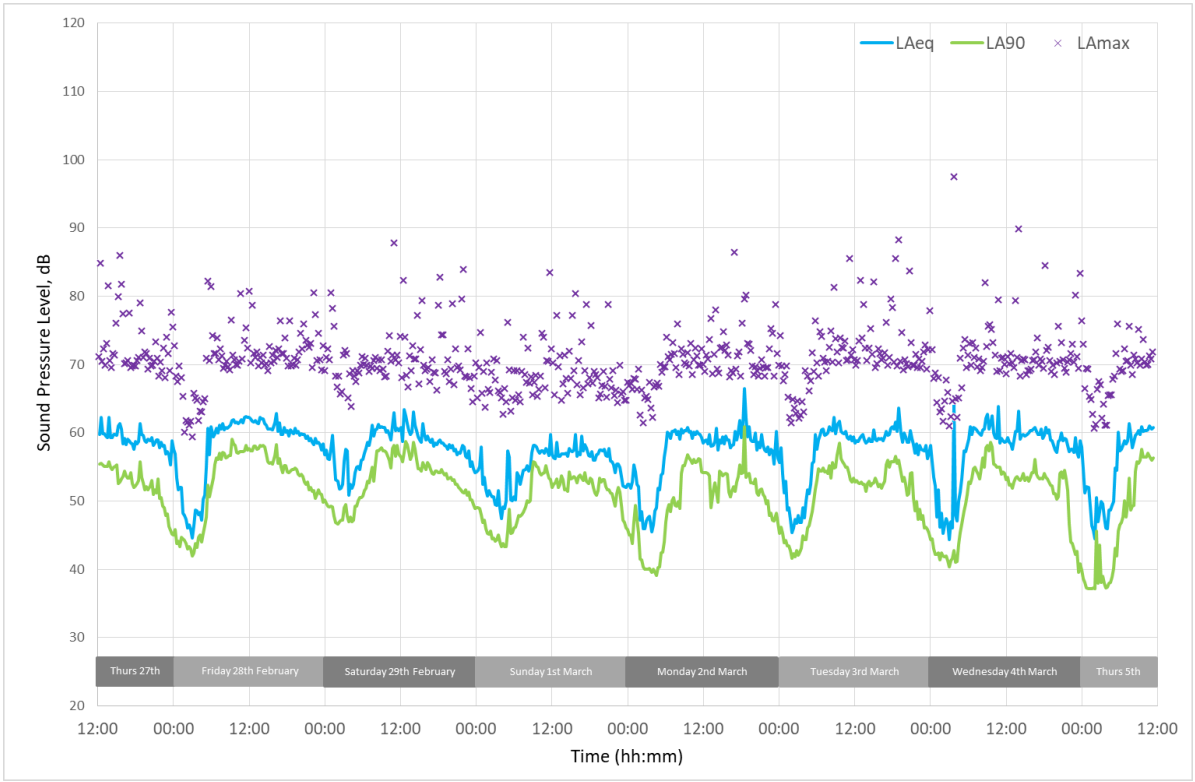

Figure 4: Graphical results from unattended position 1 (first floor level overlooking Windmill Centre)

	Ambient L_{Aeq}, dB			Background L_{A90}, dB		Maximum L_{Amax}, dB	
	Min	Max	Av	Min	Max	Min	Max
Daytime (07:00-19:00)	53	67	60	48	61	65	90
Day (07:00-23:00)	53	67	60	43	61	64	90
Evening (19:00-23:00)	54	64	58	43	56	64	88
Night (23:00-07:00)	44	64	55	37	56	59	97

Table 2: Results obtained at Logger 1 (27th February – 5th March 2020)

Unattended position 2

This position was chosen to measure noise levels from the Pub courtyard without as significant contribution from road traffic noise as other positions. However, there was line of sight with the railway line.

The logging sound level meter was installed at first floor level. Figure 5 shows the views at a similar position but from the roof, showing the pub courtyard and the railway lines. This figure also shows the plant located on the pub's roof, however there was no audible contribution perceived from this source during the visits.

Further to this, no attended measurements were possible during either visit to establish noise levels from the use of this courtyard, however, from observations it seems like this is mainly for bin storage, which could potentially involve some activities such as bottling out. It is unknown if the small external area would be frequently used by customers (e.g. smoking area), however the website does state that the outdoor area is licensed. The pub is part of the Wetherspoons chain and does not have loud music for entertainment.

Figure 5: Photo of pub service yard and line of site to railway line (photo from roof, logger 2 positioned at the same vertical location but at 1st floor level)

Figure 6 and Table 3 show the results obtained at this position. Note that this had significant contribution from railway noise.

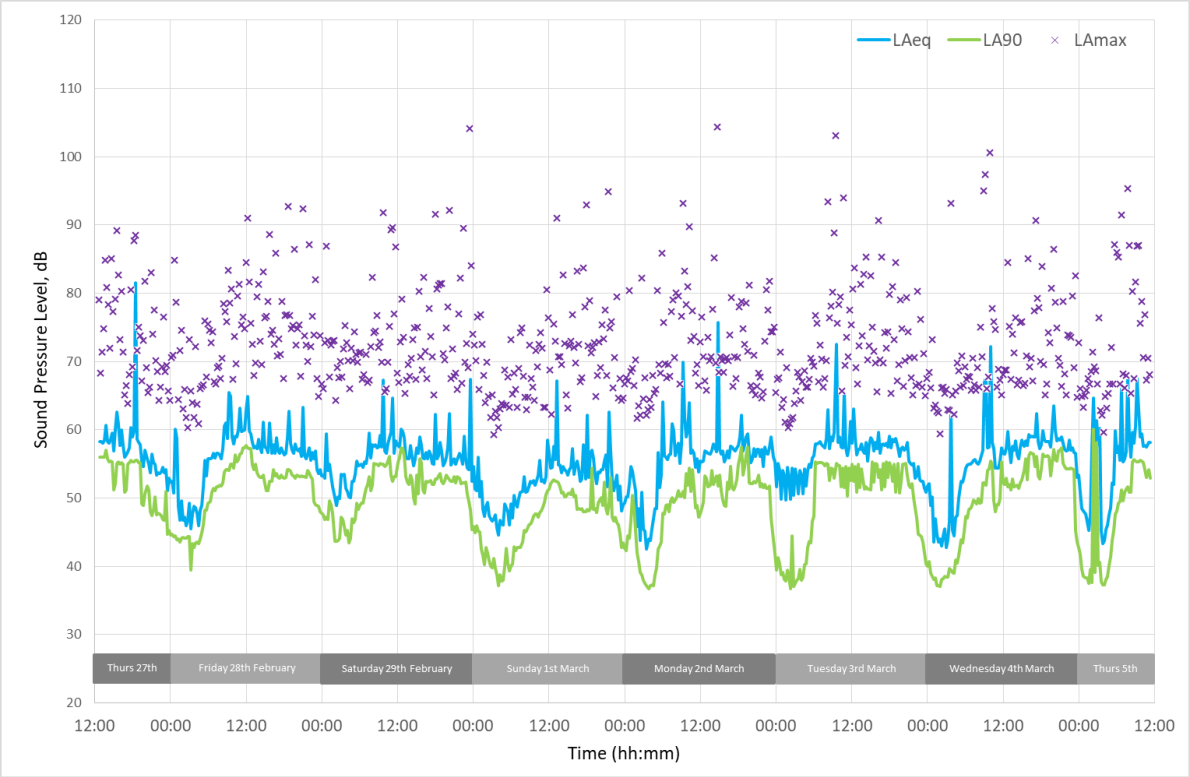

Figure 6: Graphical results from unattended position 2 (first floor level overlooking pub service yard, with line of sight to the railway line)

	Ambient L_{Aeq}, dB			Background L_{A90}, dB		Maximum L_{Amax}, dB	
	Min	Max	Av	Min	Max	Min	Max
Daytime (07:00-19:00)	49	82	62	43	58	62	104
Day (07:00-23:00)	49	82	61	43	58	62	104
Evening (19:00-23:00)	51	64	57	45	58	64	95
Night (23:00-07:00)	43	67	54	37	60	59	104

Table 3: Results obtained at Logger 2 (27th February – 5th March 2020)

Unattended position 3 and attended position

This unattended position was located on the roof, where the main noise source contribution (other than road and railway) was from the restaurant kitchen extract. For this reason the attended measurement was undertaken to capture noise levels from this source at the closest possible position (across the roof). Figure 7 and Table 4 show the attended position as well as the view from the unattended position.

Plant noise from the pub (or any other commercial source) was not audible at this position due to other sources in the area. Plant noise from the restaurant was just audible during traffic lulls when no railway was passing by. Figure 8 shows the results obtained at the logging position on the roof.

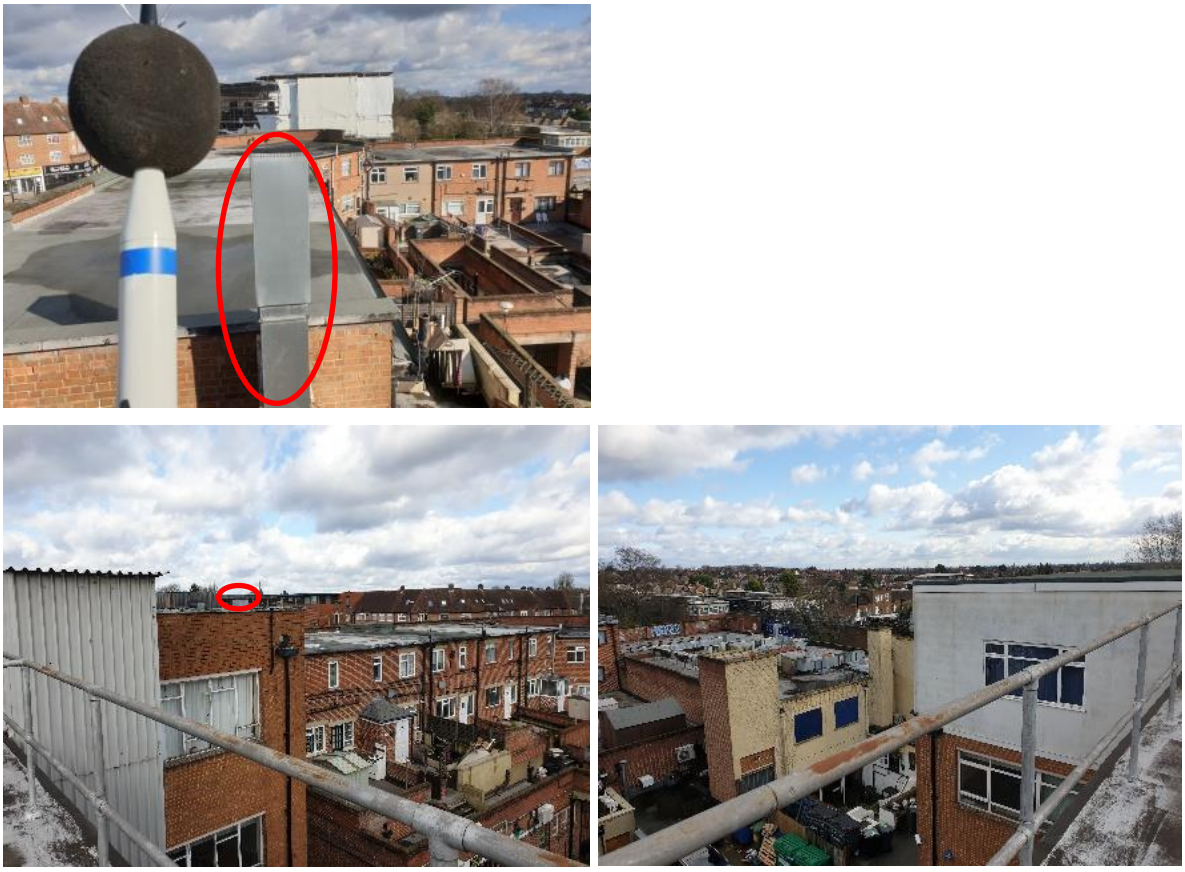

Figure 7: Photos at roof level, top: attended measurement @3.5m from kitchen extract; bottom left: view from logger 3 position towards Pembroke Rd (and restaurant kitchen extract circled in red); and bottom right: view to the right (pub plant on the roof, pub service yard and railway line)

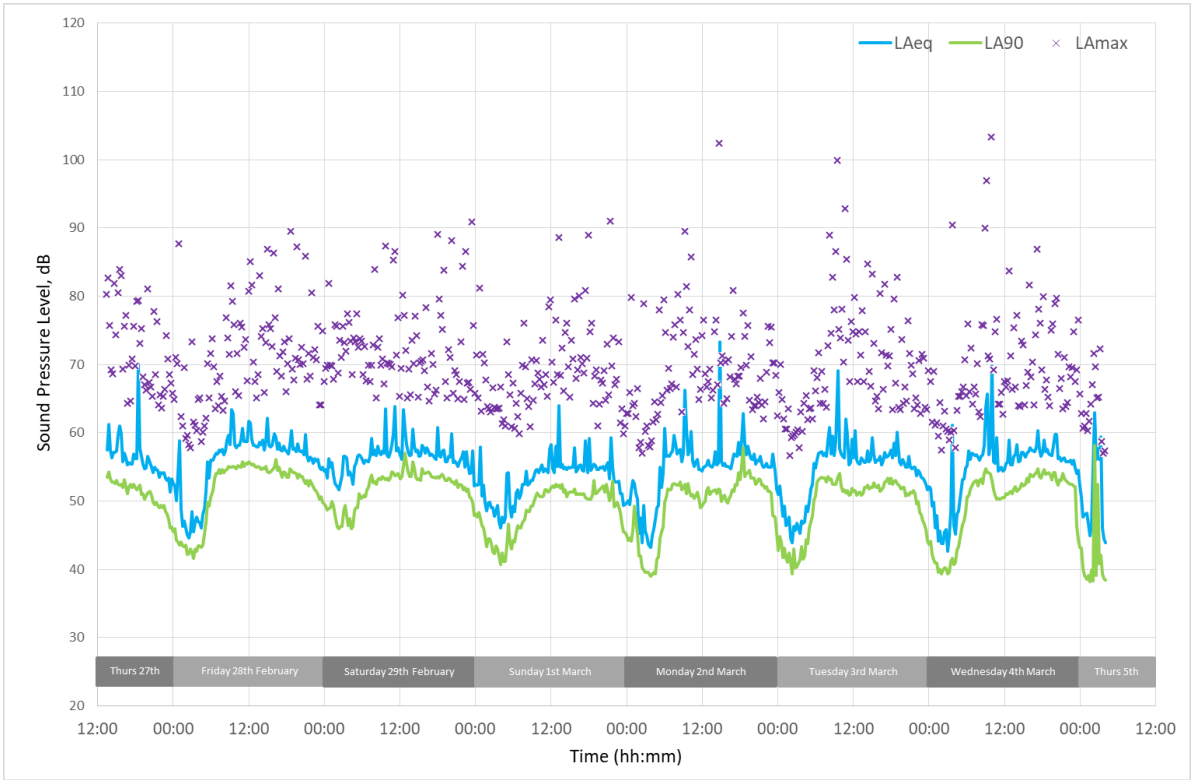

Figure 8: Graphical results from unattended position 3 (roof level)

	Ambient L_{Aeq}, dB			Background L_{A90}, dB		Maximum L_{Amax}, dB	
	Min	Max	Av	Min	Max	Min	Max
Daytime (07:00-19:00)	50	73	59	46	58	60	103
Day (07:00-23:00)	50	73	58	46	58	60	103
Evening (19:00-23:00)	53	60	56	48	55	61	91
Night (23:00-07:00)	43	63	53	38	58	57	91

Table 4: Results obtained at Logger 3 (27th February – 5th March 2020)

4 ASSESSMENT OF COMMERCIAL NOISE

4.1 Ground floor commercial units

It is understood that the ground floor units to the front of the building (Pembroke Road side) are to be kept as retail units. The current floor construction is unknown, other than this being a concrete slab with carpet stuck to concrete at first floor. During the visits it was observed that the current Cups 'n' Cakes store was not operating, however The Windmill Studio was open. It is understood that this is related to the adjacent Windmill (Studio) Centre, and it provides a reception area to the front of the property (Pembroke Road) with some further rooms to the back of the property (hired for healthcare treatments, meetings/interviews, photo shoots, and adult classes in fitness and dance). No noise was observed at first floor level above The Windmill Studio Centre during the attended visit, and it is understood that the office just above does not hear any significant noise from the unit below during normal working hours.

The minimum airborne sound insulation requirements for between residential properties in Approved Document E of the Building Regulations (43 dB $D_{nT,w} + C_{tr}$ for flats formed by a material change of use, and 45 dB $D_{nT,w} + C_{tr}$ for newly built dwelling). At paragraph 0.8 of Approved Document E it is noted that "*A higher standard of sound insulation may be required between spaces used from normal domestic purposes and communal or non-domestic purposes. In these situations the appropriate level of sound insulation will depend on the noise generation in the communal or non-domestic space.*" This criterion of 43-45 dB $D_{nT,w} + C_{tr}$ is considered reasonable for low noise risk office/small shop use, but if any potentially more noise generating uses are proposed a higher criterion is likely to be required.

It was not possible to undertake airborne sound insulation between the commercial units and the offices just above due to unavailable access to the commercial units. Since there was no audible contribution, it was not possible to measure any noise coming through the floor construction either. It would be recommended to measure the performance of the floor construction to ensure it meets the required criteria. However, from observations on site, the likelihood of disturbance across the current floor construction is considered to be low. It is recommended a convent or requirement in the lease is imposed for any incoming commercial tenants placing the onus on them to fully assess mitigate noise transmission to ensure the risk of disturbance to the proposed residential properties is minimised.

Special consideration should be given to the front glazed curtain wall during the design of the residential properties, and any changes to the commercial units, to ensure flanking transmission is minimised as far as practicable.

4.2 Restaurant

The main noise source observed from the restaurant (Jamaican Cuisine) was plant noise from the kitchen extract, which is located on the access road next to the site as shown in Figure 7. No other noise sources were observed during the visits; clients would not access the back of the property, and therefore any noise related to people would be kept on Pembroke Road. The restaurant opening hours are 12:00-23:00 7 days a week.

As explained in section 2, an assessment in line with BS 4142:2014 should be carried out when considering plant noise.

Following this methodology, a measurement was undertaken at the closest position possible, giving a noise level of 62 dB(A) at 3m. The closest window is located on the 2nd floor, at 5m from the kitchen extract and with an angle of at least 135°; when considering spherical spreading for the extra distance and taking the duct angle attenuation, this would give a noise level incident to the closest proposed residential window of 53 dB(A).

The attended measurement at close distance was also used to determine the tonality and any penalties applicable following BS4142 methodology. A tonal characteristic was measured at 250Hz, which was just perceivable subjectively during the attended part of the survey. Hence, a 3dB penalty has been considered for this source.

The lowest background noise level measured between 23:00-00:00, when the kitchen extract has been switched off was measured to be 40 dB $L_{A90,15min}$ at unattended positions 2 during Tuesday night. Therefore, the BS4142 rating would be 53 + 3 - 40 = +16. This is likely to be an indication of a significant adverse impact, depending on context.

Considering a partially open window typically provides around 15dB(A) reduction (as used in BS 8233 Annex G) the noise levels inside the property would be 38 dB(A) for the worst case scenario (closest window to the kitchen extract). The noise levels measured show that recommended internal noise criteria in BS 8233 would not likely be met through partially open windows due to noise levels in the area (even when excluding commercial noise). Therefore, windows would need to be closed to achieve internal noise levels.

The existing single glazed windows are likely to provide approximately 18 dB(A) of attenuation, taking into account the measured frequency spectrum, and the internal plant noise level would therefore be approximately 35 dB(A). When taking into account the character of plant noise, the criterion of daytime sleeping and resting may therefore be marginally exceeded and an upgrade to the two windows in the side of the building closest to the kitchen extract (on the first and second floor level) would be recommended to provided approximately 23 dB(A) of attenuation. It is understood that no changes to the external façade are proposed and therefore secondary glazing would be appropriate and would easily achieve this level of sound reduction.

4.3 Pub

No plant noise was audible over other noise sources during the attended part of the survey. The opening hours of the pub (J.J. Moon's) are 08:00-00:00 Monday to Thursday, 08:00-01:00 Friday and Saturday and 08:00-23:00 on Sunday. The pub is part of the Wetherspoons chain and does not have music for entertainment. The website for the pub shows that the outdoor area is licensed for use, however it is noted the area is relatively small.

Noise levels were measured to be higher at all three unattended positions during Friday night due to the contribution from rain noise, and therefore the lift in noise levels is not likely to be related with

the operation of the pub. It is therefore considered that plant noise is not audible or measurable from the site above existing noise levels.

When considering the service yard, no major noise sources were observed, however it is expected that the refuse truck will collect from this location. Further to this, there is a risk of people noise and other sources such as bottling out. The latter was captured on the morning of Saturday 29th February between 10-11am, giving noise levels of up to 65 dB $L_{Aeq,15min}$ and maximums in the region of 70-90 dB $L_{Amax,15min}$ at the unattended position 2.

As explained above, it is likely that windows would need to be closed in order to achieve internal noise levels when considering other sources in the area. It is considered that given that the higher noise levels only happen during daytime but also during weekends, the glazing would need to achieve 30 dB reduction in order to ensure internal noise levels achieve 35 dB(A). Maximums at night-time are generally below 75dB $L_{Amax,15min}$ and therefore a reduction of 30dB through closed windows would reduce maximums to 45 dB L_{Amax}, with few exceptions that could go over, but generally below this level.

Some of the windows in the east side of the building have previously been upgraded to double glazing units; when closed these should provide sufficient reduction of noise from the service yard to meet the criteria in BS 8233. For the remaining existing single glazed windows these would need to be upgraded and secondary glazing would provide sufficient sound reduction.

4.4 Windmill Centre

The Windmill (Studio) Centre hosts performing arts activities, health and beauty treatment rooms and provides some rooms and studio space to hire for business meetings and training sessions. It is understood that it was a former air raid shelter built towards the end of WW2 and is understood to have a reinforced concrete roof. It is understood that the opening times of the Windmill (Studio) Centre are dependent on bookings, but it would potentially open 6 days a week and sometimes into the evening. No noise was observed during the attended parts of the survey, other than the heat pump units located outside in between the buildings, as shown in Figure 3.

Heat pump condenser units

It was not possible to get in close proximity to these units during the attended part of the survey. It is understood that these two units are associated with the Windmill Centre and not the office block and therefore would still operate if the office block was to be converted to residential properties.

These type of condenser units generally have a sound power level of up to 80 dB(A), data taken from a similar unit. From observations, it is understood that both units were operating, giving a total sound power level of 83 dB(A). These units are located 4m away from the closest windows of the site, which would provide 17 dB attenuation assuming quarter-spherical spreading. This would mean that the source level incident at the closest windows is 66 dB(A). No tonality was observed from these units, however, they are likely to be identifiable against the background road traffic noise and therefore it is appropriate to apply a character penalty of 3dB.

The typical background noise level at unattended position 1 during daytime (07:00-19:00) was 48 dB $L_{A90,\ 15min}$ and 43 dB $L_{A90,\ 15min}$ when considering the evening period as well (07:00-23:00). Therefore, the BS4142 rating has been calculated to be up to +26dB, indicating that there is likely to be a significant adverse impact, depending on context.

Considering a partially open window typically provides around 15dB(A) reduction (as used in BS 8233 Annex G) this would be 51 dB(A) inside the nearest property for the worst-case scenario. This would

be 16dB(A) over the criteria in BS8233 for daytime of 35 dB(A). Internal ambient noise levels through partially open windows when considering noise from these units would be above 35dB(A) for all windows located within 24m of these units. This would mean all windows on the western façade with line of sight to the units.

When considering noise levels measured at unattended position 1 during the first day when both units were observed to be running (approximately 60 dB $L_{Aeq,15min}$) and at the nearest windows would therefore be approximately 63 dB(A) at ground level. Typical data from this type of units was calculated to provide 66dB(A) at the closest window. It should be noted that the rooms in the Windmill Centre are not in constant use and the requirements for occupancy (and therefore heating and cooling) vary considerably). When considering the worst-case scenario based on the data for the units, closing the existing windows is calculated to only reduce internal noise levels to approximately 41-44 dB(A). Even with a 5dB relaxation in the BS 8233 daytime criterion, to take account of the worst-case condition not occurring frequently, internal noise levels of 40dB(A) would still not be achieved for the operation of the units as observed during the survey for the nearest windows.

It is assumed that it is not possible to mitigate this noise at source and therefore increasing the sound attenuation through the windows is considered; taking account of the frequency spectrum of the source, secondary glazing will generally provide at least 34 dB(A) of attenuation and therefore the internal noise criterion would be achieved with closed windows and secondary glazing.

Internal sources

When considering other possible sources from the Windmill Centre, this could include noise from events inside the Centre.

It was observed that the windows at the Windmill Centre have secondary glazing (likely to give a minimum of 39dB R_w (34 dB R_{tra})), with the outer glazing being fixed (non-openable) as shown in Figure 3.

Therefore, for any source at the Windmill Centre, there would be attenuation through the secondary glazing likely to give an overall reduction of 42 dB(A) to the level incident to the closest proposed residential window when considering all window areas and distances and assuming quarter-spherical spreading. Further to this, there would be an attenuation of 15dB(A) through the proposed residential window when partially open (as used in BS 8233 Annex G).

The combined attenuation would therefore be approximately 57 dB(A), which means that for internal noise levels inside the proposed residential units to be 35dB(A) during daytime hours, noise levels inside the Windmill Centre would need to be 92 dB(A) or above. Noise levels this high in the Windmill Centre are considered unlikely given the operation and type of possible events. It is therefore considered that noise from the centre is generally unlikely to be disturbing to residents of the proposed dwellings.

4.5 Car service centre

No significant noise was observed from this location during the survey. The operating hours for the garage are listed as being 08:30-18:00 Monday to Saturday and 10:00-16:00 on Sunday.

Noise levels in vehicle maintenance garages vary considerably depending upon the activities being undertaken and may typically have an underlying level from a radio and speech between workers with short term higher levels from the use of specific tools such as air impact wrench. Sustainable Acoustics has previously measured noise level in various garages and workshops and found overall reverberant levels to be up to 70 dB $L_{Aeq,\ 1\ hour}$ with short term levels of 58-77 dB $L_{Aeq,\ 5\ min}$ and typical

maximum levels of around 90 dB L_{Amax}. Considering open doors during operation and a reverberant noise level inside the garage of up to 70 dB $L_{Aeq,1hour}$, it has been calculated that the noise outside the closest windows on the front façade of the site (32m away) would be 32 dB L_{Aeq}.

The background noise levels at the front façade were not measured, however, these are likely to be similar to or just above (due to contribution from road traffic noise) those measured on the roof. At unattended position 3, the background noise levels were measured to be 46-58 dB L_{A90} during daytime hours (07:00-19:00).

The character of the noise from the garage can include impulsivity and intermittency with the short term maximum levels likely to be around 52 dB L_{Amax}, which is at least 8dB below the lowest maximums recorded at any of the three unattended positions. However, given the character of the noise from the garage, it is considered appropriate to apply a penalty for character of 9 dB following the subjective method in BS 4142:2014 (6dB for impulsivity and 3 dB for intermittency). When added to our predicted specific noise source level, the worst case rating level is 41 dB (Rating level, $L_{Ar,\,Tr}$), which would result in a difference to the background noise level of -5 dB to -17 dB. The lowest background noise levels occur in the first and last hours of the period considered, where it is unusual to have high activity noise levels inside the workshop.

Furthermore, internal noise levels assuming 15 dBA attenuation through a partially open window (as used in BS 8233 Annex G) would be 17 dB L_{Aeq} and 37 dB L_{Amax}, which are 18dB and 8dB better than the BS 8233 criteria for daytime.

Therefore, the potential noise impact from the vehicle maintenance operation at the garage site opposite is therefore considered very low and not significant.

5 MITIGATION

The assessment of commercial noise sources has determined that some mitigation is required to ensure internal noise levels are achieved. Closed windows are recommended on the side facing the restaurant and pub service yard, and those with a view of the plant at the side of the Windmill Centre.

The requirements of windows are discussed below.

It should be noted that ventilation requirements are not covered in this assessment. Where windows need to be closed to provide the necessary sound reduction, an assessment of the ventilation requirements will need to be made. Where any ventilation scheme is proposed, it will need to be designed to ensure that the desired internal noise levels can still be met and the attenuation of any ventilation elements considered.

5.1 Windows

All windows with line to sight to the restaurant's kitchen extract, the pub service yard, and the plant at the site of the Windmill Centre will need to ensure suitable internal noise levels when closed.

The existing windows should provide sufficient attenuation for rooms with windows more than 10m from the plant at the side of the Windmill Centre.

For the other windows, it is understood that no external changes are proposed and therefore secondary glazing is recommended, except where windows are already double glazed. Noise from the sources identified would be attenuated to an acceptable level through the use of secondary

glazing. The secondary glazing would need to have a void depth of at least 50mm, a glass thickness of at least 6mm and adequate seals.

Noise levels from the service yard require the performance for the glazing to achieve 30dB(A) reduction when considering noise sources such as bottling out. This specific source was considered for the calculations, concluding that this can also be achieved through standard double glazing (4mm/12mm/4mm) and therefore the existing double glazing is considered adequate where provided.

6 SUMMARY

A noise impact assessment from surrounding commercial noise has been carried out at 106 Pembroke Road, Ruislip Manor, Ruislip, HA4 8NW. Ambient noise levels in the area are controlled by road traffic noise.

The closest commercial units to the site have been considered: 1, ground floor commercial units; 2, restaurant to the east on Pembroke Road; 3, pub on Victoria Road; 4, Windmill Centre to the west; and 5, vehicle service centre directly in front on Pembroke Road. No commercial noise was observed during site visits, other than from the kitchen extract on the restaurant. Potential noise generating sources from nearby commercial sites have been identified and assessed.

The assessment indicates that mitigation in the form of closed windows (standard double glazing) is required for sources 2 and 3 (eastern façade).

Ventilation requirements have not been assessed or covered in this report.

The western façade would also potentially need closed windows with glazing achieving 36 dB R_w (and alternative ventilation strategy), unless the condenser units can be put into an acoustic enclosure providing a minimum performance to achieve a 16 dB(A) reduction in noise levels from this source.

The assessment with the proposed mitigation shows that all commercial noise sources are not likely to be significant.

APPENDIX 1 Acoustic Terminology

Environmental Noise

Environmental noise is normally described in terms of the single figure A-weighted sound pressure level, in decibels (dB). The A-weighting corresponds to the frequency sensitivity of the ear and, therefore, provides an approximation to the subjective response to sound at different frequencies. When a sound level is expressed in this way, the units can be denoted dB(A).

When sound is time varying, it is convenient to express the sound level using an indicator, or descriptor that takes account of this variation. Two types of indicator are in common use, the equivalent continuous sound level and the statistical indicators.

Equivalent continuous sound level

$L_{Aeq, T}$: This indicator provides the overall noise exposure to time varying sound and is the energy average of the sound over a specified time period. It is the notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound over the same period. It is denoted $L_{eq, T}$, or, if A-weighted, $L_{Aeq, T}$, where T is the time period of interest.

Statistical indicators

The statistical indicators are also single figure descriptors, but provide additional information on the temporal variation of the noise level with time. The indicators are expressed as the sound level exceeded for a specified percentage of the time period of interest and the most commonly used are described below:

$L_{A90, T}$: the A-weighted noise level exceeded for 90% of the time period T. This indicator is representative of the noise level occurring in the absence of short-term events and is used in the UK to represent the background noise level.

$L_{A10, T}$: the A-weighted noise level exceeded for 10% of the time period T. This indicator is used in the UK to define traffic noise, although in PPG 24 the $L_{Aeq, T}$ is used. For freely flowing continuous traffic, the $L_{Aeq, T}$ is approximately 3 dB lower than the $L_{A10, T}$.

$L_{A1, T}$: the A-weighted noise level exceeded for 1% of the time period T. This indicator is representative of any short-term peaks that occur in the time period.

$L_{Amax, T}$: the maximum A-weighted noise level that occurred during the time period T. It usually includes an additional subscript, slow (s) or fast (f), ie $L_{Amax, slow, T}$ or $L_{Amax, fast, T}$ which denotes the response time used in the analysis algorithm. The fast response tracks the maximum level of a rapidly changing sound more accurately than the slow response and the value is generally higher for impulsive or transient sounds.

$L_{Amin, T}$: the minimum A-weighted sound level occurring in the time period T, expressed in a similar way to the $L_{Amax, T}$.

Sound Insulation

When specifying the level of sound insulation required for a given building element the following descriptors may be used:

R_w: the 'weighted sound reduction index'. This represents the level of sound reduction measured in a laboratory for a given building element. The w denotes 'weighting' and takes account of the deviations in sound reduction at a range of frequency bands when compared with a reference curve to determine the single figure value. Note this does not represent the in-situ performance of an installed element. Manufacturers should quote the R_w performance for their products.

$D_{nT,w}$: This is the normalised, weighted sound level difference measured on site through a separating element (wall or floor) and is used to quantify the level of sound insulation provided. The 'D' denotes the sound level difference measured across the separating element and is normalised 'n' to take account of the receiving room properties in which it was measured, and weighted 'w' by comparing the level difference across a range of frequency bands and comparing with a standard reference curve to provide a single figure value. It is often accompanied by an adaptation term C_{tr}, which alters the value to reflect the performance with a broadband low-frequency bias noise source (based on road traffic noise).

D_{new}: This is a way to represent the sound insulation provided by a small building element, such as a ventilation opening. This is similar to above except that it is calculated differently to represent a small element 'e' in a larger segment of a building. Manufacturers of small building elements such as ventilation openings should state the D_{new} performance of their products.

APPENDIX 2 Policy and Guidance on Noise

A1.1 National Planning Policy Framework

Current planning policy is based on the National Planning Policy Framework (NPPF), published in March 2012, which supports a presumption in favour of development, unless the adverse impacts of that development would outweigh the benefits when assessed against the policies in the Framework, taken as a whole.

The noise implications of development are recognised at paragraph 123, where it is stated that planning policies and decisions should aim to

- *avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*
- *mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;*
- *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established.*

A1.2 Noise Policy Statement for England

Paragraph 123 of the NPPF also refers to advice on adverse effects of noise given in the Noise Policy Statement for England[1] (NPSE). This document sets out a policy vision to

> *"Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development".*

To achieve this vision the Statement sets the following three aims:

- *avoid significant adverse impacts on health and quality of life*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life.*

A1.3 Planning Policy Guidance: Noise

Further government advice on how planning can manage potential noise impacts in new development is given in PPG: Noise[2]. The table below from PPG: Noise summarises the noise exposure hierarchy, based on the likely average response of those affected:

[1] Department for Environment, Food and Rural Affairs, *Noise Policy Statement for England,* London, 2010
[2] https://www.gov.uk/guidance/noise--2 (last updated July 2019)

Response	Examples of outcomes	Increasing effect level	Action
No Observed Effect Level			
Not present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

A1.4 Local Policy DHM 3: Office Conversions

Local planning policy on matters related to conversion of offices is contained in the London Borough of Hillingdon Local Plan (Part 2) at policy DMH 3, which states:

"A) Where offices are found to be redundant, their demolition and redevelopment for office accommodation will be supported. Where this is not feasible or viable, proposals for the conversion of offices to residential which fall outside of current permitted development rights will be supported where:

i) the conversion of offices provide an external finish that is suitable to a residential building and in keeping with the character of the area;

ii) balconies and/or amenity spaces are designed into the development as integral facilities and the creation of well designed public realm and landscaping is demonstrated;

iii) any additional functional features that are needed such as pipes, flues or communications equipment are grouped together and routed through existing features where possible, and kept off publicly visible elevations; and

iv) proposed homes have a dual aspect wherever possible (see Mayor of London's Housing SPG). A sole aspect home overlooking a parking court or other shared use rear area will generally be unacceptable.

B) All conversions that fall outside of existing permitted development rights will be expected to accord with National and London Plan minimum space and parking standards and meet the requirements of all other policies in this plan, including those in Policy DME 3: Office Development."

A1.5 BS 8233: 2014

The British Standard BS 8233: 2014, *Guidance on Sound insulation and noise reduction for buildings* provides additional guidance on noise levels from sources without specific character in the built environment, based on the recommendations of the World Health Organisation. The criteria desirable levels of steady state, "anonymous" noise in unoccupied spaces within dwellings, from sources such as road traffic, mechanical services and other continuously running plant, are tabulated below:

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

The standard also recommends that for traditional external amenity areas, such as gardens, it is desirable that external noise levels do not exceed 50 dB $L_{Aeq,\ T}$, and that 55 dB $L_{Aeq,\ T}$ would be acceptable in noisier environments. However, it is recognised that these values may not be achievable in all areas where development is desirable, and in such locations, development should be designed to achieve the lowest practicable levels.

BS 8233 states that regular induvial noise events can cause sleep disturbance and that a guideline value in terms of SEL or $L_{Amax,\ F}$ may be set depending on the character and number of events. *ProPG*[2] *adds to these criteria with the advice that good acoustic design should aim limit individual events to not more than 45 dB* $L_{Amax,\ F}$ *more than 10 times per night (inside bedrooms).*

Where development is considered necessary or desirable, despite external noise level above WHO guidelines, it is noted in BS 8233 that the above target levels may be relaxed by up to 5 dB. *ProPG*[3] *expands on this stating that the more often internal noise levels exceed the target by more than 5 dB, the more likely they are to be regarded as unreasonable and it should be demonstrated how these will be kept to a minimum. Where internal target levels are exceeded by more than 10 dB they are highly likely to be regarded as unacceptable and should be prevented.*

[3] Professional Practice Guidance on Planning & Noise: New Residential Development, published May 2017 by a Working Group of the Institute of Acoustics, Association of Noise Consultants and Chartered Institute of Environmental Health

A1.6 British Standard BS 4142

The British Standard BS 4142: 2014, *Methods for rating and assessing industrial and commercial sound* is an update of the previous edition of the standard, and describes methods for rating and assessing sound of an industrial and/or commercial nature, to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident. The sound from the industrial/commercial source is rated by taking into account the sound level of the source, known as the specific sound level, and its characteristics, such as tonal, impulsive or intermittency of the source, and applying an appropriate correction to give the rating level of the sound source. To gain an initial estimate of the potential impacts of the sound source, it is compared to the background noise level, and the level by which the rating level exceeds the background noise level indicates the following potential impacts:

Difference	**Assessment**
Around 10 dB or more	Likely to be an indication of a significant adverse impact, depending on the context
Around 5 dB	Likely to be an indication of an adverse impact, depending on the context
0 dB or less	An indication of the specific sound source having a low impact, depending on the context

The standard states that "*where an initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following:*

1) *The absolute level of the sound*
2) *The character and level of the residual sound compared to the character and level of the specific sound*
3) *The sensitivity of the receptor*

The current edition of the standard also requires that the potential impact of uncertainty should be reported, and practicable steps are taken to reduce the level of uncertainty.