



Report No. REG/7205/B

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Dated: 16 April 2019

**BS 4142 COMMERCIAL NOISE IMPACT ASSESSMENT
FOR
29 BROADWATER ROAD
WELWYN GARDEN CITY
HERTFORDSHIRE**

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BS 4142 COMMERCIAL NOISE IMPACT ASSESSMENT**FOR****29 BROADWATER ROAD****WELWYN GARDEN CITY****HERTFORDSHIRE****1. INTRODUCTION**

AIRO is retained by Hightown Housing Association Ltd to provide independent specialist advice and measurement services in respect of a proposed redevelopment of 29 Broadwater Road, Welwyn Garden City, Hertfordshire. The proposal consists of converting the existing office block to provide 71 residential units.

This report presents the results of noise measurements made at the site and a noise impact assessment of nearby pre-existing commercial and industrial noise sources on the proposed residential properties. The assessment is made in accordance with the method set out in British Standard BS 4142:2014 (ref 1).

This report should be read in conjunction with AIRO Report DLW/7205 (ref 2), which sets out the Acoustic Design Statement for the proposed redevelopment.

2. DESCRIPTION OF THE SITE

The proposed development site is currently occupied by a 5-storey office block of concrete construction located near to Broadwater Road, with a tarmac car park area behind. It is proposed that this existing building is converted in its current location to residential dwellings.

The site is bounded to the west by Broadwater Road (also known as the A1000), a main thoroughfare through the town. To the north of the site is Broad Court, a side road providing access to a number of commercial businesses located nearby. There are undeveloped brown-field sites to the east and south, with the one to the east currently in use as a storage compound.

The wider area within the vicinity of the site is generally industrial or commercial in nature, although several new-build residential blocks have been recently

constructed to the south and another is ongoing around 60 metres south along Broadwater Road.

The commercial units to the north of the site comprise: Hertz car rental and Supertyres Motorist Centre (tyre and MOT garage), located immediately beyond Broad Court. Directly behind these are Majestic Wines wine merchants, Mike's Muscle Car Garage and Uniclip water pump manufacturer. Another block is located to the north-east, comprising several smaller commercial outfits and storage units, including Adam's Autocare, a small motor mechanics.

The nearest commercial unit to the site is Supertyres Motorist Centre, which is approximately 14 metres from the site boundary and 20 metres from the nearest facade.

The environmental noise levels at the site are dominated by road traffic on Broadwater Road, as well as road traffic on Broad Court. Any commercial noise tends to originate from one of three sources: Supertyres, Adam's Autocare or Mike's Muscle Car garage. Other noise sources occasionally audible on site include aircraft flyovers, distant train horns and birdsong.

3. MEASUREMENT UNITS

3.1 A-Weighted Equivalent Continuous Sound Level - $L_{Aeq,T}$

The $L_{Aeq,T}$ is a measure of the acoustic energy of a fluctuating noise climate over a given period, T , expressed as the single continuous noise level having the same energy as the time varying signal. The 'A' within the descriptor means A-weighted, an internationally agreed frequency response generally similar to that of the human ear so that A-weighted sound levels in dB correspond reasonably well with what is heard.

3.2 Maximum Noise Level - L_{AFmax} , L_{ASmax}

In some circumstances it is useful to quantify the maximum level of fluctuating noise and a commonly used descriptor is L_{Amax} . The L_{Amax} represents the maximum reading given by a sound level meter for a given event or period of time and is usually qualified by F for 'Fast' or S for 'Slow' according to the response time setting of the meter.

3.3 A-Weighted Percentile Noise Levels - L_{An}

Percentile noise levels are a statistical representation of the time varying level. The value is the noise level L exceeded for $n\%$ of the period T .

To measure background environmental noise levels the statistical index L_{A90} is commonly preferred. The L_{A90} is the Sound Pressure Level that is exceeded for 90% of the measurement period. The L_{A90} therefore discriminates against short duration peaks of noise and is consequently considered to provide a better representation of typical minimum noise levels compared with, for example, the L_{Aeq} .

4. MEASUREMENT SURVEY

Measurements of environmental noise were made at and around the site during the period commencing 09:15 and ending at 14:45 on Tuesday 9 April 2019.

Noise level measurements were made using data-logging meters, which recorded the noise level every 125 ms as well as logging hourly values. In addition, short duration sample measurements were made of specific noise sources (e.g. each of the main commercial sources) at various locations around the site.

Data from a previous survey carried out by AIRO on 22 to 23 October 2018 (ref 2) has also been used. This was measured at Position 1 (also referred to as Position 1 in ref 2), which was located near the external fire escape at first floor level, around halfway along the northern facade of the existing building.

Position 2 was located at ground level on the northern site boundary adjoining Broad Court, in line with the rear of the existing office block.

Sample noise measurements were made at three other positions. Position A was 2 metres from the open doorway to Supertyres Motorist Centre, located on the facade closest to the site. Position B was 3 metres from the open doorway to Adam's Autocare and Position C was 8 metres from the open doorway to Mike's Muscle Car Garage, in the courtyard between the garage and the rear of Uniclip.

All the measurement positions were located so as to be away from reflective surfaces (except the ground) and so these measured levels can be considered free-field. All measurement positions were at a height of 1.5 metres above local ground level, except Position 1 which was approximately 2.5 metres above ground.

All of the measurement positions and locations of plant are shown in Figure 1 and the measured noise levels are presented in Section 5. Details of the measurement equipment used and the recorded weather conditions are given in Appendix A.

Figure 1 – Plan of Site showing Measurement Locations



From Google Maps (ref 3)
Scale Unknown

5. RESULTS

Table 1 – Position 1 Hourly Data (from DLW/7205, ref 2)			
Period Commencing	Free-Field Noise Levels (dB)		
	L_{Aeq}	L_{A90}	L_{AFmax}
<u>22/10/18</u>			
11:00	63	53	86
12:00	62	53	89
13:00	61	52	81
14:00	61	52	80
15:00	61	51	88
16:00	62	53	77
17:00	62	53	80
18:00	62	52	85
19:00	62	49	92
20:00	60	48	74
21:00	59	46	79
22:00	58	44	74
23:00	57	43	78
<u>23/10/18</u>			
00:00	54	40	76
01:00	52	39	75
02:00	54	40	76
03:00	54	40	77
04:00	55	43	79
05:00	59	46	76
06:00	62	50	83
07:00	64	55	81
08:00	62	55	84
09:00	62	55	81
10:00	62	53	82
Daytime period (07:00 – 23:00)	62	52	92
Daytime period (08:00 – 18:00) *	62	53	89
Night-time period (23:00 – 07:00)	57	43	83

* This period has been specifically identified as it includes the operating hours of all commercial operations on Broad Court.

Table 2 – Position 2 Hourly Data				
Period Commencing		Free-Field Noise Levels (dB)		
		L_{Aeq}	L_{A90}	L_{AFmax}
<u>9/4/19</u>				
	09:30	56	48	74
	10:30	61	49	87
	11:30*	59	52	80
	12:30	57	51	74
	13:30	56	49	75
Daytime period (09:30 – 14:30)		58	50	87

* Between 11:30 and 12:30 a waste collection vehicle was in close proximity to Position 2. This significantly affected the measured values for approximately 15 minutes but it is excluded from the values given in Table 2.

Table 3 – Sample Measurement Noise Data (all measured 9 April 2019)						
Location	Time	Duration, T (min:sec)	Event	Free-Field Noise Levels (dB)		
				L_{Aeq}	L_{A90}	L_{AFmax}
Position A (2m from source)	10:04 – 10:20	15:00	General noise from Supertyres plus background (dominated by road traffic). Commercial sources include: pneumatic tools, wrench, radio, ramp moving, car manoeuvres, telephone bell, car horn, welding, dropping of tools, air line (for inflating tyres), staff chatting	58	55	80
	11:39 – 11:57	15:00		64	55	86
	13:06 – 13:22	15:00		64	54	91
Position B (3m from source)	10:22 – 10:37	15:00	General noise from Adam’s Autocare, including: car ramp, conversation, telephone bell, delivery van, car engines, dropping of tools, hammering & pneumatic tools.	58	47	86
	12:15 – 12:30	15:00		54	52	67
	13:24 – 13:46	15:00		64*	48*	87*
Position C (8m from source)	11:06 – 11:21	15:00	General noise from Mike’s Muscle Car Garage including: car engine revving/testing, car ramp, telephone bell, hammering, compressor, whistling, conversation. Also includes background, e.g. road traffic and birdsong.	60	49	84
	12:32 – 12:42	10:00		56	53	73
	13:47 - 14:02	15:00		60	50	79

Notes on Table 3:

* Values include 4 minute sample measured at 12m from source (due to being asked to move by business owner). These levels have been corrected to 3m and combined with data from the 11 minute measurement immediately preceding it at Pos B.

NB – All measurements exclude noise due to passing road traffic on Broad Court as this is not specifically due to the source being measured. Because of this, some measurement periods are shorter than the times given. Measured levels do include road traffic noise from Broadwater Road and other background sources (e.g. aircraft flyovers and birdsong).

6. ASSESSMENT METHOD

British Standard BS 4142:2014 (ref 1) is the most commonly used method for assessing the impact of noise from industrial or commercial sources on dwellings. The BS 4142 method compares the Background Sound Level to a Rating Level for the noise source in order to determine the likely impact of the noise.

BS 4142:2014 defines noise parameters that include:

- Background Sound Level - the L_{A90} measured without the noise source in operation.
- Specific Sound Level - the L_{Aeq} due to only the noise source operating (in this case noise from the 3 commercial sources identified), when evaluated at the assessment location over a 1 hour period during the daytime and over a 15 minute period at night.
- Rating Level - the Specific Sound Level with a character correction applied according to the acoustic characteristics of the Specific sound. Rating penalties can be applied for tonality (up to 6 dB), impulsivity (up to 9 dB), intermittency (up to 3 dB) and for other sound characteristics (up to 3 dB).

The assessment location is defined as 3.5 metres in front of the nearest residential façade or 1 metre in front of the façade for receiver positions above ground floor level.

The assessment of the impact of noise is made by subtracting the Background Sound Level from the Rating Level. The greater the difference, the greater the magnitude of the impact but specifically, BS 4142 states:

“A difference of around + 10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

A difference of around + 5 dB is likely to be an indication of an adverse impact, depending on the context.

Where the Rating Level does not exceed the Background Sound Level, this is an indication of the Specific Sound source having a low impact, depending on the context.”

7. NOISE IMPACT ASSESSMENT

The three main commercial sources likely to affect the site are identified as: Supertyres Motorist Centre (tyre and MOT garage), Adam’s Autocare (mechanic’s garage) and Mike’s Muscle Car Garage. Other commercial operations, including Unclip water pump manufacturer and Hertz car rental did not generate any noise that was noticeable outside those premises during the survey period. All businesses verbally confirmed that the date of the measurement survey was a ‘typical’ day, with no activities that were expected to be particularly loud or quiet.

All three garages generally operate such that all work is carried out inside their buildings but the large front doors (typically 4 metres wide and 4 to 5 metres high) are open at all times. All noise sources in each case are inside, except for car manoeuvres in or out of the buildings. There were no external plant noise sources audible on any of the commercial buildings on Broad Court.

7.1 Assessment Locations and Period

The chosen assessment locations are shown in Figure 1 (marked as AL1 and AL2). These are the positions on the existing facade closest to measurement Positions 1 and 2. AL2 also represents the closest part of the building to the commercial units.

The commercial units all operate only between the hours of 08:00 and 18:00 Monday to Friday. Supertyres Motorist Centre is also open between 08:30 and 16:45 on Saturdays. None of the businesses operate on Sundays or during the evening or night. Therefore, the noise impact assessment need only consider the daytime hours between 08:00 and 18:00.

7.2 Background Sound Level

The sound levels measured at Positions 1 and 2 are expected to be identical to those experienced at the nearby assessment locations AL1 and AL2. Noise from the commercial operations near the site is generally of short duration and only for relatively short periods, meaning the measured L_{A90} at these positions is unlikely to be affected by commercial noise.

Therefore, the measured L_{A90} values in Tables 1 and 2 can be used as the Background Sound Levels at AL1 and AL2 respectively. The overall period L_{A90} values have been chosen (08:00 – 18:00 for Position 1 and 09:30 – 14:30 for Position 2) as these are considered representative of the 'typical' background levels throughout the working day.

7.3 Specific Sound Level

The noise levels due to each commercial unit have been measured at Positions A, B and C (see Table 3). Due to the nature of these businesses, any noise generated tends to be short duration and unpredictable (e.g. use of pneumatic tools, ramp movements, car manoeuvres or tools being dropped). The exception to this is where the commercial unit had a radio, which formed a more constant source but was at a much lower level than the other sources. Therefore, the overall noise level generated by each business can vary significantly throughout the day, depending on how busy they are at any specific time and the tools required for any specific job.

Whilst any noise sources from each commercial unit did dominate at Positions A, B or C for the short duration over which they occurred, there was also some significant proportion of each measurement period where the commercial units generated negligible sound levels. As such, each of the measured L_{Aeq} values in Table 3 includes some Residual Sound (i.e. sound generated by sources other than commercial noise). These residual sources include road traffic on Broadwater Road, aircraft flyovers and birdsong.

The L_{A90} values in Table 3 are likely to give a good approximation of the underlying residual sound level at each measurement position, except at Position A, as the Supertyres Motorist Centre had a radio on at all times, which was audible at Position A during quieter periods. Instead, the residual sound level at Position A can be determined from the L_{A90} at Position 2 (see Table 2), as this was a similar distance from Broadwater Road but sufficiently far from the radio for the radio to be inaudible.

The sound level due to each commercial unit was measured over three separate 15 minute periods (see Table 3). For the purposes of this assessment, the energy average of the three $L_{Aeq,15min}$ values for each source (corrected for residual sound) has been used to estimate a typical hourly value for that source. This is considered appropriate as each hour would be expected to include periods of quieter activity and so the energy average is likely to be the most representative of the level at each measurement position if measured over a 'typical' hour.

In order to determine the sound level due to each commercial unit at AL1 and AL2, the average source levels (after correcting for residual sound) at Positions A, B and C are adjusted for distance (assuming the sound level decreases by 6 dB(A) for each doubling of distance). Levels measured from Mike's Muscle Car Garage also have a -10 dB(A) correction applied due to the barrier effect of the existing buildings between the garage and the site. This results in a Specific Sound Level at each assessment location for each source. These can then be combined using decibel addition to determine the overall Specific Sound Level due to all commercial sources.

7.4 Rating Level

BS 4142 (ref 1) recognises that certain acoustic features can increase the impact of a source and hence allows for rating penalties to be applied depending on a subjective assessment of the specific source(s).

Noises from the three commercial units considered for this assessment were generally short duration sounds occurring unpredictably (e.g. use of pneumatic tools, dropping of tools, engine running). Of the acoustic characteristics listed in Section 9 of BS 4142 (and in Section 6 of this report), the sounds could be described as 'impulsive' but did not have any tonal elements. Some of the sound sources from Supertyres could be heard at Position 2 at times, meaning that a penalty for intermittency is also applicable.

Accordingly, at AL2 a penalty of +3 dB is applied to the Specific Sound Level for ***"impulsivity that is just perceptible at the noise receptor"***. A further +3 dB penalty is applied for ***"intermittency [that] is readily distinctive against the residual acoustic environment"***.

No penalties apply at AL1 as due to the closer proximity to Broadwater Road and the increased distance from the commercial sources, road traffic noise is sufficiently high that commercial noise is not generally audible.

7.5 Assessment

The assessment is summarised in Table 4 below.

Table 4 – Summary of BS 4142 Assessment		
Assessment Criterion	AL1 All Floors (midway along northern facade)	AL2 All floors (rear of existing block, NE corner)
Background Sound Level, L_{A90}	53 dB	50 dB
Specific Sound Level, L_{Aeq} corrected for residual sound, distance and barriers	38 dB (Supertyres) 32 dB (Adam's) 34 dB (Mike's)	45 dB (Supertyres) 36 dB (Adam's) 34 dB (Mike's)
Combined Specific Sound Level for all commercial sources*, L_{Aeq}	40 dB	46 dB
Penalties (subjective)**	0 dB	+ 6 dB
Rating Level, L_{Aeq}	40 dB	52 dB
Difference (Rating Level – Background Level)	-13 dB	+ 2 dB

* Combined Specific Sound Level for all commercial sources assumes the worst-case that all 3 commercial units will be generating noise simultaneously. In practice and due to the nature of the noise sources, this is only likely to happen occasionally.

** See Section 7.4.

It can be seen that commercial noise is 13 dB lower than road traffic noise at AL1, meaning that road traffic dominates and commercial noise will be generally inaudible. Therefore, commercial noise at AL1 is likely to have a very low impact.

At the north-east corner of the existing building (closest location to commercial sources), the BS 4142 assessment gives a difference of + 2 dB. This is sufficiently below the point at which BS 4142 would say that an adverse impact is indicated and is tending towards a low impact.

7.6 Context

BS 4142 (ref 1) states:

“The significance of the sound of an industrial/commercial nature depends upon both the margin by which the rating level of the specific source exceeds the background sound level and the context in which the sound occurs.”

AIRO would consider that context is particularly important at this site, as the residential block is proposed within a pre-existing industrial/commercial area. Therefore, any new residents would be aware of the existence of the commercial units prior to moving in to the properties. In addition, the businesses only operate during the hours of 08:00 and 18:00 Monday to Saturday. The vast majority of people are likely to be out at work themselves during these times or, if they are at home, will be undertaking activities that are not noise sensitive. The commercial sources do not operate during the key periods of relaxation in the evening or sleep at night.

Furthermore, it can be seen in AIRO Report DLW/7205 (ref 2) that suitable internal noise levels (to achieve BS 8233 guidelines, ref 4) can be achieved in habitable rooms near to AL1 or AL2 provided that bedroom windows achieve outside to inside sound insulation of at least 30 dB, $R_w + C_{tr}$ and the ventilation system achieves 40 dB, $D_{n,e,w} + C_{tr}$. These are readily achievable using commercially available components. Living room windows and ventilators have a lower required specification. This is based on measurements of noise from all noise sources, including commercial sources.

It can be seen from Table 4 that commercial noise is significantly below the level due to other noise sources (dominated by road traffic) at AL1. This is the case across most of the site. It is only for residential facades very close to the open door of Supertyres Motorist Centre (i.e. near AL2) that commercial sound becomes comparable to road traffic, although it can be seen that the Specific Sound Level at this most exposed location is still 4 dB below the L_{A90} background level.

It should be noted that the measured daytime L_{Aeq} at Position 2 (equivalent to AL2) is 58 dB. Although this includes noise from the commercial units, it can be shown that if the Specific Sound Level due to commercial noise at this location (46 dB) is subtracted from the total noise level, the overall noise level would remain unchanged. As such, even at the most exposed facade location commercial noise is not dominant.

Therefore, given the points above, AIRO would consider that the overall noise impact of commercial noise on the proposed development is 'low'.

8. CONCLUSIONS

This report has presented the results of environmental noise measurements carried out on 9 April 2019 in relation to a proposed re-development of an existing office block to convert to residential at 29 Broadwater Road, Welwyn Garden City, Hertfordshire.

Three commercial units have been identified on Broad Court to the north of the site that could potentially have a noise impact on the proposed development. These are: Supertyres Motorist Centre, Adam's Autocare and Mike's Muscle Car Garage. Noise levels were measured close to each of these sources in order to determine the Specific Sound Level for each. The Background Sound Level was measured at the nearest point of the existing building to the commercial sources.

These measurements, along with background measurements made at the site on 22 and 23 October 2018 (ref 2), have been used to undertake a noise impact assessment in accordance with British Standard BS 4142:2014 (ref 1). This gave a difference between the Rating Level and Background Sound Level of -13 dB midway along the northern facade and +2 dB at the most exposed north-east corner of the existing block.

Due to the result of the assessment and the context of the site, it is considered that noise impact due to commercial noise sources is low.

Report Approved by:

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REFERENCES

1. British Standard BS 4142:2014
Methods for rating and assessing industrial and commercial sound
The British Standards Institution, 2014
2. Report No. DLW/7205
Acoustic Design Statement at 29 Broadwater Road, Welwyn Garden City
AIRO Ltd, 30 October 2018
3. Google Maps
<http://www.google.com/maps>
Google, 2019
4. British Standard BS 8233:2014
Guidance on sound insulation and noise reduction for buildings
The British Standards Institution, 2014

APPENDIX A - Details of Measurement Instrumentation/Weather Conditions

Table A1 - Schedule of Noise Instrumentation			
Use	Type		Serial No.
Measuring System	Cirrus CRL 703B	Unit X	43056
Microphone	Cirrus MK 226	Unit X	110792
Calibrator	Cirrus CR 511E	Unit X	43023
Sound Level Meter	B&K 2260		2234520
Microphone	B&K 4189		2198103
Calibrator	Cirrus CR 511E		41882

AIRO is accredited by the United Kingdom Accreditation Service as a UKAS testing laboratory No. 0483 and although the measurements carried out for this survey are not listed on our schedule of accreditation, all of AIRO's measurement equipment is routinely calibrated as part of the calibration regime in our Quality Manual and these calibrations are traceable to National Standards. In addition, the calibration level of the measuring equipment was checked at the start and the end of each survey period using the appropriate calibrator for the relevant meter.

Table A2 - Record of Weather Conditions	
	9 April 2019
Temperature	8°C
Relative Humidity	94%
Wind Speed	Negligible