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CST Environmental &
Acoustic Consultants

Acoustic Report:
PPG 24
Desktop Assessment

Site of The Old Dairy Orchard Road /Garden Road Richmond Upon-Thames TW9 4NR

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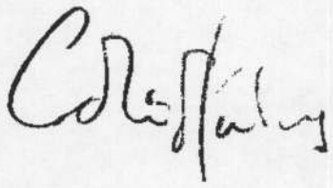
Issue 1.4

Contents Page



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Date:.....15h November 2011

1.0 Introduction

1.1 This report presents an acoustic assessment of the site of the former express Dairy Orchard Road Richmond Upon Thames. Harepath llp propose to redevelop the now vacant site with a mix of commercial and residential units.

Details of the proposed design scheme are shown in the planning drawings which form a stand alone attachment to this report.

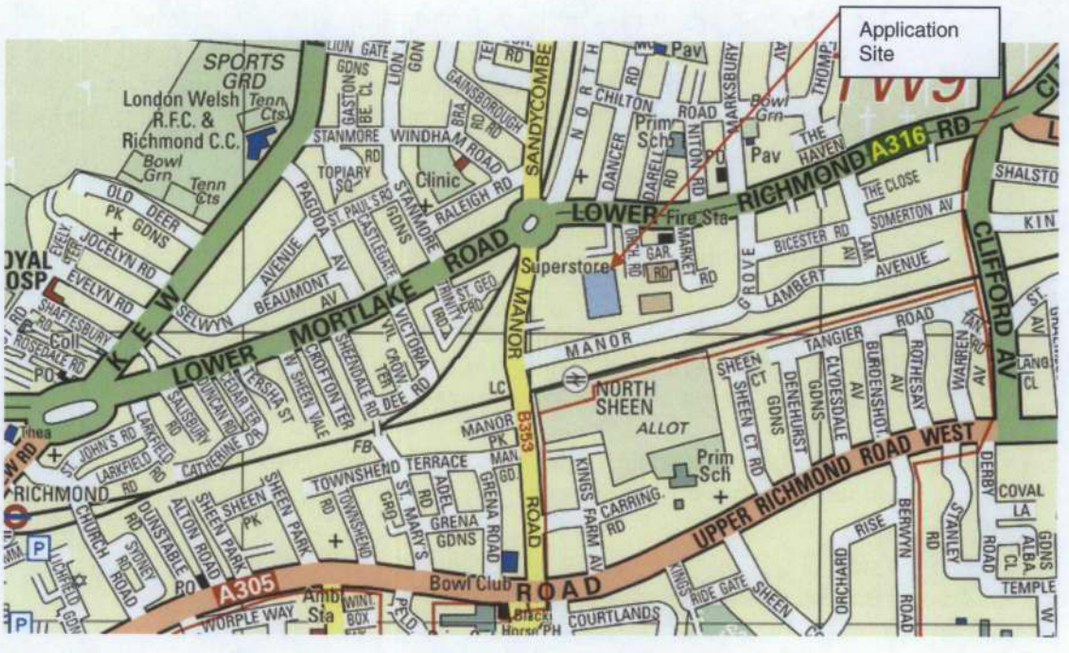
1.2 The assessment draws from objective sound measurements taken by ourselves in 2007 and 2008 on an adjoining site[1] which is also owned by the applicant. It is considered that the sound data obtained for the Hydrex House project are still within calibration and are to be preferred to new measurements which would have had to be undertaken adjacent to major construction works.

1.3 A number of acoustic terms are used throughout this report, an explanation of these terms is provided at Section 5 of this report.

2.0 Description of Site

2.1 The application site is located some 110 metres to the south of the A316 close to the junction with Manor Road. A location plan is shown below. The local area can best be described as mixed residential and commercial with established housing immediately to the south of the proposal site. Immediately to the north redevelopment of the former Hydrex House is well under way and when completed will provide a mix of 77 apartments and circa 30,000 square feet offices.

2.2



2.3 The following aerial photograph shows the application site in relation to ts surroundings.

N ↑

A 316

[1] Formerly known as Hydrex House

Local Area - Arial View

2.4 As shown above a Sainsbury Supermarket and Petrol station is located on land to the west of Orchard Road however our previous investigations demonstrated that these undertakings impact to a very limited degree on both Garden Road and Orchard Road. Objective evidence for this is contained in a 2008 supplementary PPG24 report for Hydrex House which forms a stand alone attachment to this report.

3.0 The Proposals

3.1 The design scheme envisages demolition of all the former dairy buildings and their replacement with a new three / four storey complex providing a mixed use of residential and B1 (office) uses on the site.

3.2 Copies of the planning drawings for the proposed development form a stand alone attachment to this report.

4.0 Sound – Principles and Standards

4.1 Sound is measured in decibels (dB). To establish a reference framework it is useful to consider two noise levels which are at the extreme ends of the range to be considered. At the low end, 35 to 40 dB (A) is the normal noise level in a quiet living room, 35 dB (A) is the noise level given as a target for suburban bedrooms by the Wilson Report; a government report on noise published in 1963. At the high end is the noise level experienced at the pavement edge of a busy city centre street, a level of 75 to 80 dB (A).

4.2 The sensitivity of the human ear varies with pitch or frequency. The designation "A" used in this assessment simply means that the noise level was measured using a meter which is able electronically to respond very closely to the performance of the human ear.

4.3 Decibels are measured using a logarithmic scale, and therefore two numerically equal values cannot be added together arithmetically. Two equal noise levels occurring together form a new level which is 3 dB (A) higher than either alone. Thus two identical vehicles each producing 65 dB (A) outside someone's window will produce, not 130 dB (A), but 68 dB (A) if both engines are running together at the same distance from the microphone.

4.4 If one source of noise is 10 dB (A) below an adjacent louder source, then the combined effect will be virtually no different to the louder one alone.

4.5 Experiments have shown that most people will indicate that a noise has become twice as loud, when on a measuring meter it has risen by about 10 dB (A). Also it is generally accepted that a difference in 3 dB (doubling in energy terms) is the smallest incremental step that can be distinguished by the average human ear.

4.6 Some additional acoustic terms are also referred to in this report. These are:

L_A90. This is the noise level exceeded for 90% of a time interval T. L_A90 and it is termed background noise level. It is effectively a measure of the minimum noise level which is experienced in the absence of specific noisy events such as brake squeal or engine backfire.

$L_A$eq T is the equivalent continuous noise level over a time T, which can be described as the "energy - average" noise level.

L_A max is the highest noise level recorded by the measuring meter during a single event e.g. overflying aircraft. In this assessment the meter was set to "slow" response.

L_{A10} is the sound level in dB(A) exceeded for 10% of the time. This level gives an indication of the sound level during the noisier periods of time of any given sample. It has been used in the UK traditionally to measure and assess road traffic noise.

Lden The main indicator used to describe the noise levels on noise the maps is L_{den}, expressed in A-weighted decibels. The Lden is a combined indicator, based on an annual average 24 hour period, and calculated from the average A-weighted sound pressure levels for the day, evening and night periods. When calculating L_{den}, 5 dB is added to L_{eve} and 10 dB is added to L_{night} to reflect increased sensitivity to noise at these times.

5.0 Planning and Noise - PPG 24

5.1 Noise is simply defined as being sound which is unwanted by the recipient. Noise is a relevant planning consideration and where new dwellings will be exposed to an existing noise source local planning authorities will generally wish to be satisfied that future occupants are not likely to be subjected to unreasonable levels of noise both during the day and at night.

5.2 Local Planning Authorities are empowered to set specific criteria and provide guidance on what may constitute an acceptable noise climate for new developments. This is usually based upon government planning advice contained in PPG 24 and BS 8223:1999 "Code of practice for sound insulation and noise reduction for buildings". PPG 24 advises that sites for residential development that may potentially be affected by transportation noise should be assessed against specific criteria in order that a noise exposure category (NEC) can be assigned.

6.0 Assessment Framework

6.1 Planning Policy Guidance 24 "Planning and Noise" outlines considerations to be taken into account in determining planning applications for noise-sensitive developments and for activities that generate noise. It defines four Noise Exposure Categories (NECs) to assist local planning authorities in considering applications for residential development near transport-related noise.

6.2 The following table summarises the advice contained in PPG24. An extract of the PPG showing the table is to be found at Appendix 2.

NEC	Advice
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 a desirable level
B	Noise should be taken into account when determining planning permission and, where appropriate, conditions imposed to ensure an adequate level of protection against noise
C	Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.
D	Planning permission should normally be refused

6.3 The above noise exposure categories are defined in terms of "Average" (L_{Aeq}) levels measured or predicted at the locations of the residences and at a height of 1.2 to 1.5 metres above ground level. Different levels are set for daytime and night-time periods, defined for this purpose as 07:00 to 23:00 hours and 23:00 to 07:00 hours respectively. For the night-time, maximum

single event noise levels (L_{Amax}) are also taken into account, as this is the factor most closely linked to sleep disturbance.

6.4 The NEC "band widths" vary according to type of transportation noise source(s) concerned. Table 2 at Annex 1 of PPG 24 sets out the various bandings. For ease of reference an extract of the table is attached at appendix iv to this report. The table also confirms that the bandings refer to noise levels measured or calculated under what is known as "free field" conditions. The PPG recognises that it may not always be possible to obtain baseline data under free field conditions and advises that in situations where facade measurements are specified, these should be regarded as being 3dB higher than "free field" measurements.

6.5 The PPG advises that where a site is affected by a combination of noise sources the overall impact of any combination of road, rail, air and industrial noise sources it may be appropriate to assess the site as being subject to "mixed sources".

7.0 Local Sound Environment

7.1 Our previous objective investigation of the local sound environment identified three possible noise sources. These were:

(i) Commercial activity from the Sainsbury supermarket to the west

(ii) Road Traffic Noise - from the A 316

(iii) Aircraft Noise - from Heathrow arrivals

7.2 For the sake of completeness each of the identified sources are considered in turn below:

7.3 Noise from Commercial Activity

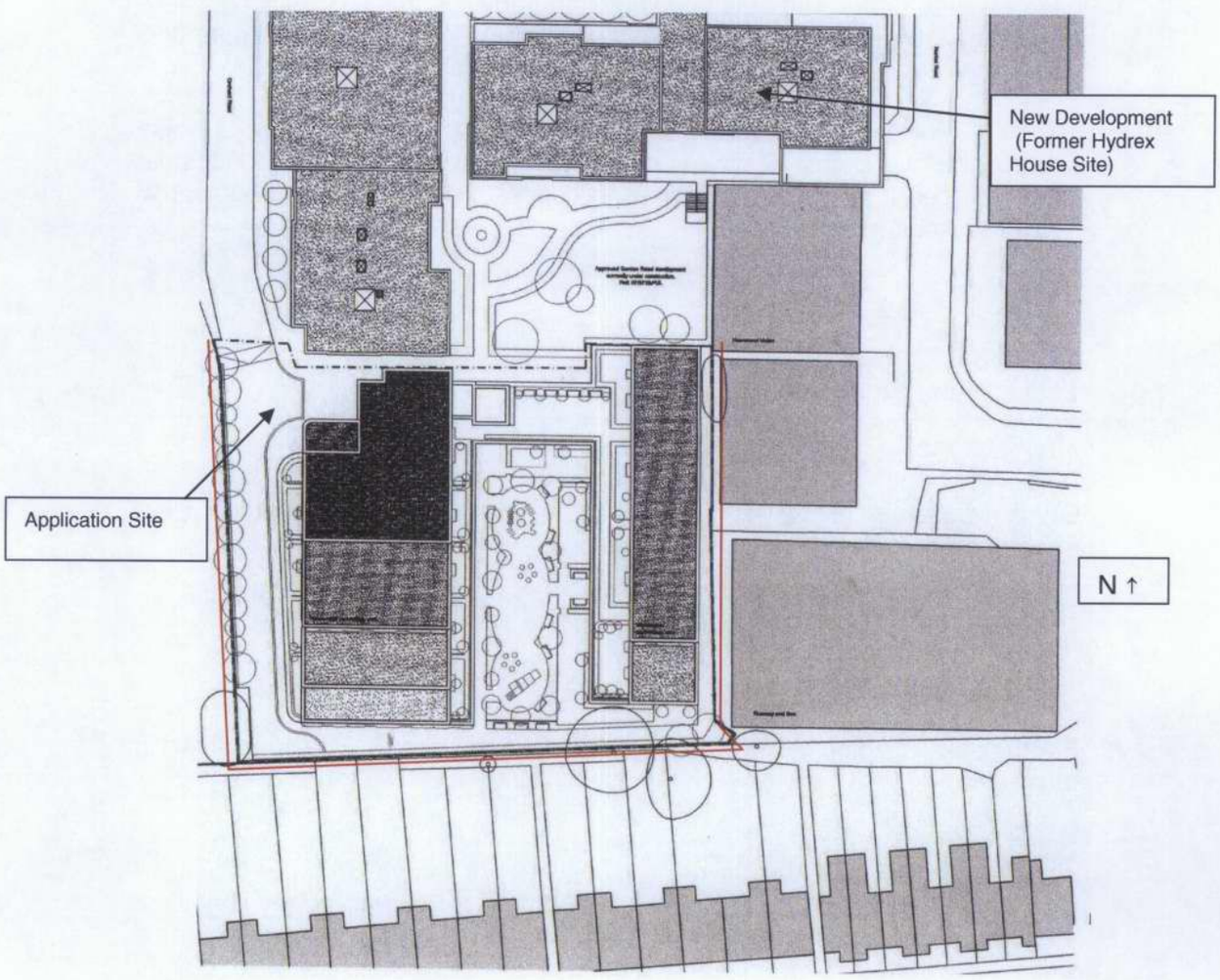
7.4 Our April 2008 assessment[2] addressed concerns expressed by the local authority about possible adverse impacts from the Sainsbury's Superstore as well as the former Express Dairy Depot. This assessment involved a night time attended noise survey. The attended survey was supported by CCTV monitoring over an extended period. Noise survey data obtained during the attended survey was used to undertake a formal BS 4142:1997 test. BS 4242:1997 is the accepted UK tool for indicating the likelihood of complaints being received from residential occupiers when industrial and residential land uses are proximate. The results showed that at night there was little activity from the Sainsbury Site, most of the recorded noise impact being generated from a noisy compressor rather than from loading and unloading activity at either of the two nearby commercial locations.

[2] May 2008 Site c/o Garden Road / Orchard Rd (Hydrex House) - Supplementary PPG 24 report (CST)

7.5 Noise Impact from Roads

7.6 The new Garden Road development to the north will continue to provide significant shielding for the application site from the main A 316 in the same way as did the former complex on this site.

7.7 This can be seen from the following extract of the design scheme:



Do not scale from this extract

7.8 The following extract of the Defra London Noise Map noise map (taken from our 2007 report on Hydrex House) shows that even for the most exposed western façade of the application site, night time noise levels from the A316 do not exceed 47 $_{Lnight}$ (by interpolation).

7.9 Extract of London Noise Map (Application site - arrowed)

7.10 There have been no adverse changes so far as we can ascertain either in traffic flows or speeds affecting the A 316 at this point since 2007.

7.11 With respect to the daytime position although no official 16 hour road maps have been published the following Defra "Lden" noise map shows that the application site sits comfortably within the lowest noise bands for south west London .

7.12 A 2006 Defra publication[3] helpfully enables some greater precision to be assigned to the 16hr daytime results. The following formula taken from the CRTN update report previously referred to enables a conversion from Lnight to LA1018hr. This is shown below:

$$Lnight = 0.90 \times LA_{1018h} - 3.77\ dB$$

Taking an Lnight value of 47dB(A) (from s7.8 above) this gives an LA_{1018hr} value of: 56dB

PPG 24 then helpfully provides a rule of thumb calculation of:

$$16Hr\ L_{Aeq} = LA_{1018hr} - 2$$

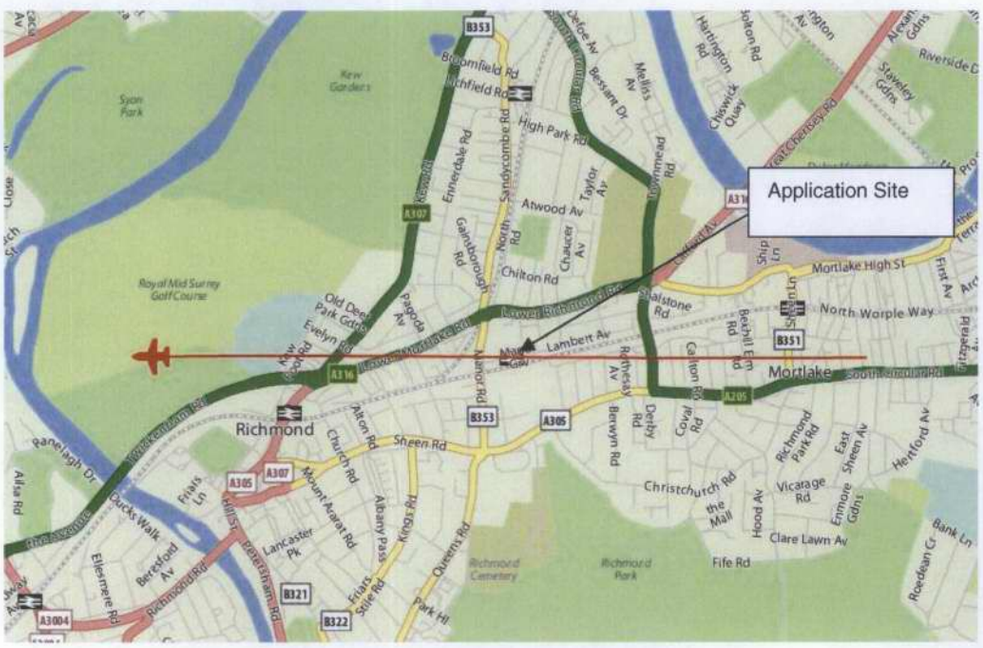
Thus it is possible to derive a daytime road traffic noise impact of **54dBLA_{eq16hr}** for the application site.

[3] Method for converting the UK Road Traffic Noise Indices $L_{A10\ 18hr}$ to the EU Noise Indices for Noise Mapping (2006)

Defra Road Traffic Noise Map (Lden)

7.13 Noise Impact from Aircraft

7.14 For the application site the key element that drives the local sound environment is aircraft using Heathrow Airport. The airport is located some 10kms to the west with the application site being located approximately 250m to the north of runway 027L.



Heathrow Arrivals Flightpath - Runway 27L

7.15 Local relief from aircraft over flights is however provided by a system of "runway alternation" which results in westerly arrivals being split between the two parallel runways. Communities directly under the final Heathrow approach are therefore only directly overflown for half of every 16 hour day. A system of weekly rotation between the runways is also in place and this provides additional relief.

7.16 Air Noise is traditionally assessed through the use of contours which show areas of equal noise impact around UK airports. The government has for a number of years through the DfT published annual daytime noise contours for Heathrow. It has however not routinely published night time noise contours.

7.17 The daytime air noise contours are calculated using the government's own ANCON noise model. The contours are derived from predicted noise data from numbers and types and aircraft that actually flew in the year in question during the 92 day summer period from mid July to mid September.

7.18 For about 70% of the time Heathrow operates in what is known as westerly mode, which sees arrivals to Heathrow passing over the proposal site. Conversely this also means that for around 30% of the time no aircraft noise is audible at all in the local area as the application site is not affected by any of the Heathrow easterly take off routes.

7.19 When considering aircraft noise for planning use purposes the convention is that it is appropriate to assess the impact by reference to the latest "average mode" contours".

7.20 The government recently published updated daytime noise contours for Heathrow[4]. An extract of the relevant contour covering the proposal site is attached at Appendix iii. From this it can be seen that the proposal site falls within the 57dB contour (58dB by interpolation).

7.21 Government advice is that the 57dB daytime contour is the benchmark for the onset of significant community annoyance. This advice is reflected in the NEC categories of PPG 24. (section 8 - table PPG 24), the upper boundary of NEC A being 57dB. For ease of reference an extract of the relevant part of the PPG is shown at Appendix ii).

7.22 Aircraft Noise - Night Noise - Night (23:00 - 07:00) contours are not routinely published for Heathrow. However in order to comply with the EU Environmental Noise Directive the government commissioned a set of night noise contours in 2006.

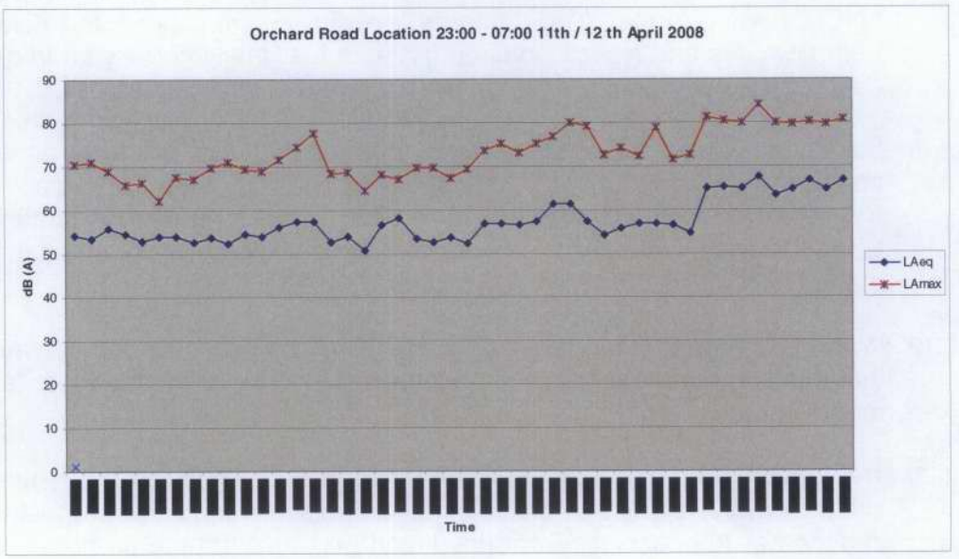
7.23 It can be seen from the contours that the application site is located just within the $50dBL_{Aeq8hr}$ contour. (**51dB** by interpolation). Reference to the latest Heathrow night movement air traffic movement data shows very little change in numbers of movements and aircraft types compared to 2006. Some confidence can therefore be gained that the 2006 contours are still within calibration.

[4] ERCD Report 1101 - Civil Aviation Authority

7.24 The latest Heathrow day and night contours are shown on the attached plots at Appendix iii.

7.25 PPG 24 further advises that single event levels that regularly exceed 82dB$L_{Amax(s)}$ "several times in any hour" should automatically result in an NEC "C" classification for a site. Our 2008 survey for Hydrex House included some objective measurements of night time aircraft overflights on R27L. The following graph which is taken from this report shows that application site is not subjected to $L_{Amax(s)}$ levels in excess of 82dB(A) several times an hour and therefore does not fall into the C category on this count.

7.26 Chart 1 - Measured $L_{Amax(f)}$ levels for the application site (23:00 - 0700)



7.27 **Note** for the avoidance of doubt the above chart is constructed from measurement data which was obtained with the measuring meter set at fast response. $L_{Amax(s)}$ levels due to aircraft noise can be expected to be 2-5dB(A) less than those indicated above[5].

7.28 Combined Effects - The NEC system can only be applied to transport related noise sources and in this case commercial noise sources have already been shown to be insignificant as regards their impact on an adjoining site (Ex Hydrex House). The application site is similarly located and therefore the findings of this study are considered to be applicable to this case.

7.29 For the western façade of the proposed development some combined effects are predicted due to noise break in from the A316 along Garden Road. This is considered below:

7.30 Calculation of Combined Effects - Night

(i) Road Traffic western façade "worst case" 47dBLA_{eq8hr} (from map section 7.9)

[5] Aircraft Noise and London Heathrow - Noise Monitoring Report (CST / Bureau Veritas) for HACAN 2007

(ii) Add Air Noise 51dBLA$_{eq8hr}$

(iii) Combined effect = 47dB + 51dB = 52dBLA$_{eq8hr}$ (NEC **B)**

7.31 Calculation of Combined Effect - Day

(iv) Road Traffic (by calculation section 7.12) = 54dB L$_{Aeq16hr}$

(v) Add Air Noise 58dBL$_{Aeq16hr}$

(vi) Combined effect = 54dB + 58dB = 59dB - **NEC B**

8.0 Discussion

8.1 By reference to Annex 1 of PPG 24 we suggest the application site lies comfortably within **NEC B** classification by day and night. Annex 1[6] of PPG 24 indicates that sites within NEC B are suitable for new housing in terms of the local sound environment. However the PPG advises that *"noise should be taken into account when determining planning permission and, where appropriate, conditions imposed to ensure an adequate level of protection against noise"*

8.2 In considering what level of protection is desirable, PPG 24 advises that attention should be paid to the following elements:

(i) The sound environment affecting external amenity areas - The PPG refers to World Health Organisation (WHO) guidelines for external amenity areas. The WHO advice is that "general outdoor noise levels of less than 55dBL$_{Aeq}$) are desirable to prevent significant community annoyance".

8.3 Daytime combined effects for external amenity areas (balconies) will be at worst 58dB which is 3dB above the PPG recommended limits. Unfortunately much of south west London is similarly affected by Heathrow operations and practically speaking it is impossible to mitigate the adverse effects without completely enclosing the balconies with glass screens ("winter gardens").

(ii) The sound environment inside bedrooms - Advice based on WHO advice is that a night time sound level of less than 35dB(A) is recommended in order to preserve the restorative process of sleep (PPG24).

(iii) The sound environment inside Living Rooms - Whilst PPG 24 does not provide any direct advice on desirable sound levels in living rooms, Annex 6 of the PPG advises that more detailed guidance on the insulation of buildings against external noise can be found in BS 8233:1987 (now updated to 1999). The revised BS makes reference to the 1995 WHO Guidelines on Community Noise and sets out both "reasonable" and "good" internal noise standards for dwellings. These are summarised in the table below:

[6] See Table Paragraph 8 Annex 1 PPG24 "Planning and Noise"

Table 1 – From BS 8233:1999

Criterion	Typical situations	Design Range L_{Aeq} dB "Good"	Design Range L_{Aeq} dB "Reasonable"
Reasonable resting / sleeping conditions	Living rooms	30	40
Reasonable resting / sleeping conditions	*Bedrooms	30	35
* For a reasonable standard in bedrooms at night, individual noise events (measured with F time weighting) should not normally exceed 45dB L_{Amax} Open windows - will give typically 10 - 15dB outside to in sound reduction			

8.4 Calculation of Internal Noise Levels (BS 8233:1999)

Section 6.7.1 of British Standard 8233 provides a basic calculation method for determining internal noise levels

Free field Night Time Sound Level for the Site (combined effects) = 52dBL_{Aeq}

For Bedrooms

Insulating glass window units to have an insulation of 33dBRw

For closed windows internal 8 hr sound levels = 52- 33 = 19dBL_{Aeq}

Open Windows internal 8 hr sound levels = 52 - 15 = 37dB$_{Aeq}$

Free field Day Sound Level for the Site (combined effects) = 58dBL_{Aeq}

For Living Rooms

Insulating glass window units to have an insulation of 33dBRw

For Closed windows internal 16 hr sound levels = 58 -33 = 35dBL_{Aeq}

For open Windows internal 16 hr sound levels = 58 -15 = 43dBL_{Aeq}

8.5 The above calculation shows that the PPG 24 / Bs 8233:1999 "reasonable" noise standard in bedrooms of 35dB $L_{Aeq8hour}$ will be met so long as windows are kept closed. With windows part open it is not possible to be confident that the 35dB standard will be met.

8.6 With respect to the BS 8233 night time "single event" standard of 45dB$_{LAmax}$ From Chart 1 above it can be seen that for the core part of the night (23:00 – 04:30) - when there is no aircraft activity the standard will be met. However from around 04:30 onwards the standard will be exceeded. This is unremarkable for the local situation in Richmond Upon Thames. For the sake of completeness the calculation is shown below:

For closed windows

Typical L_{Amax} (from aircraft) = 80dB - 33dB (closed window) = 47dB

For part open windows

Typical L_{Amax} (from aircraft) = 80dB - 15dB (closed window) = 65dB

8.7 When set in terms of UK government policy it needs to be remembered that the 45dBL_{Amax} standard is aspirational being based upon WHO recommended levels to ensure that there is no detectable interference with sleep due to noise. The UK Department of Transport (DfT) bases its Heathrow night flying restrictions on an assumption that the 45dBL_{Amax} target is not reasonably achievable in urban areas. The DfT continues to base Heathrow night flying restrictions on the results of its 1983 "Sleep Disturbance Study". This study showed that even at 80dBL_{Amax} there is approximately a 1 in 75 chance of the average person being awakened from sleep.

8.8 Noise Mitigation Proposals -

8.9 The following table summarises the position of the application site with respect to the relevant noise standards

Noise Standards - Compliance Table

LOCATION	STANDARD	WINDOWS CLOSED	WINDOWS OPEN	PROPOSED MITIGATION
Bedrooms	35dB$L_{Aeq\ 8hr}$ 45dB L_{Amax}	Pass Fail (from 04:30)	Fail Fail (from 04:30)	Install mechanical ventilation
Living Rooms	40dB$_{LAq16hr}$	Pass	Fail	Nil
External Amenity (Balconies)	55dB$L_{Aeq16hr}$	N/A	Fail	Nil

8.10 The above table shows that it is only proposed to mitigate the effects of aircraft overflights in the proposed bedrooms. This is in line with government policy on aircraft noise mitigation around Heathrow. For living rooms the exceedances are minor and will not occur for around 30% of the year, therefore no mitigation above the installation of good quality thermal glazing is considered necessary.

8.11 So far as the amenity areas are concerned, we would point out that at this location there is no reasonably practical solution to providing actual noise reduction to balconies other than by way of enclosure. Whilst it would be technically possible to enclosure the proposed balconies with glass screens (winter gardens) our experience with this approach is that it materially degrades the "open air" amenity value of the subject space. For the

application site there will be no aircraft overflights for an average of 30% of the year and at Heathrow. Therefore on balance we do not believe that a requirement for this is justified.

9.0 Conclusions

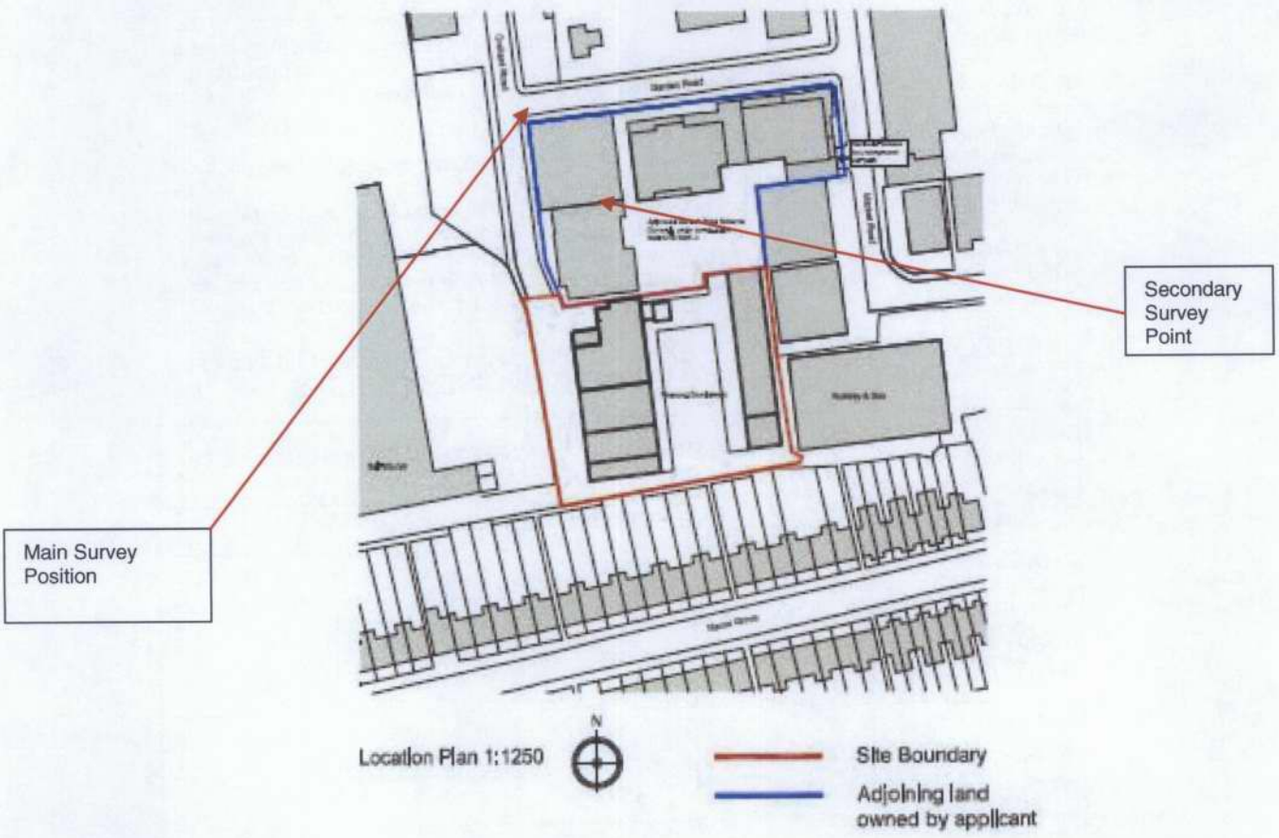
9.1 A PPG 24 Noise Assessment by way of desktop review of previously obtained objective sound data and published official material.

9.2 The review shows that the application site when assessed within the PPG 24 NEC scheme sits comfortably within NEC band **B** both by day and night.

9.3 PPG 24 advises that potential development sites within NEC B are suitable for new housing but some noise mitigation may be required.

9.4 A proposed noise mitigation scheme for the proposed development has been set out which is believed to be effective and proportional to ensure that the new dwellings have a reasonable internal sound environment.

10.0 Appendix i – 2007 and 2008 Noise Survey Positions



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11.0 Appendix ii Extract of PPG 24

BS 7445: 1991 by expressing all noises in terms of $L_{Aeq,T}$. The recommended time periods are 07.00-23.00 and 23.00-07.00.

8. Values in the table below refer to noise levels measured on an open site at the position of the proposed dwellings, well away from any existing buildings, and 1.2m to 1.5m above the ground. The arithmetic average of recorded readings should be rounded up. Where that average falls on the boundary between NECs B and C it will be for the local planning authority to determine which is the more appropriate NEC for the proposal.

9. Levels of noise from road and rail traffic are often specified at one metre from a facade, and these facade levels should be assumed to be 3 dB(A) higher than levels measured away from any buildings, unless a more accurate figure is available. For road traffic noise in NECs C and D, $L_{Aeq,16h} \simeq L_{A10,18h}$ -2 dB.

10. For aircraft, the noise levels refer to aircraft noise exposure contour values which are specified at 1.2m above the ground and published at 3 dB(A) intervals (each 3 dB(A) increment represents a doubling of noise energy). Because most aircraft noise originates from above, contours include the effects of ground reflection (see Note 2 below).

RECOMMENDED NOISE EXPOSURE CATEGORIES FOR NEW DWELLINGS NEAR EXISTING NOISE SOURCES

NOISE LEVELS[a] CORRESPONDING TO THE NOISE EXPOSURE CATEGORIES FOR NEW DWELLINGS $L_{Aeq,T}$ dB				
	NOISE EXPOSURE CATEGORY			
NOISE SOURCE	A	B	C	D
road traffic				
07.00 - 23.00	<55	55 - 63	63 - 72	>72
23.00 - 07.00[b]	<45	45 - 57	57 - 66	>66
rail traffic				
07.00 - 23.00	<55	55 - 66	66 - 74	>74
23.00 - 07.00[b]	<45	45 - 59	59 - 66	>66
air traffic[c]				
07.00 - 23.00	<57	57 - 66	66 - 72	>72
23.00 - 07.00[b]	<48	48 - 57	57 - 66	>66
mixed sources[d]				
07.00 - 23.00	<55	55 - 63	63 - 72	>72
23.00 - 07.00[b]	<45	45 - 57	57 - 66	>66

Notes

[a] **Noise levels:** the noise level(s) ($L_{Aeq,T}$)used when deciding the NEC of a site should be representative of typical conditions.

[b] **Night-time noise levels (23.00 - 07.00):** sites where individual noise events regularly exceed 82 dB L_{Amax} (S time weighting) several times in any hour should be treated as being in NEC C, regardless of the $L_{Aeq,8h}$ (except where the $L_{Aeq,8h}$ already puts the site in NEC D).

[c] **Aircraft noise:** daytime values accord with the contour values adopted by the Department of Transport which relate to levels measured 1.2m above open ground. For the same amount of noise energy, contour values can be up to 2 dB(A) higher than those of other sources because of ground reflection effects.

[d] **Mixed sources:** this refers to any combination of road, rail, air and industrial noise sources. The "mixed source" values are based on the lowest numerical values of the single source limits in the table. The "mixed source" NECs should only be used where no individual noise source is dominant.

To check if any individual noise source is dominant (for the purposes of this assessment) the noise level from the individual sources should be determined and then combined by decibel addition (remembering first to subtract 2 dB(A) from any aircraft noise contour values). If the level of any one source then lies within 2 dB(A) of the calculated combined value, that source should be taken as the dominant one and the site assessed against the appropriate NEC for that source, rather than using the "mixed source" NECs. If the dominant source is industrial noise see paragraph 19 of Annex 3.

If the contribution of the individual noise sources to the overall noise level cannot be determined by measurement and/or calculation, then the overall measured level should be used and the site assessed against the NECs for "mixed sources".

12.0 Appendix iii – Heathrow Air Noise Contours

Heathrow Air Noise Contours Lnight (2006)

2010 Heathrow Air Noise Contours LA_{eq16hr}

13.0 Appendix iii – 2008 Assessment of Commercial Noise

Stand Alone Attachment