

LONDON BOROUGH OF HILLINGDON

Avondale Drive Estate

Avondale Drive, Hayes, London, UB3 3PN

Noise Assessment

**REPORT REF.
2104170-04B**

March 2022

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Document Control Sheet

REV	ISSUE PURPOSE	AUTHOR	CHECKED	APPROVED	DATE
-	Draft	JG	LD	Draft Only	04/11/2021
-	FINAL	JG	JG	LD	18/11/2021
A	Final – Updated text in Section 6.	JG	JG	LD	03/12/2021
B	Final – Update following Peer Review	JG	JG	LD	02/03/2022

Distribution



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1. Introduction

- 1.1. Ardent Consulting Engineers were instructed by London Borough of Hillingdon (LBH) to undertake a Noise Assessment to support the residential development at Avondale Drive Estate, Hayes (hereafter referred to as the site).

Site Location

- 1.2. The site is set in a predominantly residential area. The south is bounded by residential properties on Avondale Drive, to the east by the A312 dual carriageway, to the north and west by Minet Junior School and grounds. Hayes Town Centre lies approximately 800m to the southwest of the site. The surrounding area and approximate site boundary are shown in Figure 1.

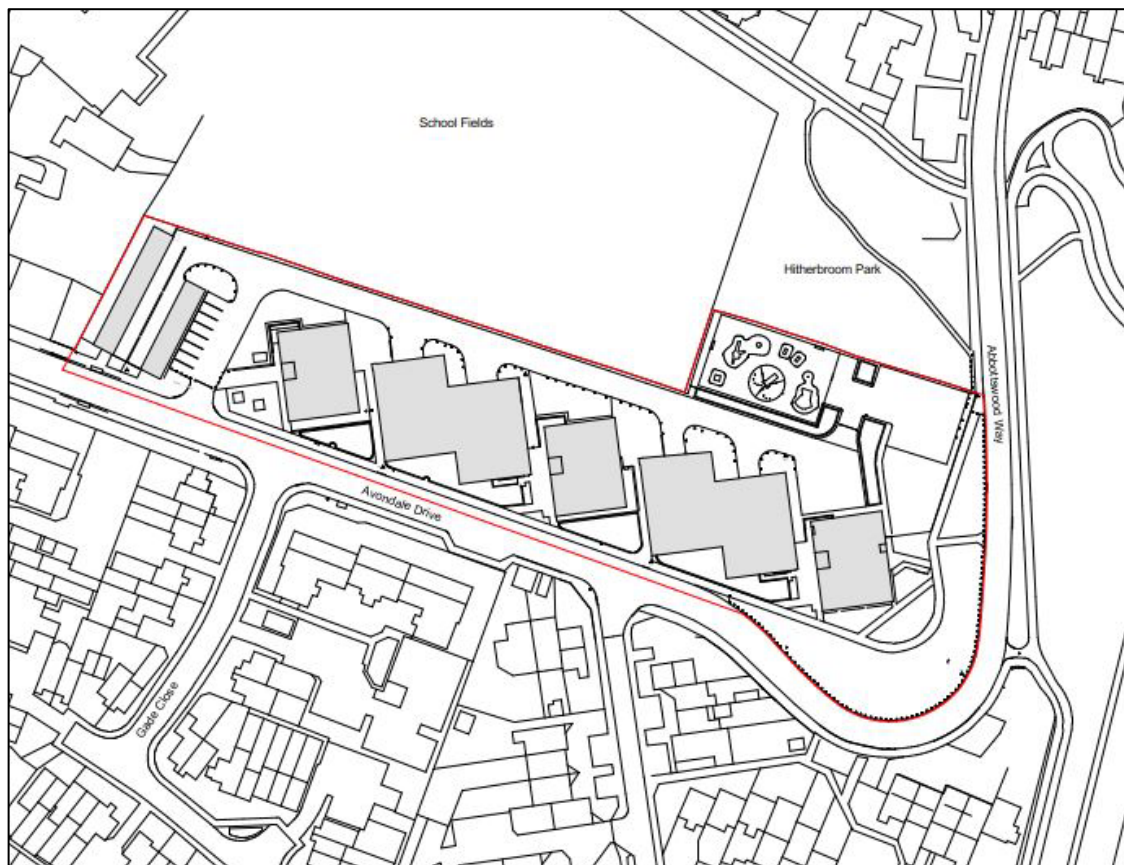


Figure 1 Site boundary and surrounding area

Site Proposals

1.3. A description of the proposals for the site is as follows:

"Development in outline (with all matters reserved) for residential floorspace (Class C3) to comprise: demolition of all existing buildings and structures; erection of new buildings; new pedestrian and vehicular access; associated amenity space, open space, landscaping; car and cycle parking spaces; plant, refuse storage, servicing area and other works incidental to the proposed development; and

Detailed planning consent for Block A comprising 30 residential units and ancillary facilities (Class C3); new pedestrian access; associated amenity space and landscaping; cycle parking, refuse storage, and other associated infrastructure."

1.4. An extract of the indicative proposals is shown in Figure 2.



Figure 2 Proposed Phasing Plan

2. Relevant Policy and Guidance

Liaison with London Borough of Hillingdon Council

- 2.1. Contact¹ was made with London Borough of Hillingdon to discuss the proposals and approach/methodology towards the noise assessment. At the time of writing, no response has been received.
- 2.2. The methodology in the following standards and guidance has been followed in this assessment.

BS8233:2014 – Guidance on Sound Insulation and Noise Reduction for Buildings

- 2.3. Formerly a Code of Practice, the 2014 revision of BS8233 is now presented and intended as a guidance document. The standard is mainly concerned with building design from an acoustic standpoint. It does, however, contain information relevant to environmental noise more specifically by stating guidance for desirable internal noise levels for dwellings and other buildings.
- 2.4. Table 2 of BS8233:2014 provides suitable internal levels for residential development and is reproduced in Table 1.

Table 1 Extract from BS8233:2014 Table 4 - Indoor ambient noise levels in dwellings

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

- 2.5. The guidance of BS8233:2014 with regards to external amenity spaces is as follows:

"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$ with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognised that these guideline values are not

¹ Email contact on 28/10/2021 with V. Beale, London Borough of Hillingdon Council

achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited."

ProPG: Planning and Noise – May 2017

- 2.6. Guidance in ProPG Planning and Noise provides an approach which aims to inform developers, practitioners and local authorities on how potential residential sites should be assessed. ProPG states that the guidance can be used for other types of residential institution and therefore it is considered applicable to the site.
- 2.7. The guidance also builds upon government planning policy that noise should not be treated in isolation and there should be an holistic approach to good acoustic design.
- 2.8. ProPG sets out a 2-stage approach; the first of which is a risk assessment to identify the likelihood of significant adverse impact, then depending on the outcome of this risk assessment the extent of the acoustic design statement required. The graphic in Figure 3 is an extract from ProPG and indicates the level of risk associated with ranges of sound levels and provides some guidance on the likely extent of work associated with progressing a development exposed to these sound levels.
- 2.9. In relation to maximum noise levels, ProPG states that:

"In most circumstances in noise sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{Amax,F}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events."

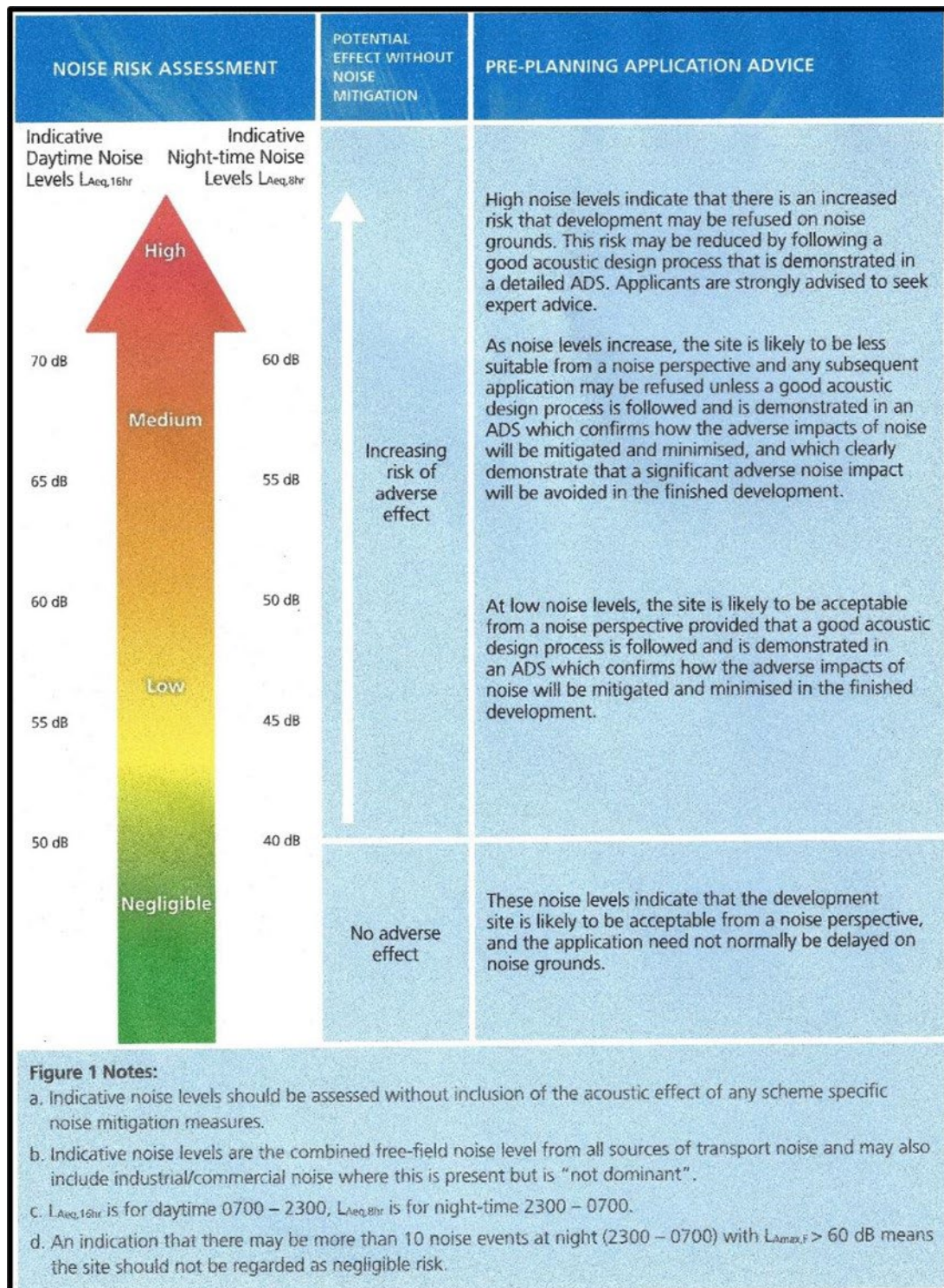


Figure 3 Extract from Figure 1 in ProPG - Initial Site Noise Risk Assessment

National Planning Policy Framework (NPPF) – July 2021

2.10. Under the NPPF: paragraph 185 of Section 15, with regard to environmental noise; planning policies and decisions should aim to:

- Mitigate and reduce to a minimum, potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;
- Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

Noise Policy Statement for England (NPSE)

2.11. To avoid and mitigate adverse noise effects on health arising from and impacting on new development, the NPPF makes reference to NPSE. The NPSE was published in March 2010 and covers all forms of noise, other than occupational noise. For the purposes of this report, "Neighbourhood Noise" is most relevant as NPSE defined at paragraph 2.5:

"neighbourhood noise which includes noise arising from within the community such as industrial and entertainment premises, trade and business premises, construction sites and noise in the street."

2.12. NPSE introduces three concepts to the assessment of noise in the UK:

- NOEL – No Observed Effect Level – This is the level below which no effect can be detected and below which there is no detectable effect on health and quality of life due to noise.
- LOAEL – Lowest Observable Adverse Effect Level – This is the level above which adverse effects on both health and quality of life can be detected.
- SOAEL – Significant Observed Adverse Effect Level – This is the level above which significant adverse effects on health and quality of life occur.

2.13. NPSE does not numerically define levels for NOEL, LOAEL or SOAEL, rather it makes it clear that the noise level is likely to vary depending upon the noise source, the receptor and the time of day or day of the week, etc.

National Planning Practice Guidance (2014)

2.14. The purpose of the guidance is to complement the NPPF and provide advice on how to deliver its policies.

2.15. The guidance includes a table (as shown in Figure 4) that summarises “the noise exposure hierarchy, based on the likely average response” and which offers “examples of outcomes” relevant to NOEL, LOAEL, and SOAEL effect levels described in the NPSE.

Perception	Examples of outcomes	Increasing effect level	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
		Lowest Observed Adverse Effect Level	
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, eg 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 perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
		Significant Observed Adverse Effect Level	
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, eg 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
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, eg regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, eg auditory and non-auditory	Unacceptable Adverse Effect	Prevent

Figure 4 NPPG Noise Exposure Hierarchy, based on the Likely Average Response

The London Plan 2021

2.16. The latest version of the London Plan, as published in March 2021, provides an overall strategic plan for London, setting out an integrated economic, environmental, transport and social framework for the development of London over the next 20-25 years. The ‘Publication London Plan’ brings together the geographic and locational

aspects of the Mayor's other strategies, including a range of environmental issues such as climate change (adaptation and mitigation), air quality, noise and waste.

2.17. The most relevant guidance in terms of the impact and assessment of noise is found within Policy D14: Noise, which states:

"...Policy D14

A In order to reduce, manage and mitigate noise to improve health and quality of life, residential and other non-aviation development proposals should manage noise by:

- 1. Avoiding significant adverse noise impacts on health and quality of life*
- 2. Reflecting the Agent of Change principle as set out in Policy D13 Agent of Change*
- 3. Mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of or in the vicinity of new development without placing unreasonable restrictions on existing noise-generating uses*
- 4. Improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity)*
- 5. Separating new noise sensitive development from major noise sources (such as road, rail, air transport and some types of industrial use) through the use of distance, screening, layout, orientation, uses and materials – in preference to sole reliance on sound insulation*
- 6. Where it is not possible to achieve separation of noise-sensitive development and noise sources without undue impact on other sustainable development objectives, then any potential adverse effects should be controlled and mitigated through applying good acoustic design principles.*
- 7. Promoting new technologies and improved practices to reduce noise at source, and on the transmission path from source to receiver.*

- B Boroughs, and others with relevant responsibilities, should identify and nominate new Quiet Areas and protect existing Quiet Areas in line with the procedure in Defra's Noise Action Plan for Agglomerations..."*

2.18. Policy D14: Noise refers to Policy D13: Agent of Change, which states:

- A The Agent of Change principle places the responsibility for mitigating impacts from existing noise and other nuisance-generating activities or uses on the proposed new noise-sensitive development. Boroughs should ensure that Development Plans and planning decisions reflect the Agent of Change principle and take account of existing noise and other nuisance generating uses in a sensitive manner when new development is proposed nearby.*
- B Developments should be designed to ensure that established noise and other nuisance-generating uses remain viable and can continue or grow without unreasonable restrictions being placed on them.*
- C New noise and other nuisance-generating development proposed close to residential and other noise-sensitive uses should put in place measures to mitigate and manage any noise impacts for neighbouring residents and businesses.*
- D Development proposals should manage noise and other potential nuisances by:*
- 1. Ensuring good design mitigates and minimises existing and potential nuisances generated by existing uses and activities located in the area*
 - 2. Exploring mitigation measures early in the design stage, with necessary and appropriate provisions including ongoing and future management of mitigation measures secured through planning obligations*
 - 3. Separating new noise-sensitive development where possible from existing noise-generating businesses and uses through distance, screening, internal layout, soundproofing, insulation and other acoustic design measures.*
- E Boroughs should not normally permit development proposals that have not clearly demonstrated how noise and other nuisances will be mitigated and managed..."*

Acoustics Ventilation and Overheating – Residential Design Guide, January 2020

- 2.19. Acoustics Ventilation and Overheating (AVO) recommends an approach to acoustic assessments for new residential development taking consideration for acoustics, ventilation and overheating. AVO states that the guidance can be used for other types of residential institution and therefore it is considered applicable to the site.
- 2.20. Section 3 involves a two-level risk assessment approach to estimate the potential impact on occupants in the case of overheating.
- 2.21. The Level 1 site risk assessment is based on external free-field noise levels and the assumed scenario where a partially open window is used to mitigate overheating (Table 3-2 of the guidance).
- 2.22. The sound level reduction from outside to inside for a partially open window is 13dB in this instance. A Level 1 site risk assessment is considered adequate if the site falls within the 'Negligible risk' category. A Level 2 assessment can optionally be undertaken to give more confidence in the case of Low or Medium risk sites, where appropriate. The Level 2 assessment is strongly recommended for 'High' risk sites.
- 2.23. The Level 2 assessment suggests that assessment of the adverse effect from noise exposure should include an estimate of how frequently and for what duration the overheating condition occurs (Table 3-3 of the guidance).

2.24. Figure 5 explains the two-level noise assessment procedure for overheating conditions.

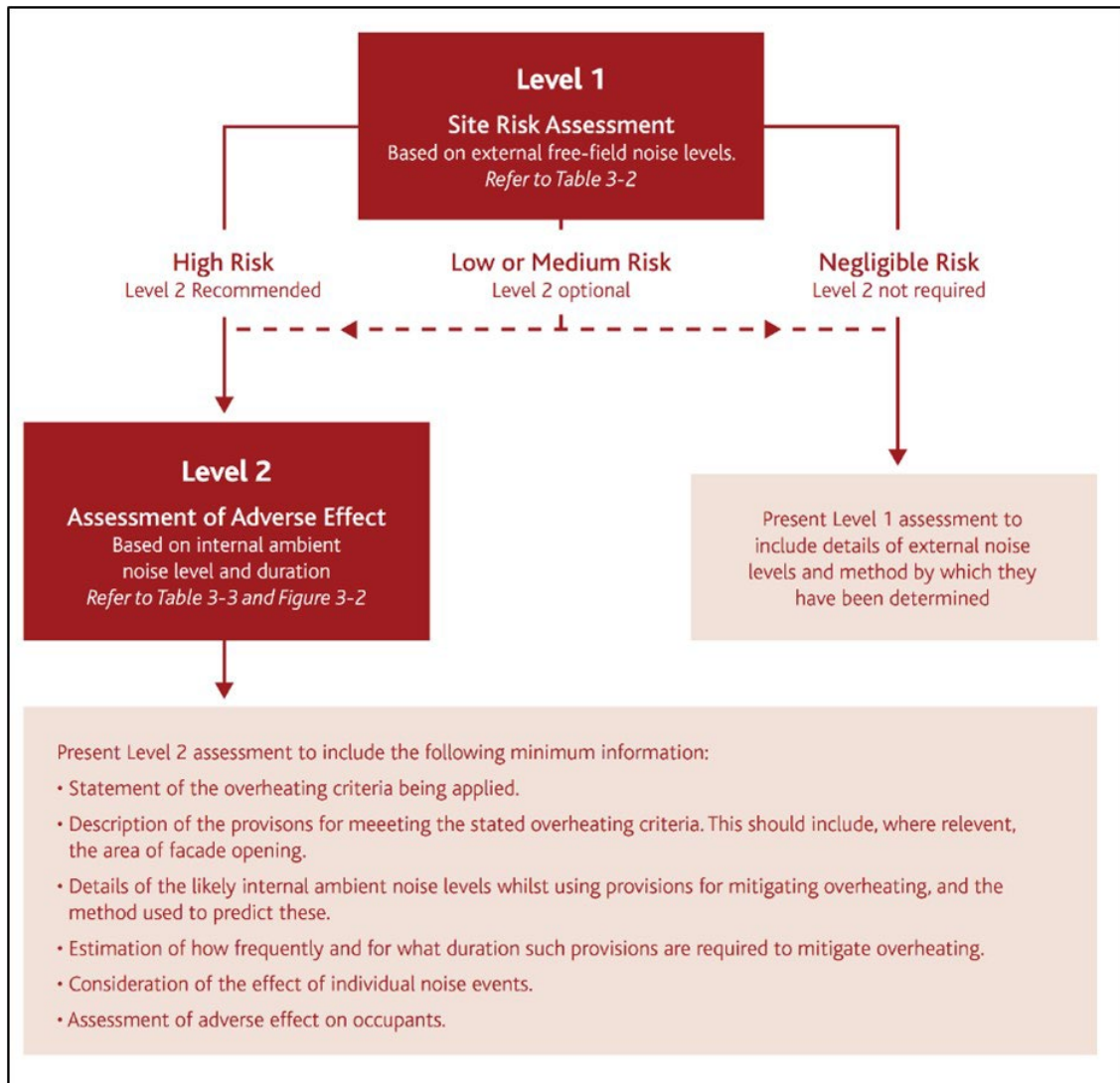


Figure 5 Two-level Assessment Procedure (Figure 3-1 of AVO Guidance)

2.25. Figure 6 shows the Level 1 site risk assessment of noise, relating to overheating conditions.

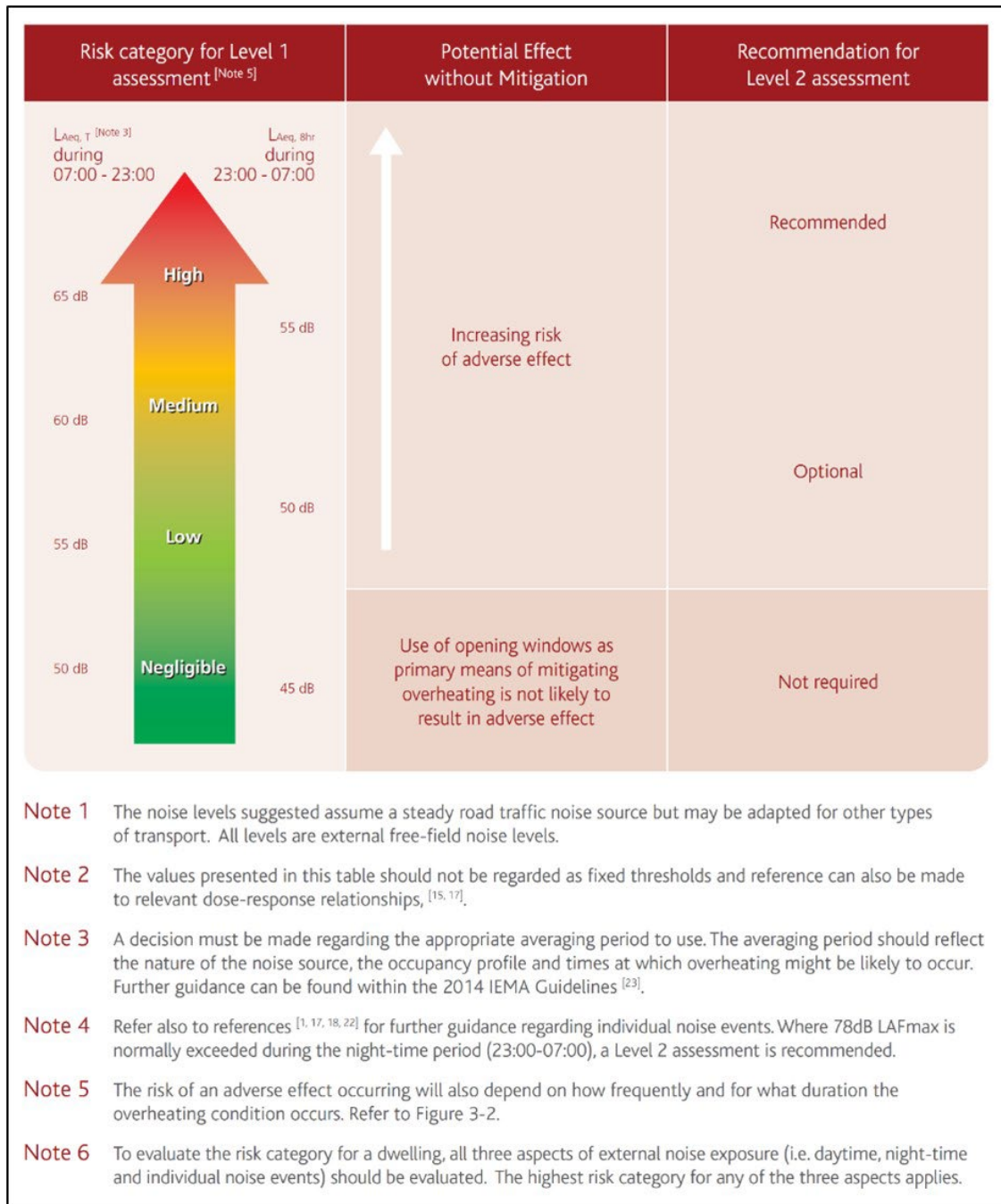
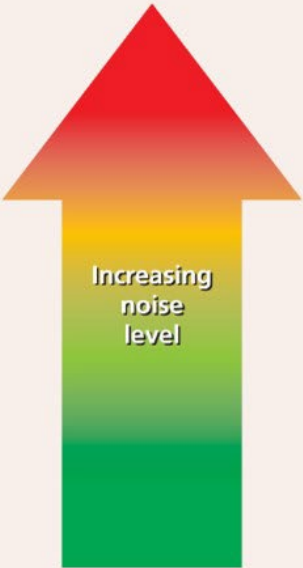


Figure 6 Level 1 Risk Assessment (Figure 3-2 of AVO Guidance)

2.26. Figure 7 shows the Level 2 site risk assessment of noise, relating to overheating conditions.

Internal ambient noise level [Note 2]			Examples of Outcomes [Note 5]	
L _{Aeq,T} [Note 3] during 07:00 – 23:00 [Note 6]	L _{Aeq,8h} during 23:00 – 07:00	Individual noise events during 23:00 – 07:00 [Note 4]		
> 50 dB	> 42 dB	Normally exceeds 65 dB L _{A,F,max}	Noise causes a material change in behaviour e.g. having to keep windows closed most of the time	Avoiding certain activities during periods of intrusion. 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.
			Increasing likelihood of impact on reliable speech communication during the day or sleep disturbance at night	At higher noise levels, more significant behavioural change is expected and may only be considered suitable if occurring for limited periods. As noise levels increase, small behaviour changes are expected e.g. turning up the volume on the television; speaking a little more loudly; having to close windows for certain activities, for example ones which require a high level of concentration. Potential for some reported sleep disturbance. Affects the acoustic environment inside the dwelling such that there is a perceived change in quality of life. At lower noise levels, limited behavioural change is expected unless conditions are prevalent for most of the time. [Note 8]
≤ 35 dB	≤ 30 dB	Do not normally exceed L _{A,F,max} 45 dB more than 10 times a night	Noise can be heard, but does not cause any change in behaviour	Noise can be heard, but does not cause any change in behaviour, attitude, or other physiological response [Note 9]. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.

Note 1 The noise levels suggested in Tables 3-2 and 3-3 assume a steady road traffic noise source but may be adapted for other types of transport.

Figure 7 Level 2 Risk Assessment (Figure 3-3 of AVO Guidance)

2.27. The noise levels suggested in Figure 6 and Figure 7 assume a steady road traffic noise source but may be adapted for other types of transport by taking account of the differing responses to different transport sources.

London Borough of Hillingdon – Local Plan Part 2, Policy DM1: Managing Transport Impacts

2.28. Policy DMT1 of the London Borough of Hillingdon local plan relates to the management of transport impacts as follows:

"A) Development proposals will be required to meet the transport needs of the development and address its transport impacts in a sustainable manner. In order for developments to be acceptable they are required to:

- i. Be accessible by public transport, walking and cycling either from the catchment area that it is likely to draw its employees, customers or visitors from and/or the services and facilities necessary to support the development;*
- ii. Maximise safe, convenient and inclusive accessibility to, and from within developments for pedestrians, cyclists and public transport users;*
- iii. Provide equal access for all people, including inclusive access for disabled people;*
- iv. Adequately address delivery, servicing and drop-off requirements; and*
- v. Have no significant adverse transport or associated air quality and noise impacts on the local and wide environment, particularly on the strategic road network.*

B) Development proposals will be required to undertake a satisfactory Transport Assessment and Travel Plan if they meet or exceed the appropriate thresholds. All major developments that fall below these thresholds will be required to produce a satisfactory Transport Statement and Local Level Travel Plan. All these plans should demonstrate how any potential impacts will be mitigated and how such measures will be implemented."

London Borough of Hillingdon – Local Plan Part 2, Policy DMT2: Highways Impacts

2.29. Policy DMT2 of the London Borough of Hillingdon local plan relates to any potential highways impacts, as follows:

"Development proposals must ensure that:

- i. Safe and efficient vehicular access to the highway network is provided to the Council's standards;*
- ii. They do not contribute to the deterioration of air quality, noise or local amenity or safety of all road users and residents;*
- iii. Safe, secure and convenient access and facilities for cyclists and pedestrians are satisfactorily accommodated in the design of highway and traffic management schemes;*
- iv. Impacts on local amenity and congestion are minimised by routing through traffic by the most direct means to the strategic road network, avoiding local distributor and access roads; and*
- v. There are suitable mitigation measures to address any traffic impacts in terms of capacity and functions of existing and committed roads, including along roads or through junctions which are at capacity."*

3. Environmental Noise Levels

- 3.1. An environmental noise survey was undertaken at the site between 12th and 13th October 2021. Measurement positions from the survey are shown in Figure 8. Noise measurements were taken on the roof of the existing eastern and western tower blocks on site and were selected to obtain representative baseline noise levels due to the main observed noise sources around the site.
- 3.2. All measurements were taken using a microphone mounted on an extension pole over the side of the roof, to capture free field conditions without reflection or screening from the building façade. Equipment was installed under the supervision of the LBH Facilities team.
- 3.3. At Position 1 the acoustic environment was dominated by road traffic noise from the A312. The acoustic environment at Position 2 was dominated by a mixture of road traffic noise from the A312 and local roads. Children playing on the school fields adjacent to site were the dominant noise source during school break-times.

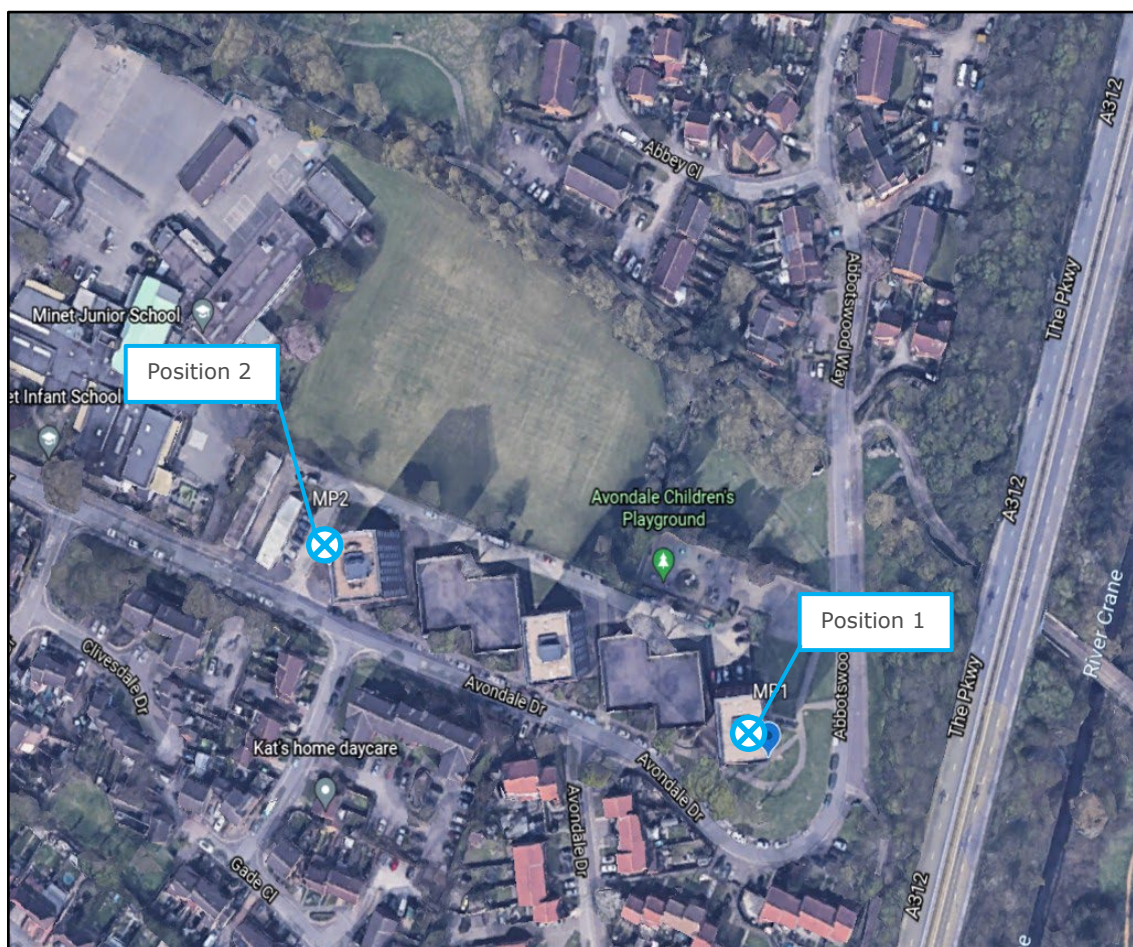


Figure 8 Survey measurement locations

3.4. Photographs of the survey locations are shown in Appendix A.

3.5. The equipment used was as follows:

- Svantek 958 Sound Level Meter (serial number: 15845)
- Svantek 958A Sound Level Meter (serial number: 69074)
- Rion NC74 Calibrator (serial number: 34172694)

3.6. All equipment used has been professionally calibrated. Field calibration of the sound level meter (and complete measurement signal chain) was undertaken before and after measurement to ensure no drift of the calibration signal. Calibration certificates are available on request.

3.7. Observations regarding the prevailing weather conditions were taken during the survey, which noted no precipitation and low wind speeds and therefore considered suitable for environmental noise measurements.

3.8. Time histories of measured data are shown in Appendix A and a summary of the measured noise level taken at the site are summarised in Table 2.

Table 2 Summary of measured noise levels

Monitoring Position	Ambient Noise Level dB $L_{Aeq,T}$		Typical Background Sound Level dB $L_{A90,T}$		Representative Night-time Maximum Noise Level dB L_{AFmax}
	Daytime	Night-time	Daytime	Night-time	
MP1	70	67	68	61	75
MP2	58	51	53	48	62

3.9. The time history chart for MP1 shows that the noise level is generally consistent at this location through the daytime period, with a decrease in ambient and background noise levels overnight when traffic volumes on the A312 are reduced. The daytime ambient noise levels are approximately 70 dB $L_{Aeq,T}$ with background noise averaging 68 dB $L_{A90,T}$. The corresponding night-time levels were 67 dB $L_{Aeq,T}$ and 61 dB $L_{A90,T}$ respectively.

3.10. Measured ambient noise levels at MP2 were also generally consistent through the survey period. Average daytime ambient noise levels were 58 dB $L_{Aeq,T}$ with background noise averaging 53 dB $L_{A90,T}$. The corresponding night-time levels were

51 dB $L_{Aeq,T}$ and 48 dB $L_{A90,T}$ respectively. Periods of elevated ambient and background noise can be observed during school break-times.

3.11. The representative L_{AFmax} level is the value which has been exceeded fewer than 10 times in the 8-hour night-time period, i.e., one which can be considered to be 'not normally exceeded' as per the WHO guidelines.

3.12. Based on the measured sound levels at the site, facades in close proximity to the A312 dual carriageway are considered to be 'high-risk' and all other facades are considered to be 'medium-risk' when compared with Figure 1 included in Section 2 of ProPG, as shown in Figure 3. The risk category for facades at the development are identified in Appendix F.

3.13. This would not prohibit the development as good acoustic design processes will be followed to reduce sound levels to as low as practical across the site.

3.14. Representative octave band levels in Table 3 are the daytime and night-time averaged ambient sound levels and the maximum noise level not normally exceeded more than ten times during the night-time period, in accordance with WHO guidelines. These are used in glazing calculations to ensure a robust assessment of internal noise levels.

Table 3 Octave Band data for noise monitoring locations

		Octave Band Centre Frequency, dB							
		63	125	250	500	1k	2k	4k	8k
MP1	$L_{Aeq,T}$ (day)	66	61	62	64	68	63	50	39
	$L_{Aeq,T}$ (night)	61	58	58	61	65	60	48	36
	$L_{AFmax,T}$ (night)	72	72	70	71	73	68	56	47
MP2	$L_{Aeq,T}$ (day)	62	55	52	51	53	51	48	49
	$L_{Aeq,T}$ (night)	55	52	47	46	49	42	31	27
	$L_{AFmax,T}$ (night)	67	63	60	59	59	53	44	36

3.15. Where appropriate, effects such as acoustic screening and distance attenuation have been taken into account in the predicted noise levels at the development site.

4. Demolition and Construction Phase

- 4.1. Given the proximity of the proposed construction to neighbouring noise sensitive properties such as residential areas, it is possible that the site clearance, preparation and construction noise may impact nearby receptors.
- 4.2. Indicative demolition and construction phasing plans and completion dates are included in Table 4.

Table 4 Indicative phasing programme

Construction/Demolition Phase	Period
Phase 1a	Autumn 2022 – Summer 2024
Phase 1b	Spring 2023 – Summer 2025
Phase 2	Spring 2025 – Summer 2027

- 4.3. A detailed construction programme, specific plant data and operations are not available at this stage of the project. Therefore, it is not possible to undertake a detailed assessment of likely impact at this time.
- 4.4. The indicative Phasing and Demolition Strategy which includes the Demolition and Construction Management Statement sets out best practice measures to be followed during demolition and construction.
- 4.5. Reasonable construction noise limits can be derived using the Example Method 1 (the ABC Method) of BS5228, within section E.3.2. Table E.1 from the standard is reproduced in Figure 9.

Table E.1 Example threshold of significant effect at dwellings			
Assessment category and threshold value period (L_{Aeq})	Threshold value, in decibels (dB)		
	Category A ^{A)}	Category B ^{B)}	Category C ^{C)}
Night-time (23.00–07.00)	45	50	55
Evenings and weekends ^{D)}	55	60	65
Daytime (07.00–19.00) and Saturdays (07.00–13.00)	65	70	75
NOTE 1 A significant effect has been deemed to occur if the total L_{Aeq} noise level, including construction, exceeds the threshold level for the Category appropriate to the ambient noise level. NOTE 2 If the ambient noise level exceeds the threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a significant effect is deemed to occur if the total L_{Aeq} noise level for the period increases by more than 3 dB due to construction activity. NOTE 3 Applied to residential receptors only.			
^{A)} Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values. ^{B)} Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values. ^{C)} Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values. ^{D)} 19.00–23.00 weekdays, 13.00–23.00 Saturdays and 07.00–23.00 Sundays.			

Figure 9 BS5228:Part 1 - Table E.1

- 4.6. Existing ambient noise levels at the site will place the site and surroundings within Category A of Table E.1 at the western end of site, and Category C at the eastern end of site.
- 4.7. Therefore, the ambient noise levels (as a result of construction activities) in Table 5 should be considered as reasonable limits to adhere to during construction works.

Table 5 Construction Noise Limits

Time Period	Construction Noise Limits L_{Aeq} (dB)
Weekdays 08:00 – 18:00	65
Saturday 08:00 – 13:00	65

5. Road Traffic Noise

- 5.1. Traffic flow volumes have been provided by Markides Associates, which have been used to calculate the change in noise levels arising from operational road traffic, i.e. during occupation, of the site are presented in Appendix C. The data is presented as 18-hour AAWT (0600 – 0000) flows.
- 5.2. Table 6 shows the traffic flows and predicted changes in noise levels for the change in traffic flow between future baseline (without development) at completion year and operational traffic flows.

Table 6 Change in noise levels due to operational traffic compared to future baseline

Road	Completion Year Baseline (Without Development)	Predicted Flow Due to Operational Traffic	Change in Noise Level, dB
Avondale Drive	2,397	2,569	0.3
A312	64,251	64,251	0.0

- 5.3. The changes in noise levels are negligible in all cases when compared to Table 3.54b of DMRB, LA 111, as shown in Appendix D. There will be no adverse impacts arising from the proposed development in relation to road traffic noise.

6. Mitigation Recommendations

- 6.1. The measured results, predicted future traffic flows and layout were used to undertake calculations for suitable façade treatments, presented in Appendix E and other mitigation measures required for the site, outlined as follows.
- 6.2. The aim of this section of the report is to identify mitigation measures capable of providing suitable levels of attenuation to achieve the required internal sound levels based on the predicted noise levels and the planning noise assessment.
- 6.3. To achieve suitable internal amenity sound levels during normal conditions, windows must remain closed, but not sealed, and an alternative means of ventilation provided. In this case the ventilation will be provided by a Mechanical Ventilation and Heat Recovery (MVHR) system. Windows do not need to be sealed shut and residents will have the choice to open them, e.g., for purge ventilation, whilst accepting elevated noise levels. .

External Building Fabric – Non-Glazed Elements

- 6.4. It is assumed that the non-glazed external building fabric elements comprise of masonry cavity walls. This would typically provide a sound reduction performance of at least the figures shown in Table 7 when tested in accordance with BS EN ISO 10140-2:2010 (figures derived from: Representative Values of Airborne SRI for Some Common Structures: Appendix B of Flakt Woods 'Guide to Noise Control').

Table 7 Non-glazed elements assumed Sound Reduction Performance

Element	Octave band centre frequency SRI, dB					
	125	250	500	1k	2k	4k
Masonry Cavity Wall	34	43	55	66	77	85

External Building Fabric – Glazing

- 6.5. Minimum attenuation values are provided for both the Detailed Phase 1 and Outline Area of the development.

Detailed Phase 1

- 6.6. Phase 1 is furthest from the A312 dual carriageway and will be exposed to the lowest ambient noise levels at the development. Facades at Phase 1 will not require

upgraded glazing to control internal noise levels. A detailed floorplan for Phase 1 is shown in Figure 10.



Figure 10 Detailed Phase 1 floorplan

6.7. Table 8 sets out the required glazing performance types for Phase 1. These specifications take into account the glass, frame, seals and associated fittings.

Table 8 Required minimum attenuation values – Detailed Phase 1

Glazing Type	Sound Reduction Index, dB R_w	Octave band centre frequency SRI, dB					
		125	250	500	1k	2k	4k
Type 2 (no markup)	29	21	71	25	35	37	31

Outline Area

6.8. The remaining outline area is located in the centre and east of the site, and experiences progressively higher ambient noise levels towards the A312 dual

carriageway. Upgraded glazing will be required in Phase 1B on the northern, eastern and southern facades.

- 6.9. Table 9 sets out the required glazing performance types for Phase 1B and Phase 2, these specifications take into account the glass, frame, seals and associated fittings.

Table 9 Required Minimum Attenuation Values for Glazing – Outline Area

Glazing Type	Sound Reduction Index, dB R_w	Octave band centre frequency SRI, dB					
		125	250	500	1k	2k	4k
Type 1	36	24	24	33	39	40	49
Type 2 (no markup)	29	21	71	25	35	37	31

- 6.10. The above table should be viewed in conjunction with Figure 11, which indicates the location of glazing specifications for Phase 1.

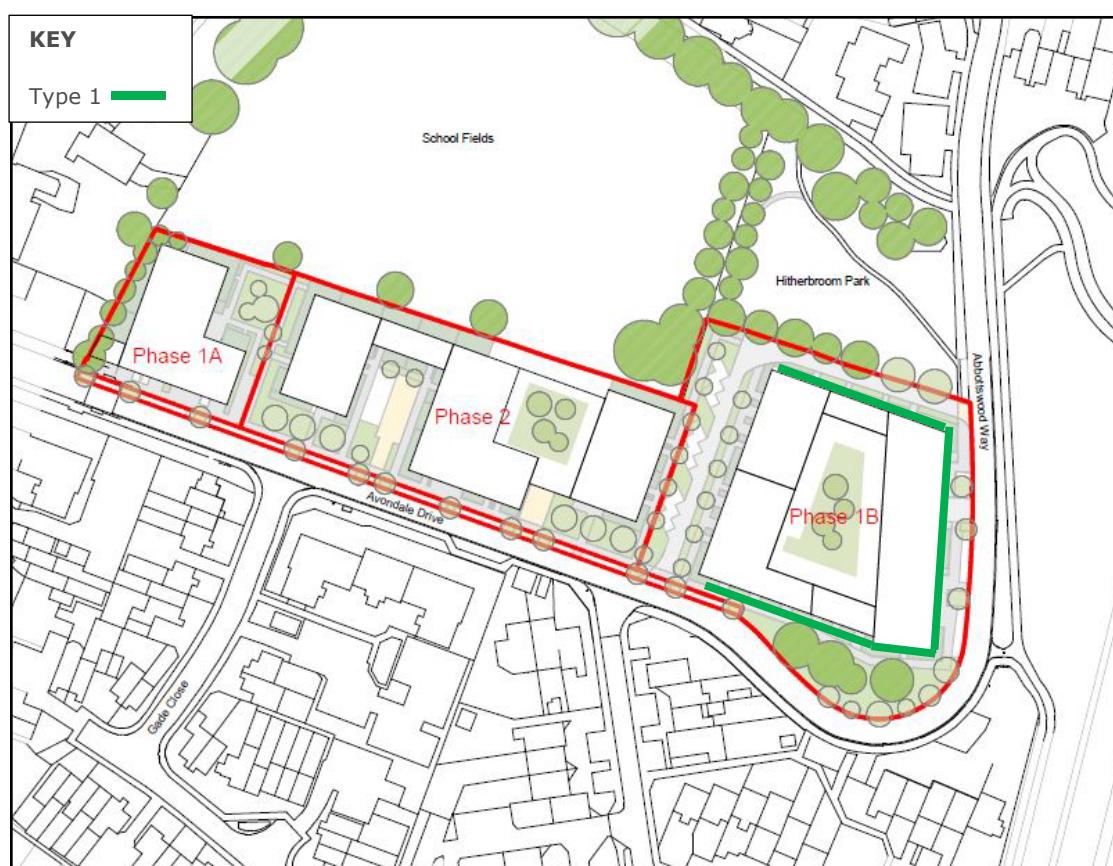


Figure 11 Glazing layout, Phase 1A and Outline Area

External Building Fabric - Ventilation

- 6.11. It is understood that all units will benefit from mechanical ventilation and that trickle vents at the façade will not be provided.
- 6.12. Where non-sensitive rooms and sensitive rooms form part of an open plan area, for example a dining and kitchen area, the glazing specification for the more sensitive room should be used across the combined area.
- 6.13. All major building elements should be tested in accordance with BS EN ISO 10140-2:2010. Sole glass performance data would not necessarily demonstrate compliance with this specification.
- 6.14. It should be noted that there may be additional considerations for glazing requirements such as overheating, security, thermal performance, and air quality. Alternative glazing could be used assuming the minimum acoustic performance is met.

Overheating

- 6.15. Consideration has been given to the potential for adverse noise impact during overheating conditions; where residents may open windows to control temperature. The expected noise levels place facades in close proximity to the A312 are considered to be 'high-risk' with all other facades considered to be 'medium-risk' category under overheating conditions according to the AVO guidance as set out in Section 2.
- 6.16. In these circumstances a Level 2 Overheating assessment is recommended for parts of the site which fall within medium and high-risk categories as per the Level 1 site risk assessment. The overheating risk categories for the site as described above are described in Appendix F of this report.
- 6.17. An overheating assessment for Phase 1 has been undertaken by Synergy Consulting and has been completed with regard to the above considerations.

External Amenity Areas

Detailed Phase 1

6.18. Communal amenity areas, private gardens and private balconies are proposed in Phase 1A, as shown above in Figure 10 and in Figure 12.

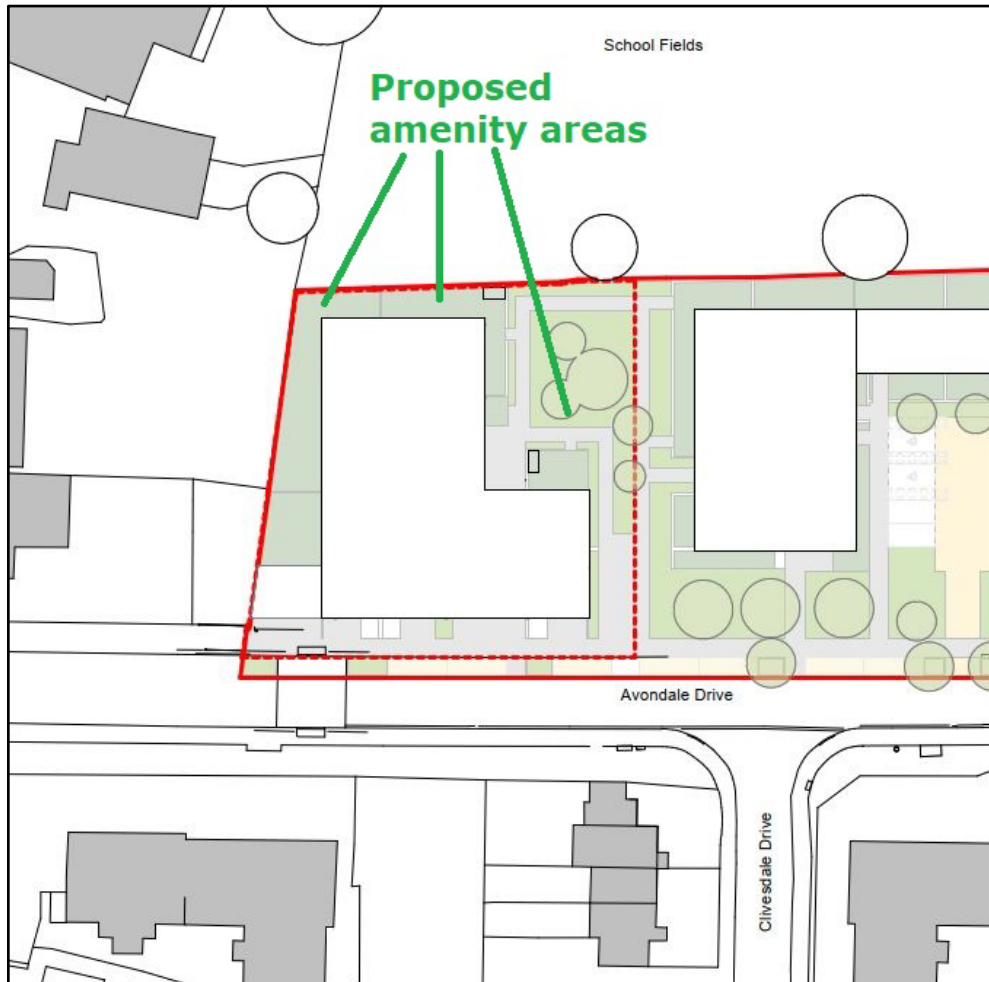


Figure 12 Amenity areas – Phase 1A

6.19. Based on the measurements taken at the site, private balconies and gardens will meet the guideline value of 55 dB $L_{Aeq,16hour}$ for external amenity areas as defined in BS8233:2014, at Phase 1A.

Outline Area

6.20. Communal amenity areas, private gardens and private balconies are proposed at the site, as shown in Figure 13.

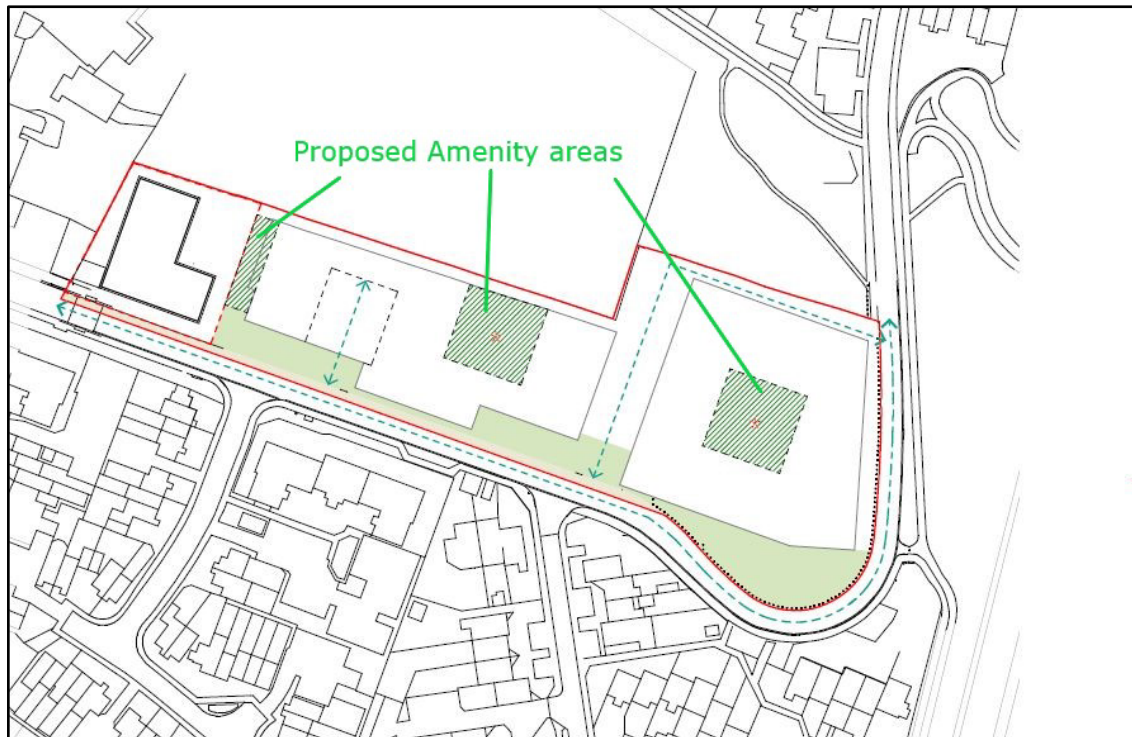


Figure 13 Amenity areas – Outline Area

- 6.21. Based on the measurements taken at the site, private balconies and gardens in close proximity to the A312 will exceed the upper guideline value of 55dB $L_{Aeq,16\text{hour}}$ for external amenity areas, as defined in BS8233:2014.
- 6.22. External sound levels at private balconies and gardens would meet the guidance criteria of BS8233 for the majority of spaces, only balconies most exposed to noise from the A312 dual carriageway would be marginally above the guidance criteria.
- 6.23. Only the balconies at the eastern end of the outline area, closest to the A312, would experience noise levels marginally above the guidance criteria. Alternative amenity spaces where noise levels are expected to be within the criteria of BS8233 are provided within the development and are available to use by all residents in the development.
- 6.24. For the communal amenity area located centrally, within buildings at the site, external sound levels are expected to meet the upper guideline value of BS8233 for all but the most exposed parts of this area. Screening has been provided as much as possible by the buildings proposed as part of the site.

6.25. Therefore, residents would have the choice of accepting higher external sound levels on balcony areas or use of alternative communal amenity areas where sound levels would be in line with the guidance in BS8233.

6.26. Additionally, BS8233 states the following in terms of the external amenity areas and the context of the site location:

"...in higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited..."

6.27. The site is located in an urban environment and there are numerous transport links in the immediate vicinity of the site, it is therefore considered that the above statement applies to the site and that amenity levels are appropriate in the context of the existing environment with the mitigation measures provided in this report.

Construction Phase

6.28. Construction activities should only take place between 08:00 to 18:00 on weekdays and 08:00 to 13:00 on Saturdays. No construction activity should be carried out during the night, on Sundays or on bank holidays without additional consideration to controlling noise and with the prior approval of the LPA.

6.29. During construction, the contractor will employ best practicable means to control noise from construction operations.

6.30. Temporary screening in the form of solid timber hoarding can be used where operations are adjacent to sensitive receptors. Consideration will be given to neighbouring residential properties when locating the temporary site compounds and material stockpiles.

6.31. Stationary equipment and plant such as generators will be placed as far as practicable from noise sensitive receptors, including the Minet Junior School, and preferably in areas benefiting from existing or purpose-built attenuation such as bunding or behind non-sensitive buildings.

- 6.32. Delivery of materials and removal of waste from the site will be planned to minimise disturbance to neighbouring receptors. Idling of plant, machinery and delivery vehicles should be prohibited when not in use.
- 6.33. If required noise levels can be monitored regularly in accordance with BS 5228 to ensure the above set limits are not exceeded. In addition to the above all other guidance within BS 5228 will be followed at all times.

7. Conclusions

- 7.1. A noise survey has been undertaken and measured levels have been used to calculate and assess suitable glazing and ventilation specifications.
- 7.2. Based on the measured sound levels at the site, façades in close proximity to the A312 are considered to be 'high risk', with all other façades considered to be 'medium risk' in accordance with guidance in ProPG. Expert Acoustics advice has been sought and good acoustic design processes have been followed to reduce sound levels across the site whilst considering wider design constraints.
- 7.3. Closed windows will be required to control internal amenity sound levels and alternative ventilation will be provided to all units via MVHR. Windows are not sealed shut and residents will have a choice to open windows for ventilation, e.g., for purge ventilation, whilst accepting slightly higher internal sound levels.
- 7.4. The risk of noise impact under overheating conditions within properties has been considered in accordance with AVO Guidance. Facades in close proximity to the A312, in Phase 1B, are considered to be 'high-risk', with all other façades in Phase 1A and Phase 2 considered to be 'medium-risk'. The overheating assessment has shown that, to protect residential amenity, windows can remain closed during periods of overheating with cooling provided via the MVHR to each unit.
- 7.5. External sound levels within private balconies and gardens in close proximity to the A312 dual carriageway will exceed the guidance criteria of BS8233. Mitigation measures have been proposed to reduce noise by as much as practically possible. With the proposed mitigation measures, external sound levels at private balconies and gardens would meet the guidance criteria of BS8233 for the majority of these spaces. Only balconies most exposed to noise from the A312 would still be marginally above the guidance criteria.
- 7.6. For the community amenity areas located centrally within the site, external sound levels are expected to meet the upper guideline value of BS8233 for all but the most exposed parts of this area. Therefore, residents would have the choice of a private balcony or garden space or a quieter communal amenity areas where sound levels would be in line with BS8233 guidance.
- 7.7. Control measures will be implemented to manage potential impacts from construction noise.

7.8. This assessment demonstrates that the site is suitable for residential development subject to the recommendations included in this report.

Appendix A Photographs of Survey Locations

Position 1 - Microphone Location



Position 1 - View to A312



Position 2 - Microphone Location



Position 2 - View West



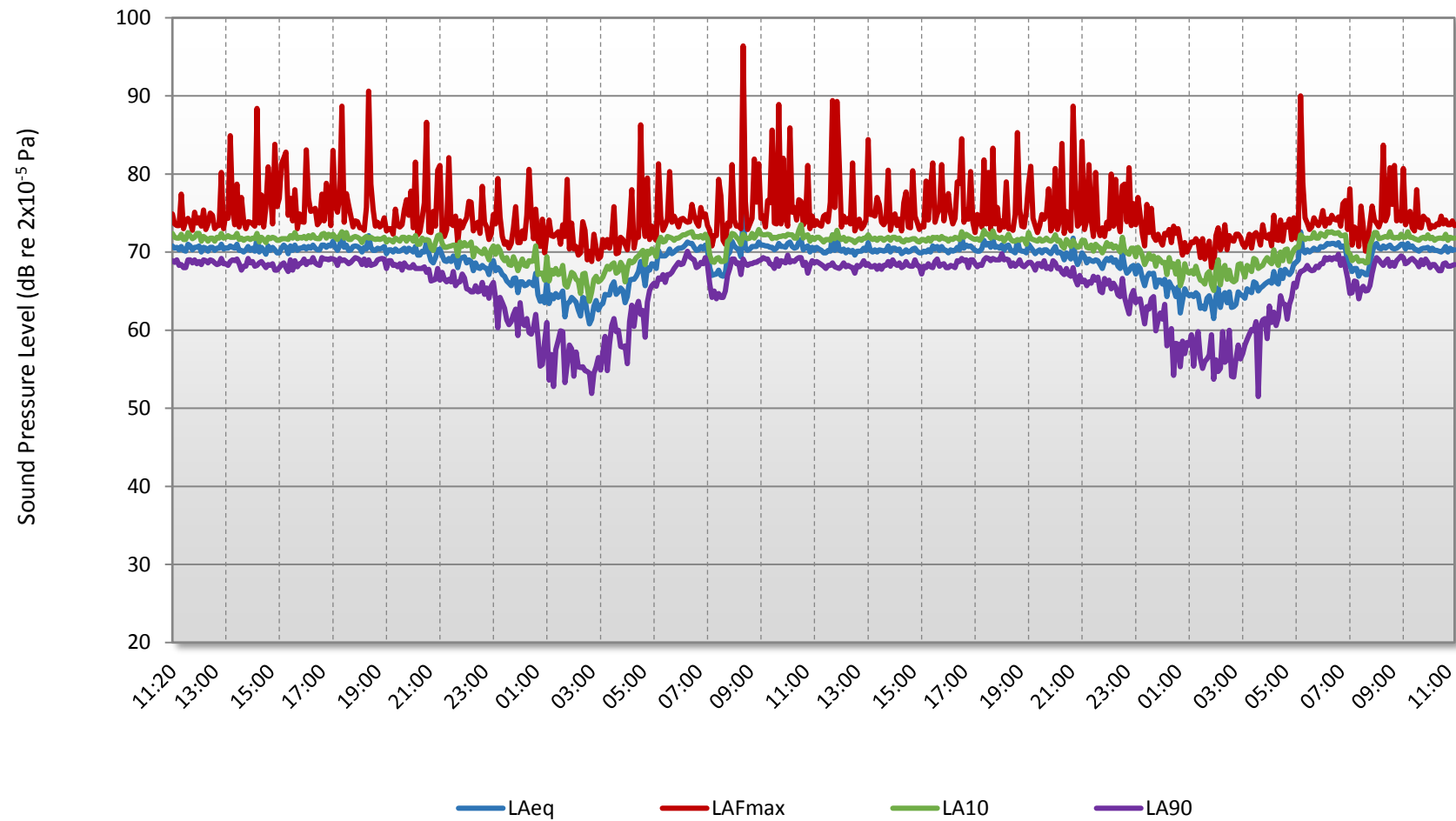
Position 2 - View Northwest



Appendix B Time Histories of Noise Measurement Data

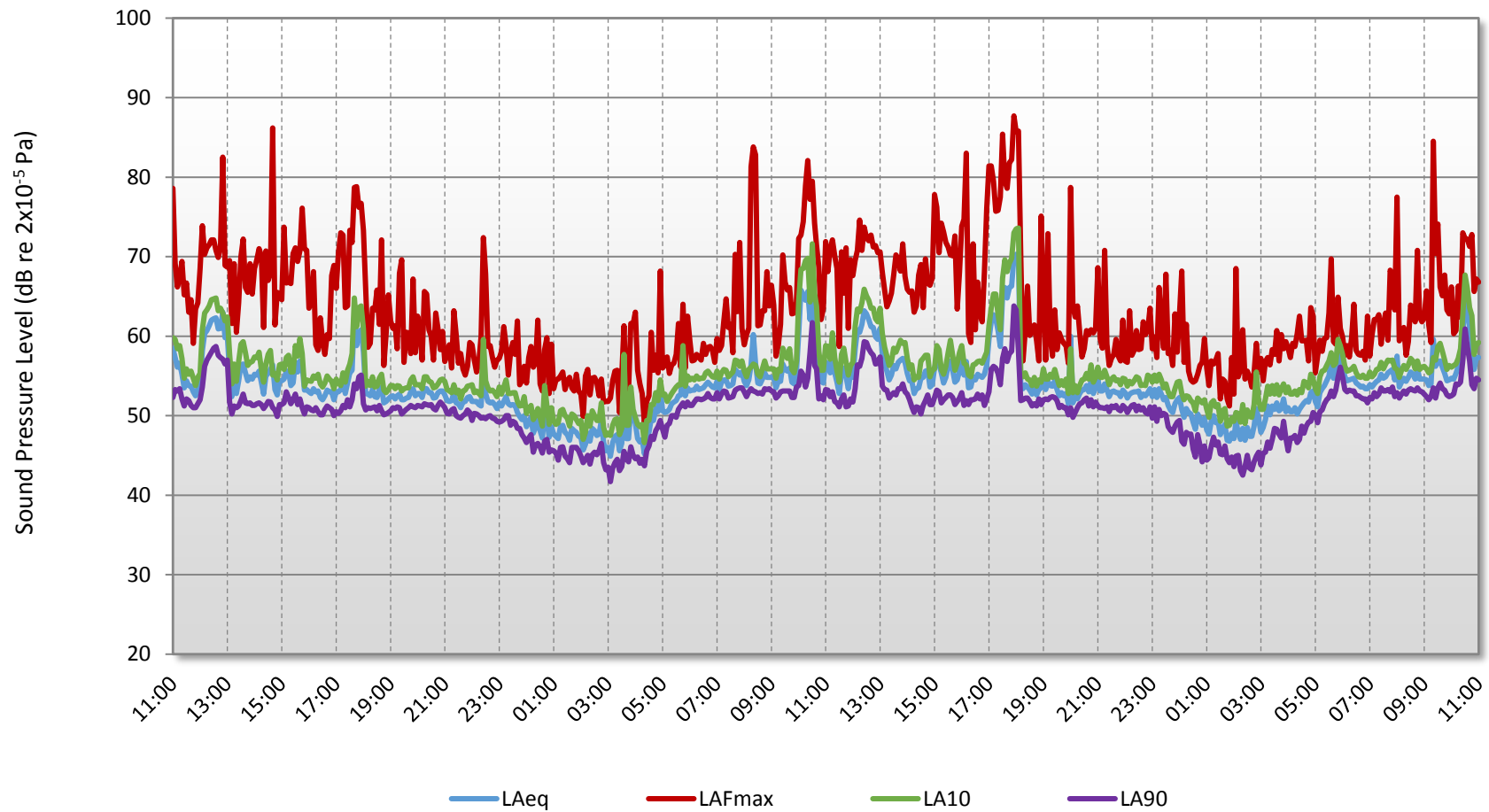
Avondale Drive, Hayes - Position 1

Environmental Noise Time History
11 October 2021 to 13 October 2021



Avondale Drive, Hayes - Position 2

Environmental Noise Time History
11 October 2021 to 13 October 2021



Appendix C Traffic Flow Volumes

07-23 AAWT		Completion Year Baseline			Full Development Flows			Completion Year with Dev		
Location	Speed Limit	Total Vehicles	No. HGV	% HGV	Total Vehicles	No. HGV	% HGV	Total Vehicles	No. HGV	% HGV
Avondale Drive	20mph	2,397	52	2.2%	172	0	0.0%	2,569	52	2.0%
A312	40mph	64,251	2,716	4.2%	0	0	0.0%	64,251	2,716	4.2%

Appendix D Table 3.54b of DMRB, LA111

Short term magnitude	Short term noise change (dB $L_{A10,18hr}$ or L_{night})
Major	Greater than or equal to 5.0
Moderate	3.0 to 4.9
Minor	1.0 to 2.9
Negligible	less than 1.0

Long term magnitude	Long term noise change (dB $L_{A10,18hr}$ or L_{night})
Major	Greater than or equal to 10.0
Moderate	5.0 to 9.9
Minor	3.0 to 4.9
Negligible	less than 3.0

Appendix E Façade Treatment Calculations

Description	
Ardent CE Project No.	2104170
Property Address	Avondale Drive
Room Type	Bedroom
Parameter	LAeq, 16h

Room Dimensions and Areas	
Room volume	35.00
Total Surface area	65.50
Wall façade area	10.00
Roof façade area	0.00
Glazing area	3.60
Dne Ref Area, A0	10.00
Total façade area	13.60

- Based on typical size

Room Absorption Calculation	63	125	250	500	1000	2000	4000	8000	
Estimated Reverberation time	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
Alpha bar	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	
Total Absorption	11.27	11.27	11.27	11.27	11.27	11.27	11.27	11.27	
10Log S/A	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	

- Typical Bedroom RT

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	66	61	62	64	68	63	50	39	70
Façade to free field	0	0	0	0	0	0	0	0	
Angle of view	0	0	0	0	0	0	0	0	
Screening (Maekewa)	0	0	0	0	0	0	0	0	
Distance correction	0	0	0	0	0	0	0	0	
Other	0	0	0	0	0	0	0	0	
Noise level at façade (Leq)	66	61	62	64	68	63	50	39	70

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw
Glazing SRI	19	24	24	33	39	40	49	50	36
Transmission Coefficient	0.012589	0.003981	0.003981	0.000501	0.000126	0.000100	0.000013	0.000010	
Wall SRI	28	34	43	55	66	77	85	85	55
Transmission Coefficient	0.001585	0.000398	0.000050	0.000003	0.000000	0.000000	0.000000	0.000000	
Roof SRI	23	26	43	52	60	65	65	65	51
Transmission Coefficient	0.005012	0.002512	0.000050	0.000006	0.000001	0.000000	0.000000	0.000000	
Ventilation, Dne	32	41	39	38	47	43	46	46	43
Transmission Coefficient	0.000631	0.000079	0.000126	0.000158	0.000020	0.000050	0.000025	0.000025	
Average Transmission Coeff	0.004962	0.001405	0.001183	0.000252	0.000048	0.000063	0.000022	0.000021	
Average SRI	23	29	29	36	43	42	47	47	40

Pilkington 6/16/10 laminate

Typical masonry cavity wall (300mm - 380kg/m2)

Airvac 5000 EAW - AC2

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A
Lp (Reverberant), line source	44.7	34.8	34.4	29.6	26.9	22.7	5.7	-6.4	32
Lp (Direct)	42.9	32.9	32.6	27.8	25.1	20.9	3.9	-8.2	31
Lp (Rev & Direct)	47	37	37	32	29	25	8	-4	35
BS8233	47	37	36	32	29	25	8	-4	34

Criteria

≤ 35

≤ 35

Description	
Ardent CE Project No.	2104170
Property Address	Avondale Drive
Room Type	Bedroom
Parameter	LAeq, 8h

Room Dimensions and Areas	
Room volume	35.00
Total Surface area	65.50
Wall façade area	10.00
Roof façade area	0.00
Glazing area	3.60
Dne Ref Area, A0	10.00
Total façade area	13.60

- Based on typical size

Room Absorption Calculation	63	125	250	500	1000	2000	4000	8000	
Estimated Reverberation time	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
Alpha bar	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	
Total Absorption	11.27	11.27	11.27	11.27	11.27	11.27	11.27	11.27	
10Log S/A	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	

- Typical Bedroom RT

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	61	58	58	61	65	60	48	36	67
Façade to free field	0	0	0	0	0	0	0	0	
Angle of view	0	0	0	0	0	0	0	0	
Screening (Maekewa)	0	0	0	0	0	0	0	0	
Distance correction	0	0	0	0	0	0	0	0	
Other	0	0	0	0	0	0	0	0	
Noise level at façade (Leq)	61	58	58	61	65	60	48	36	67

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw
Glazing SRI	19	24	24	33	39	40	49	50	36
Transmission Coefficient	0.012589	0.003981	0.003981	0.000501	0.000126	0.000100	0.000013	0.000010	
Wall SRI	28	34	43	55	66	77	85	85	55
Transmission Coefficient	0.001585	0.000398	0.000050	0.000003	0.000000	0.000000	0.000000	0.000000	
Roof SRI	23	26	43	52	60	65	65	65	51
Transmission Coefficient	0.005012	0.002512	0.000050	0.000006	0.000001	0.000000	0.000000	0.000000	
Ventilation, Dne	32	41	39	38	47	43	46	46	43
Transmission Coefficient	0.000631	0.000079	0.000126	0.000158	0.000020	0.000050	0.000025	0.000025	
Average Transmission Coeff	0.004962	0.001405	0.001183	0.000252	0.000048	0.000063	0.000022	0.000021	
Average SRI	23	29	29	36	43	42	47	47	40

Pilkington 6/16/10 laminate

Typical masonry cavity wall (300mm - 380kg/m2)

Airvac 5000 EAW - AC2

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A
Lp (Reverberant), line source	39.7	31.0	30.6	26.5	23.9	19.7	2.8	-8.7	29
Lp (Direct)	37.9	29.2	28.8	24.6	22.1	17.8	1.0	-10.5	27
Lp (Rev & Direct)	42	33	33	29	26	22	5	-7	31
BS8233	42	33	33	28	26	22	5	-7	31

Criteria

≤ 30

≤ 30

Total façade area	13.60
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- Typical Bedroom RT

[illegible]

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	72	72	70	71	73	68	56	47	76
Façade to free field	0	0	0	0	0	0	0	0	
Angle of view	0	0	0	0	0	0	0	0	
Screening (Maekewa)	0	0	0	0	0	0	0	0	
Distance correction	0	0	0	0	0	0	0	0	
Other	0	0	0	0	0	0	0	0	
Noise level at façade (LAMax)	72	72	70	71	73	68	56	47	76

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw
Glazing SRI	19	24	24	33	39	40	49	50	36
Transmission Coefficient	0.012589	0.003981	0.003981	0.000501	0.000126	0.000100	0.000013	0.000010	
Wall SRI	28	34	43	55	66	77	85	85	55
Transmission Coefficient	0.001585	0.000398	0.000050	0.000003	0.000000	0.000000	0.000000	0.000000	
Roof SRI	23	26	43	62	65	65	65	65	51
Transmission Coefficient	0.005012	0.002512	0.000050	0.000006	0.000001	0.000000	0.000000	0.000000	
Ventilation, Dne	32	41	39	38	47	43	46	46	43
Transmission Coefficient	0.000631	0.000079	0.000126	0.000158	0.000020	0.000050	0.000025	0.000025	
Average Transmission Coeff	0.004962	0.001405	0.001183	0.000252	0.000048	0.000063	0.000022	0.000021	
Average SRI	23	29	29	36	43	42	47	47	40

Airvac 5000 EAW - AC2

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A
Lp (Reverberant), line source	50.4	45.2	42.2	36.8	32.0	27.6	11.6	2.1	39
Lp (Direct)	48.6	43.4	40.4	34.9	30.2	25.8	9.8	0.3	37
Lp (Rev & Direct)	53	47	44	39	34	30	14	4	41
BS8233	52	47	44	39	34	30	14	4	41

 ≤ 45

Description	
Ardent CE Project No.	2104170
Property Address	Avondale Drive
Room Type	Bedroom
Parameter	L _{Aeq} , 16h

Room Dimensions and Areas	
Room volume	35.00
Total Surface area	65.50
Wall façade area	10.00
Roof façade area	0.00
Glazing area	3.60
Dne Ref Area, A0	10.00
Total façade area	13.60

- Based on typical size

Room Absorption Calculation	63	125	250	500	1000	2000	4000	8000	
Estimated Reverberation time	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
Alpha bar	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	
Total Absorption	11.27	11.27	11.27	11.27	11.27	11.27	11.27	11.27	
10Log S/A	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	

- Typical Bedroom RT

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	62	55	52	51	53	51	48	49	58
Façade to free field	0	0	0	0	0	0	0	0	
Angle of view	0	0	0	0	0	0	0	0	
Screening (Maekewa)	0	0	0	0	0	0	0	0	
Distance correction	0	0	0	0	0	0	0	0	
Other	0	0	0	0	0	0	0	0	
Noise level at façade (L _{eq})	62	55	52	51	53	51	48	49	58

Composite SRI	63	125	250	500	1000	2000	4000	8000	R _w
Glazing SRI	18	21	17	25	35	37	31	40	29
Transmission Coefficient	0.015849	0.007943	0.019953	0.003162	0.000316	0.000200	0.000794	0.000100	
Wall SRI	28	34	43	55	66	77	85	85	55
Transmission Coefficient	0.001585	0.000398	0.000050	0.000003	0.000000	0.000000	0.000000	0.000000	
Roof SRI	23	26	43	52	60	65	65	65	51
Transmission Coefficient	0.005012	0.002512	0.000050	0.000006	0.000001	0.000000	0.000000	0.000000	
Ventilation, Dne	36	36	34	31	34	38	38	38	35
Transmission Coefficient	0.000251	0.000251	0.000398	0.000794	0.000398	0.000158	0.000158	0.000158	
Average Transmission Coeff	0.005545	0.002580	0.005611	0.001423	0.000377	0.000169	0.000327	0.000143	
Average SRI	23	26	23	28	34	38	35	38	33

Pilkington 4/16/4

Typical masonry cavity wall (300mm - 380kg/m2)

Standard Trickle Vent (35dB)

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A
L _p (Reverberant), line source	41.0	31.4	30.9	24.2	20.5	14.9	15.0	12.0	28
L _p (Direct)	39.1	29.6	29.1	22.4	18.7	13.1	13.1	10.2	26
L _p (Rev & Direct)	43	34	33	26	23	17	17	14	30
BS8233	43	33	33	26	22	17	17	14	30

Criteria

≤ 35

≤ 35

Description	
Ardent CE Project No.	2104170
Property Address	Avondale Drive
Room Type	Bedroom
Parameter	L _{Aeq} , 8h

Room Dimensions and Areas	
Room volume	35.00
Total Surface area	65.50
Wall façade area	10.00
Roof façade area	0.00
Glazing area	3.60
Dne Ref Area, A0	10.00
Total façade area	13.60

- Based on typical size

Room Absorption Calculation	63	125	250	500	1000	2000	4000	8000	
Estimated Reverberation time	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
Alpha bar	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	
Total Absorption	11.27	11.27	11.27	11.27	11.27	11.27	11.27	11.27	
10Log S/A	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	

- Typical Bedroom RT

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	55	52	47	46	49	42	31	27	51
Façade to free field	0	0	0	0	0	0	0	0	
Angle of view	0	0	0	0	0	0	0	0	
Screening (Maekewa)	0	0	0	0	0	0	0	0	
Distance correction	0	0	0	0	0	0	0	0	
Other	0	0	0	0	0	0	0	0	
Noise level at façade (Leq)	55	52	47	46	49	42	31	27	51

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw
Glazing SRI	19	24	20	25	34	37	37	37	31
Transmission Coefficient	0.012589	0.003981	0.010000	0.003162	0.000398	0.000200	0.000200	0.000200	
Wall SRI	28	34	43	55	66	77	85	85	55
Transmission Coefficient	0.001585	0.000398	0.000050	0.000003	0.000000	0.000000	0.000000	0.000000	
Roof SRI	23	26	43	52	60	65	65	65	51
Transmission Coefficient	0.005012	0.002512	0.000050	0.000006	0.000001	0.000000	0.000000	0.000000	
Ventilation, Dne	36	36	34	31	34	38	38	38	35
Transmission Coefficient	0.000251	0.000251	0.000398	0.000794	0.000398	0.000158	0.000158	0.000158	
Average Transmission Coeff	0.004683	0.001531	0.002977	0.001423	0.000398	0.000169	0.000169	0.000169	
Average SRI	23	28	25	28	34	38	38	38	33

4/12/4 double glazing (BRE Calculator v2.0)

Typical masonry cavity wall (300mm - 380kg/m2)

Standard Trickle Vent (35dB)

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A
Lp (Reverberant), line source	33.8	26.0	23.8	19.7	16.9	6.3	-4.9	-9.2	22
Lp (Direct)	32.0	24.2	21.9	17.9	15.1	4.5	-6.7	-11.0	20
Lp (Rev & Direct)	36	28	26	22	19	9	-3	-7	24
BS8233	36	28	26	22	19	8	-3	-7	24

Criteria

≤ 30

≤ 30

Description	
Ardent CE Project No.	2104170
Property Address	Avondale Drive
Room Type	Bedroom
Parameter	L _{Amax}

Room Dimensions and Areas	
Room volume	35.00
Total Surface area	65.50
Wall façade area	10.00
Roof façade area	0.00
Glazing area	3.60
Dne Ref Area, A0	10.00
Total façade area	13.60

- Based on typical size

Room Absorption Calculation	63	125	250	500	1000	2000	4000	8000	
Estimated Reverberation time	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
Alpha bar	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	
Total Absorption	11.27	11.27	11.27	11.27	11.27	11.27	11.27	11.27	
10Log S/A	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	

- Typical Bedroom RT

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	67	63	60	59	59	53	44	36	62
Façade to free field	0	0	0	0	0	0	0	0	
Angle of view	0	0	0	0	0	0	0	0	
Screening (Maekewa)	0	0	0	0	0	0	0	0	
Distance correction	0	0	0	0	0	0	0	0	
Other	0	0	0	0	0	0	0	0	
Noise level at façade (L _{Amax})	67	63	60	59	59	53	44	36	62

Composite SRI	63	125	250	500	1000	2000	4000	8000	R _w
Glazing SRI	19	24	20	25	34	37	37	37	31
Transmission Coefficient	0.012589	0.003981	0.010000	0.003162	0.000398	0.000200	0.000200	0.000200	
Wall SRI	28	34	43	55	66	77	85	85	55
Transmission Coefficient	0.001585	0.000398	0.000050	0.000003	0.000000	0.000000	0.000000	0.000000	
Roof SRI	23	26	43	52	60	65	65	65	51
Transmission Coefficient	0.005012	0.002512	0.000050	0.000006	0.000001	0.000000	0.000000	0.000000	
Ventilation, Dne	36	36	34	31	34	38	38	38	35
Transmission Coefficient	0.000251	0.000251	0.000398	0.000794	0.000398	0.000158	0.000158	0.000158	
Average Transmission Coeff	0.004683	0.001531	0.002977	0.001423	0.000398	0.000169	0.000169	0.000169	
Average SRI	23	28	25	28	34	38	38	38	33

4/12/4 double glazing (BRE Calculator v2.0)

Typical masonry cavity wall (300mm - 380kg/m2)

Standard Trickle Vent (35dB)

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A
Lp (Reverberant), line source	45.5	37.0	36.7	32.6	26.7	17.0	8.2	0.5	34
Lp (Direct)	43.6	35.2	34.9	30.8	24.9	15.2	6.4	-1.3	32
Lp (Rev & Direct)	48	39	39	35	29	19	10	3	36
BS8233	47	39	39	35	29	19	10	3	36

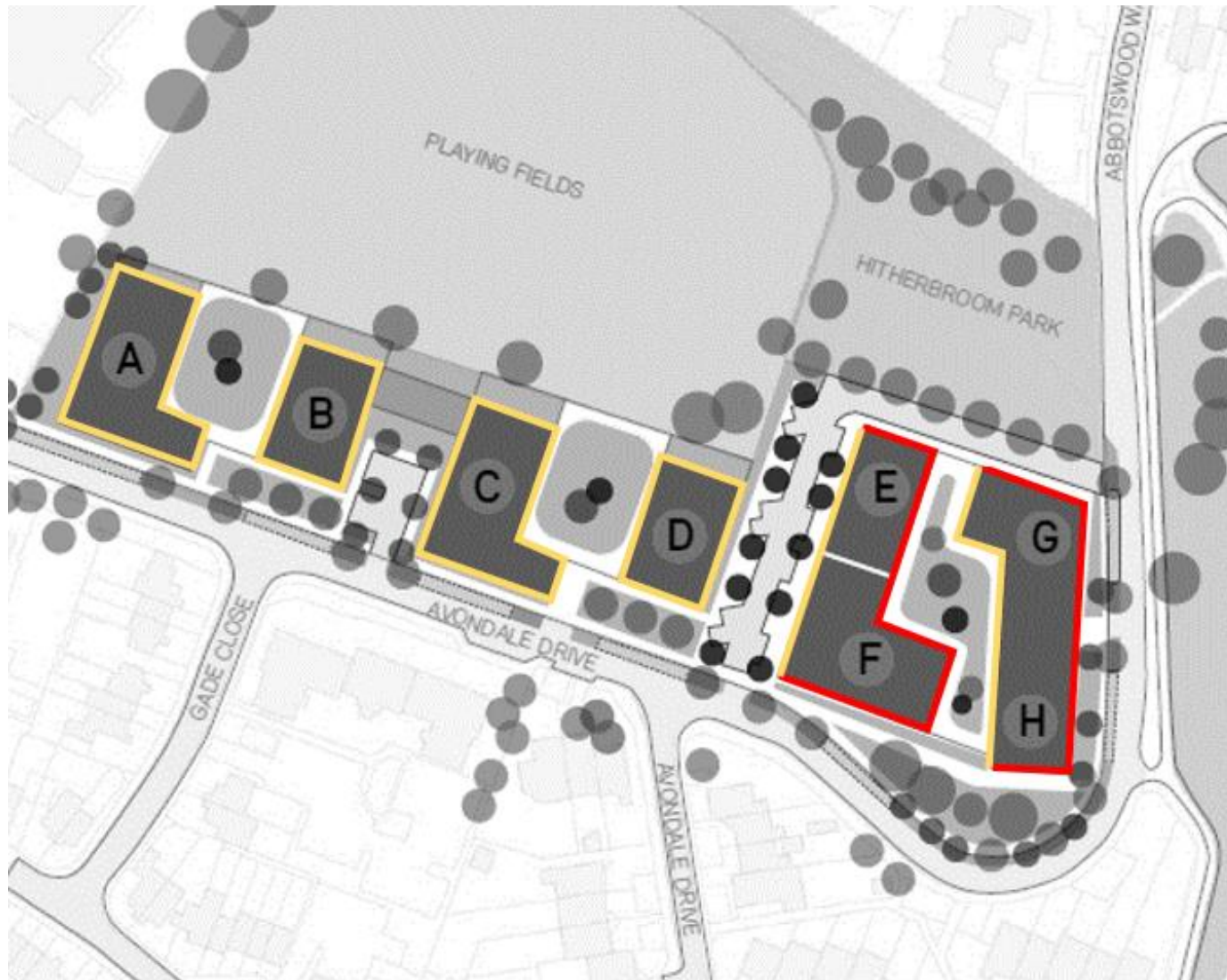
Criteria

≤ 45

≤ 45

Appendix F Overheating Risk Categories

Avondale Drive: Overheating Risk Categories – Day and Night



Risk Category for Level 1 Assessment according to Table 3-2 Acoustics, Ventilation and Overheating: Residential Design Guide

High	
Medium	
Low	
Negligible	

Appendix G Glossary of Acoustic Terminology

ACOUSTIC TERMINOLOGY

The effects of noise on human beings may be expressed in terms of physiological damage and annoyance. It is, however, only the annoyance impacts that need to be considered in detail when addressing environmental noise impacts. Annoyance also includes the immediate effects of activity interference, for example sleep disturbance and speech interference.

The practice has become to measure sound levels in decibels (dB). The decibel scale is logarithmic rather than linear and it is useful to bear in mind that a noise level change of 3dB would be equivalent to doubling the energy level (for example doubling the volume of traffic) and that an increase of 10 dB is perceived, subjectively, as a doubling of loudness. The human ear responds differently to sounds of different frequency. The ear perceives high frequency sound of a given sound pressure level more loudly than a low frequency sound at the same level. The A-weighted sound level, dB(A), takes this response into consideration and is commonly used for measurement of environmental noise in UK. It thus indicates the subjective human response to sound.

Environmental noise levels vary continuously from second to second, it is clearly impractical to specify the sound level continuously and thus time averaging is required. In practice human response has been related to various units which include allowance for the fluctuating nature of sound with time. For the purpose of this report these include:

LAeq,T : the equivalent A-weighted continuous sound level.

This unit relates to the equivalent level of continuous sound for a specific time period T, for example 16 hours for daytime noise. It contains all the sound energy of the varying sound levels over the same time period and expresses it as a continuous sound level over that period. The unit is used for assessing traffic and industrial noise for planning purposes and in particular for PPG24.

LA10,T : the A-weighted level of sound exceeded for 10% of the time period T.

This unit is used for traffic noise measurement and is the preferred unit for prediction of traffic noise in the publication, 'Calculation of Road Traffic Noise'.

LA90,T : the A-weighted level of sound exceeded for 90% of the time period T.

This unit is commonly used to represent the background noise and is used in assessing the effects of industrial noise in UK.

LAm_{ax} : the maximum A-weighted level of sound over a period of measurement.

LAr,T : the rating level.

The specific Noise plus any adjustments for the characteristic features of the noise. Used for comparison between background levels with the noise source off.

SEL : the Sound Exposure Level.

Sound exposure level abbreviated as SEL and LAE, is the total noise energy produced from a single noise event condensed into a 1 second time period.

R_w : weighted sound reduction index.

A laboratory-measured value as defined in ISO717 Part 1.

D_{nTw} :

The equivalent of R_w, but measured onsite as oppose to in a laboratory