The Landings, Ford Airfield

Phase RM4 (South)

Noise Impact Assessment
RM4_08.B
December 2024

Vistry Group

ARDENT
CONSULTING ENGINEERS
AN EMPLOYEE OWNED COMPANY

VISTRY HOMES LIMITED

THE LANDINGS, LAND AT FORD AIRFIELD

Reserved Matters RM4 (South) Noise Assessment

REPORT REF.
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Email: enquiries@ardent-ce.co.uk

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Appendices

Document Control Sheet

REV	ISSUE PURPOSE	AUTHOR	CHECKED	APPROVED	DATE
-	Final	CM	AS	LD	09/08/23
A	FINAL – with minor updates	CM	AS	LD	15/08/24
B	FINAL – with minor updates	CM	CM	AS	21/08/24
C	FINAL – with minor updates	CM	CM	AS	30/08/24
D	FINAL – with minor updates	JR	AS	LD	17/12/24

[redacted]

Distribution

1. Introduction

1.1. Ardent Consulting Engineers have been instructed Vistry Homes Limited to undertake a Noise Assessment to accompany a reserved matters planning application, RM4 (South), at the wider development area known as the Landings (hereafter referred to as the site). The site is located at Ford Airfield, Ford.

1.2. The masterplan for the site was endorsed by Arun District Council (ADC), and a noise assessment and environmental statement (ES) noise and vibration chapter was submitted as part of the outline application for the site (application ref: F/4/20/OUT).

1.3. The ES noise and vibration chapter provided a high-level assessment of internal and external amenity at proposed dwellings and also provided an outline assessment of commercial and industrial operations in the area.

1.4. Outline planning permission was granted subject to a number of conditions. Condition 25 relates to this assessment and is reproduced below.

25. Notwithstanding the Land Use and Density Parameter Plan (RG-M-123 Rev. L), any reserved matters application shall include a scheme setting out details of noise sources and proposed mitigation relevant to that application, to be secured as part of that reserved matters consent and where relevant to be in broad accordance with section 4 of the Waste Infrastructure Statement and to include details of:

- *The buffer zone between acoustic source and residential dwellings (including care home);*
- *The acoustic barriers around the edge of Ford Industrial Estate;*
- *Location of gardens so as to not face the noise sources; and*
- *Orientation of dwellings so that no habitable rooms are directly facing noise source.*

Reason: In the interests of residential amenity and to safeguard the continued use of existing and allocated waste management facilities and infrastructure in accordance with Policies QE SP1, QE DM1 and WM DM1 of the Arun Local Plan 2011-2031 and W2 and W10 of the Waste Local Plan.

Site Description

1.5. The surrounding area comprises a mix of uses. To the north and east of the is Ford Lane, to the east is a water treatment works and the rest of Ford Airfield, which hosts a market and car boot sale on Thursdays and Sundays. To the southeast is Horsemere Green Lane.

1.6. The industrial estates near the wider development area are Ford Airfield Industrial Estate to the west, Ford Lane Industrial Estate to the north and Rudford Industrial Estate to the southeast. There are also Biffa and Grundon waste processing and recycling facilities to the east and southeast respectively.

1.7. The approximate RM4 (South) site boundary, the wider development area, and the surrounding area are shown in Figure 1-1.

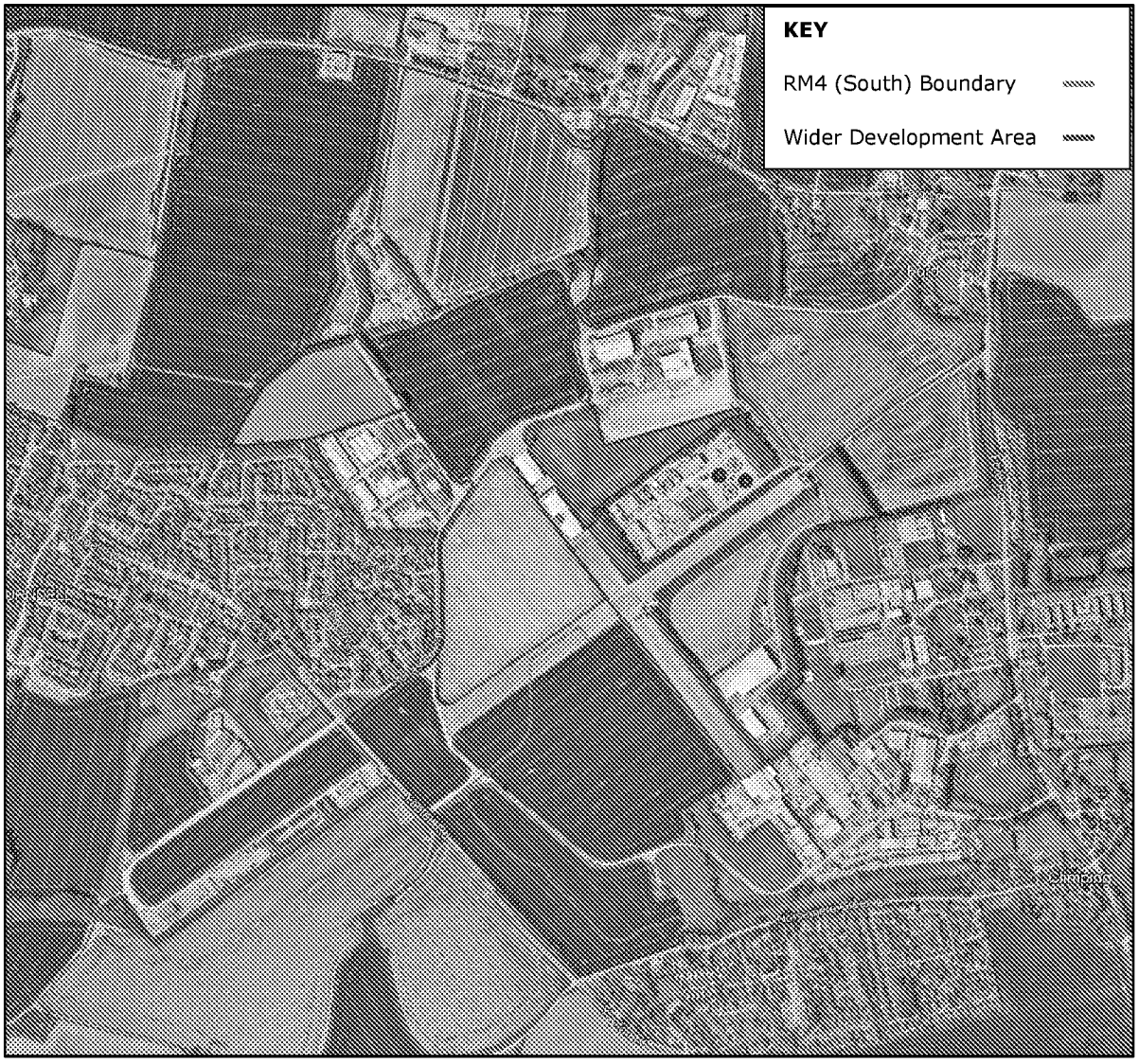


Figure 1-1: Site Boundary and Surrounding Area

Proposed Development

1.8. The description of the development is as follows:

Approval of reserved matters (layout, scale, appearance and landscaping) following outline consent F/4/20/OUT for phase RM4 (South), for the erection of 357 no. residential dwellings plus associated roads, infrastructure, parking, landscaping, open space & play areas, and associated works.

1.9. The modelled layout used to inform the assessment is drawing reference *22.1706.1000 Rev: N*. Since the model and calculations have been completed, minor revisions of the site layout have been developed *(drawing reference 22.1706.1000 Rev: S)*. However, there are no material differences that would alter the outcomes of the assessments within this report. The site layout is shown in Figure 1-2.

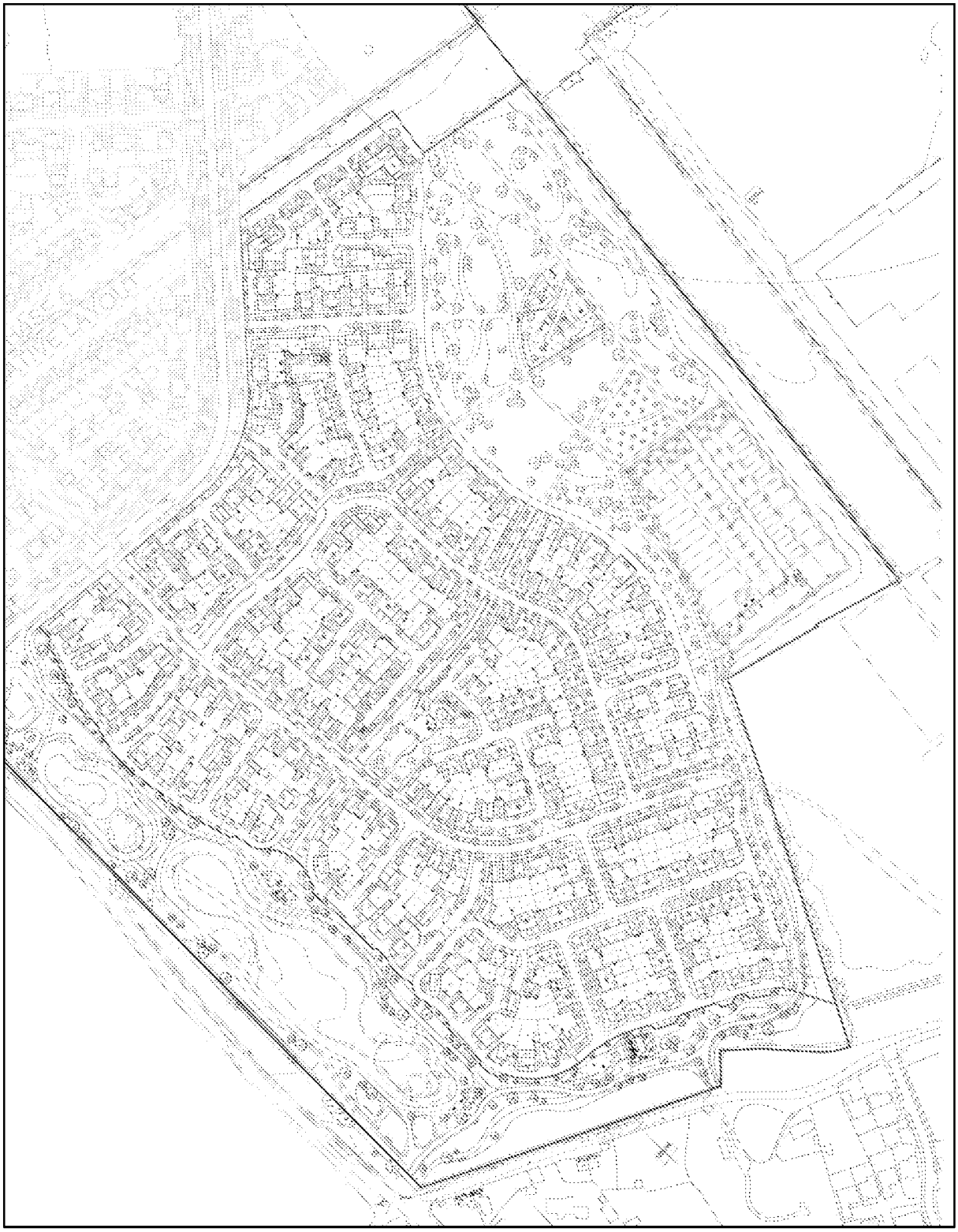


Figure 1-2: Site Layout

2. Local Authority Liaison

2.1. A meeting was held with officers at Arun District Council on the 16th June 2024 to discuss the assessment methodology and criteria. This approach has been followed in the assessment.

2.2. A summary of relevant policy and guidance is shown in Annex A.

3. Environmental Noise Levels

3.1. An environmental noise survey was undertaken between the 10th and 14th May 2024. Measurement positions were selected to obtain representative baseline noise levels due to the main observed sources in the vicinity, and to establish representative noise levels at the nearest dwellings to the site. The acoustic environment was influenced by noise from local road traffic on Yapton Road, Ford Road and Ford Lane.

3.2. Attended measurements were also taken of varying noise sources at the commercial and industrial operations at each indicated position, along with subjective observations. The measurement positions are shown in Figure 3-1.

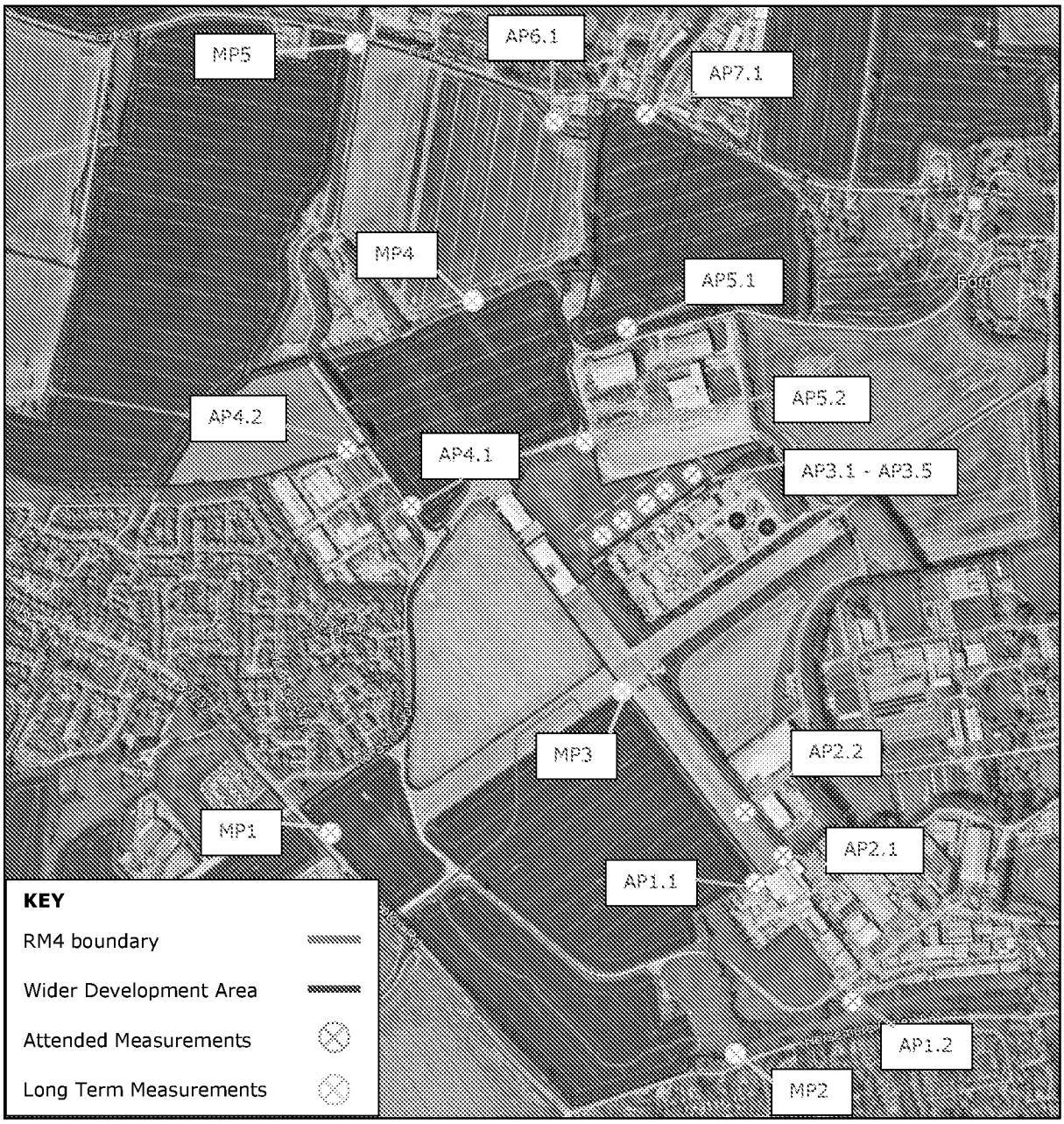


Figure 3-1: Measurement Positions

3.3. A description of the long term measurement positions is as follows:

- **Measurement Position 1:** The microphone was mounted at a height of approximately 1.5m above local ground level and had an unobstructed path to Yapton Lane.
- **Measurement Position 2:** The microphone was mounted at a height of approximately 2m above local ground level and had an unobstructed path to Horsemere Green Lane.
- **Measurement Position 3:** The microphone was mounted at a height of approximately 1.5m above local ground level and had an unobstructed path to Ford Airfield market and car boot sale.
- **Measurement Position 4:** The microphone was mounted at a height of approximately 2m above local ground level.
- **Measurement Position 5:** The microphone was mounted at a height of approximately 1.5m above local ground level and had an unobstructed path to Ford Lane.

3.4. The equipment used for the survey was as follows:

- 4 x Svantek Svan 977 Sound Level Meters (serial numbers: 34132, 34133, 45350, 45355);
- Svantek Svan 971 Sound Level Meter (serial number: 34787);
- Rion NC74 Calibrator (serial number: 34172694).

3.5. All equipment used has been professionally calibrated. Field calibration of the sound level meters (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.

3.6. Adverse weather, including elevated wind speeds, affected noise levels during parts of the survey. Where appropriate, the following periods have been excluded from assessment.

- 10th May, 13:00 to 17:00;
- 12th May, 20:15 to 23:00;
- 13th May, 04:30 to 20:15 (intermittent wind during period);
- 14th May 04:30 to 07:00.

3.7. Weather conditions were suitable for environmental noise measurements for the remainder of the survey.

A summary of measurements is shown in Table 3-1 and time histories of measured noise levels at long term measurement positions are shown in Appendix A.

Measurement Position	Ambient Noise Level, dB $L_{Aeq,T}$ Range (Average)		Background Sound Level, dB $L_{A90,T}$ Range (Representative)		Night L_{AFmax}, dB(A) Range (Representative)
	Day	Night	Day	Night	
MP1	52-76 **(65)**	26-67 **(58)**	30-60 **(48)**	22-50 **(36)**	38-84 **(81)**
MP2	37-61 **(49)**	39-52 **(46)**	35-50 **(41)**	33-48 **(36)**	41-74 **(70)**
MP3	37-57 **(48)**	29-57 **(44)**	33-50 **(40)**	27-50 **(39)**	40-80 **(68)**
MP4	34-61 **(47)**	30-60 **(46)**	31-48 **(39)**	28-52 **(33)**	38-84 **(72)**
MP5	39-71 **(57)**	39-59 **(49)**	35-53 **(39)**	34-44 **(37)**	40-83 **(75)**

Table 3-1: Summary of Measured Noise Levels

3.8. The representative L_{Amax} 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 World Health Organisation (WHO) guidelines.

3.9. Representative octave band levels from the long term measurement positions are provided in Table 3-2. Where appropriate, these are used in glazing calculations to ensure a robust assessment of internal noise levels.

		Octave Band Centre Frequency, dB							
		63	125	250	500	1k	2k	4k	8k
MP1	$L_{eq,T}$ (day)	67	63	60	60	63	57	45	36
	$L_{eq,T}$ (night)	58	53	50	52	55	50	43	40
	$L_{Fmax,T}$ (night)	83	80	75	77	79	73	66	56
MP2	$L_{eq,T}$ (day)	58	55	49	44	44	39	40	33
	$L_{eq,T}$ (night)	50	44	40	40	39	38	40	34
	$L_{Fmax,T}$ (night)	57	49	46	48	49	65	66	57
MP3	$L_{eq,T}$ (day)	57	53	47	46	43	39	33	25
	$L_{eq,T}$ (night)	55	49	42	40	38	38	33	28
	$L_{Fmax,T}$ (night)	66	64	53	52	58	63	63	60
MP4	$L_{eq,T}$ (day)	56	50	47	45	41	37	39	35
	$L_{eq,T}$ (night)	50	43	41	39	38	39	40	36
	$L_{Fmax,T}$ (night)	61	60	66	69	65	65	64	60
MP5	$L_{eq,T}$ (day)	61	57	52	48	53	50	46	41
	$L_{eq,T}$ (night)	55	51	44	41	45	43	41	37
	$L_{Fmax,T}$ (night)	69	65	62	59	68	65	72	67

Table 3-2: Octave Band Data for Noise Monitoring Locations

3.10. Based on the measurements taken onsite and the proposed development, a 3D computer based environmental noise model has been created using the DataKustik 'CadnaA' Noise Mapping software. The following has been taken into account in the generation of the noise model:

- The noise model was set up to apply the noise prediction methodology set out in ISO 9613-2: Acoustics – Attenuation of Sound propagation outdoors – Part 2: General Method of Calculation;
- The model has been set to include first order reflected noise from solid structures;
- The topography of the site and surrounding area has been taken into consideration in the assessment;
- The detailed layout of the site has been taken into account;

- Acoustic screening and reflections afforded by nearby buildings, solid structures and fences/barriers;
- The model has been calibrated and verified using the noise survey data, the current baseline traffic flows for the surrounding road network and the commercial and industrial operations in the area.

3.11. Noise contours are shown in Appendix B, where appropriate these include traffic on the primary site access road.

3.12. Based on the noise survey results and the noise model, the site would be considered low risk in accordance with ProPG Guidance.

3.13. Low risk sites are likely to be acceptable from a noise perspective provided that good acoustic design principles are followed. An acoustic design statement (ADS) has been produced which demonstrates how adverse impacts of noise can be controlled by the finished development. The ADS is shown in Appendix C.

4. Noise from Commercial & Industrial Operations

Description of Operators

4.1. A number of commercial and industrial operations are located in the vicinity of the wider development area, as shown in Figure 4-1.

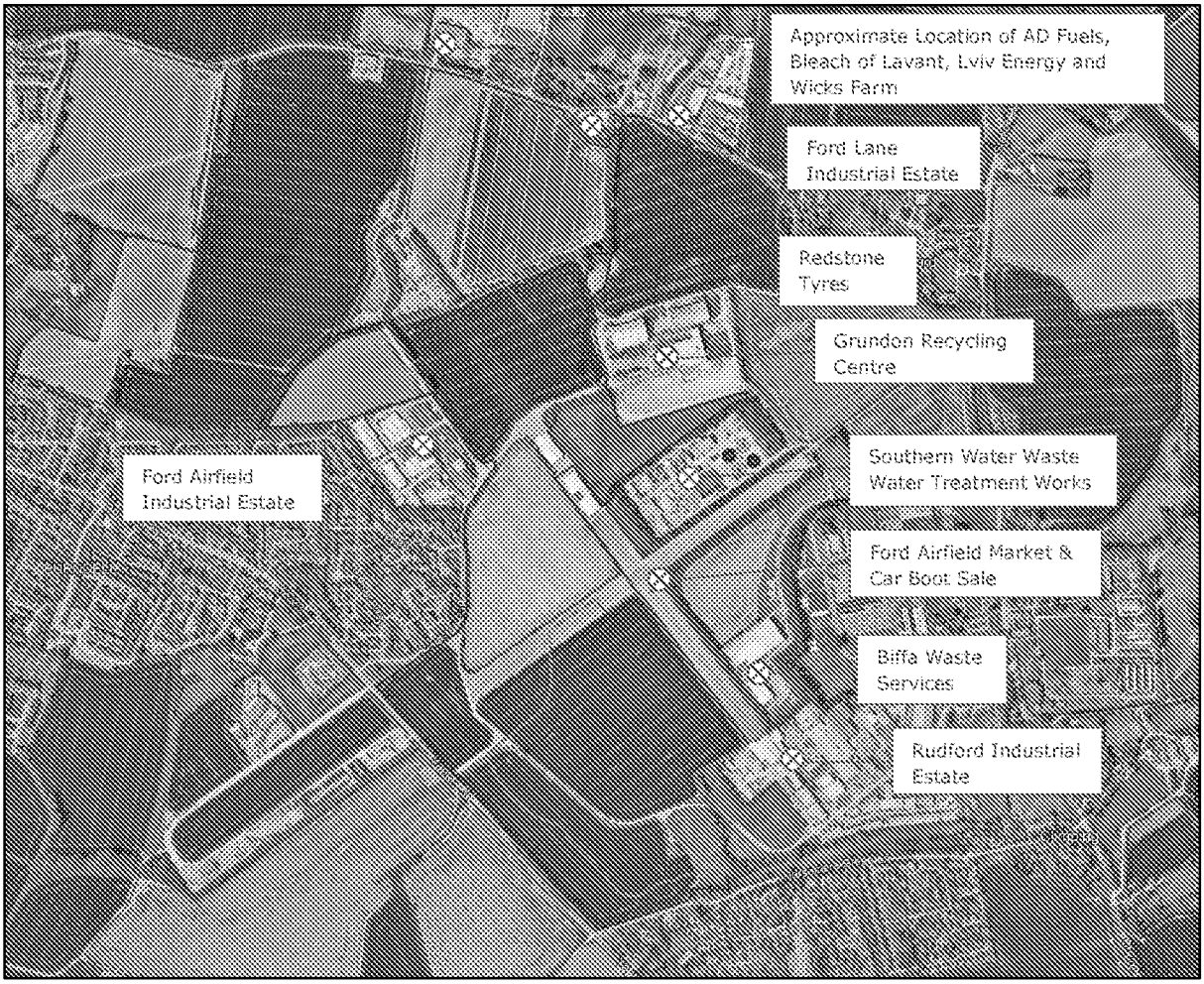


Figure 4-1: Commercial & Industrial Operations

4.2. Noise from the commercial and industrial operations have been considered based on publicly available planning and EA permitting information (where applicable) and the observations taken on site during the attended noise survey.

4.3. Industrial and commercial operations were audible but not dominant in the context of the acoustic environment, which is controlled by local road traffic on Yapton Road, Ford Road and Ford Lane.

4.4. Notable operations include Ford Lane Industrial Estate, Biffa Waste Servies, Grundon Recycling Centre, Rudford Industrial Estate and Ford Airfield Market and Car Boot

Sale. Other more distant sources were either not audible across RM4 or not considered to be significant. However, sources for each use have been included within the noise model to present a cumulative noise assessment of industrial and commercial noise.

Ford Airfield Industrial Estate

4.5. At Ford Airfield Industrial Estate, the observed noise sources were from the processing of scrap metal at HD White, which mainly consisted of grab handlers moving scrap from one location to another. It is understood that HD White operates between 08:00 and 17:00 hours, Monday to Saturday.

4.6. At one of the smaller units at the industrial estate, the roller shutter door was open and power tools such as grinders and saw were being used inside the unit. The location of the unit is shown in Figure 4-2.

Figure 4-2: Location of Small Unit at Ford Airfield Industrial Estate

4.7. During the attended survey, no other noise sources were observed to be operational at Ford Airfield Industrial Estate.

Biffa

4.8. The main noise sources at the Biffa site are the delivery and processing of waste. HGVs deliver materials to the site, the majority of which is understood to be offloaded inside the main building. Materials such as glass are processed in a smaller building and offloading of glass outside the building by mobile plant was observed during the attended survey. It is understood that the access roads around the site are cleaned by road sweepers during the day.

4.9. Biffa waste processing is subject to conditions regarding operational times. The delivery of all materials is permitted between 06:00-22:00 Mondays to Fridays and 08:00-18:00 on Saturdays, Sundays or Public Holidays.

4.10. Operations are also not permitted to be carried out in the open outside of 08:00 to 18:00 Mondays to Fridays and 08:00 hours to 16:00 hours on Saturdays, Sundays and Public Holidays. For the delivery of glass, these hours are 08:00-18:00, Monday to Friday. No outdoor operations are permitted at the site outside of 08:00-18:00 Mondays to Fridays and 08:00-16:00 hours on Saturdays, Sundays and Public Holidays.

Grundon

4.11. The main noise source at the Grundon site is the delivery of waste, which is understood to occur inside the building indicated in Figure 4-3. This building is also indicated as the site boundary within the relevant EA permit.

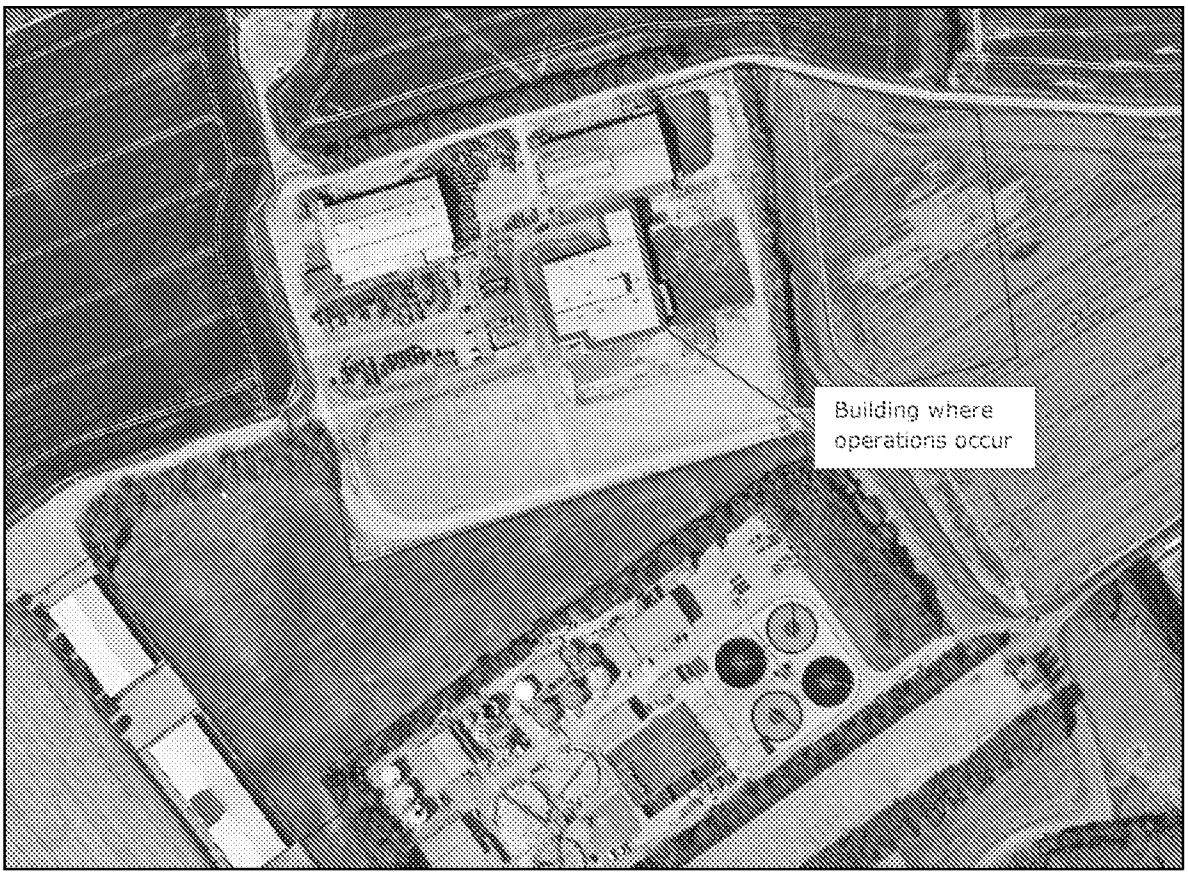


Figure 4-3: Grundon Processing Building

4.12. Waste is delivered by HGVs and is processed inside the building. During the attended survey, no activity other than HGVs was observed outside the building. Based on aerial photography, mobile plant is located outside the building and therefore movements of mobile plant have been considered.

4.13. Grundon is subject to conditions regarding operational times. Operations are restricted to 07:00-20:00 Mondays to Saturdays, with no operations permitted on Sundays, Bank Holidays or Public Holidays.

Rudford Industrial Estate

4.14. At Rudford Industrial Estate, the main sources of noise were HGV movement at the main access road within the industrial estate from ST Containers, car movements along the main access road, noise from fixed mechanical plant at Styropack and noise from a compressor at Bear Kustoms Paintworks.

4.15. It is understood that ST containers operates between 08:00 and 18:00, Monday to Friday. Styropack is understood to operate 24 hours a day, every day of the week

and Bear Kustoms Paintwork is understood to operate between 08:00 and 17:00 Monday to Friday, and 08:00 and 12:00 on Saturday.

Ford Airfield Market & Car Boot Sale

4.16. Based on the website for Ford Airfield Market and Car Boot Sale, the market is open on Thursdays and Sundays every week. A detailed review of the noise data and audio recordings which were taken throughout the survey at long term measurement position MP3 has been undertaken, which was positioned close to the area the market operates.

4.17. Based on the audio recordings, setup at the market started at approximately 05:15, prior to the opening time of 06:00. Setup consisted of vehicles arriving at the site and being unloaded and the setting up of stalls. Activities at the market during the earlier part of the morning were limited to setup, with the majority of patrons arriving at the market from around 07:15 onwards. During the market, noise from patrons and noise from a small loudspeaker system at one of the market stalls were the main noise sources.

4.18. From approximately 12:00 onwards patrons began to leave the market and pack down of the stalls started. Noise from the pack down of stalls and vehicles leaving the market continued until approximately 14:30, when the final vehicles left.

Mitigation Measures

4.19. Screening is proposed to Ford Airfield Industrial Estate. The screening, which is 4m high, forms part of the infrastructure reserved matters planning application and is shown in drawing 2205771-100_P13. The approximate location of the screening is shown in Figure 4-4.

4.20. The screening proposed at Ford Airfield Industrial Estate should be implemented prior to occupation of any properties built at a standoff of <500m from the barrier location.

4.21. Screening has been optimised to reduce noise levels by as much as practicably possible, whilst also taking into account other design considerations, such as landscaping and arboriculture.

Figure 4-4: Approximate Location of Screening

BS 4142 Assessment

4.22. Based on the information set out above, a detailed noise model of the commercial and industrial operations has been developed. The model has been used to inform the assessment of these sources.

4.23. The specific sound levels have been derived based on the cumulative noise levels from the various operations in the vicinity of the site within the noise model. The specific sound level has been calculated to include the proposed 4m high screening.

4.24. The residual sound levels have been derived from the measured data at position MP4 in the absence of commercial operators. This position has been chosen as it is considered representative of the acoustic environment at receptors at the proposed development.

4.25. Where appropriate, the representative background sound levels have been derived from the measured data at position MP4. The representative background sound levels are 39dB $L_{A90,T}$ and 33dB $L_{A90,T}$ during the day and night at position MP4

4.26. The assessment has been divided into two groups of receptors, dwellings closest to Biffa Waste Services, Rudford Industrial Estate and Ford Airfield Market & Car Boot and dwellings closest to Ford Airfield Industrial Estate, Grundon Recycling Centre and Ford Airfield Market & Car Boot.

4.27. The majority of the surrounding operations take place during the day only, with the exception of Styropack, Biffa and Ford Airfield Market and Car Boot Sale. BS 4142 states that the standard is not intended to be applied to the assessment of indoor sound levels.

4.28. As most of the operations take place during the day only, it is considered appropriate to assess the closest proposed private gardens, to determine the level of impact during the day.

4.29. For the operations taking place at night, the closest first floor façade level has been assessed, to represent a bedroom.

Dwellings Close to Biffa Waste Services, Rudford Industrial Estate & Ford Airfield Market & Car Boot

4.30. BS 4142 provides specific guidance regarding an acoustic feature correction if sound from the operations will contain characteristics that could attract a listener's attention at the noise sensitive receptors.

4.31. Due to the nature of activities at Biffa Waste Services, Rudford Industrial Estate and Ford Airfield Market and Car Boot Sale, a 3dB acoustic feature correction has been applied. The initial assessment of likely significance from Biffa Waste Services, Rudford Industrial Estate and Ford Airfield Market and Car Boot Sale is shown in Table 4-1.

	Closest Proposed Dwellings	
Initial Assessment	**Day**	**Night**
Residual sound level, dB $L_{Aeq, 60min}$	44	37
Specific Sound Level dB $L_{Aeq,T}$	35	36
Acoustic Characteristic Correction, dB	+3	+3
Rating Level, dB $L_{Ar,Tr}$	38	39
Background sound level, dB $L_{A90, T}$	39	33
Excess over background, dB	-1	+6
Initial Assessment	Low Impact	Adverse Impact

Table 4-1: BS4142 Initial Assessment

4.32. During the day, a rating level of 38dB L_{Aeq} is 6dB below the residual sound level and 1dB below the background sound level, which is considered low impact when assessed in accordance with BS 4142.

4.33. At night, the rating level is predicted to be 6dB above the background sound level, which is considered to present an adverse impact in accordance with BS 4142, depending on the context.

4.34. It should be noted that the guidance presented within BS 4142 promotes a flexible assessment methodology that can be modified depending on the context in which a sound source occurs.

4.35. BS 4142 states the following regarding consideration of internal sound levels:

"…Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following….

…3) The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:

i) facade insulation treatment;

ii) ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and

iii) acoustic screening…"

4.36. Consideration should therefore be given to the proposed façade treatments to dwellings at the site.

4.37. The proposed glazing and ventilation strategy outlined in Section 6 of this report has been designed to mitigate noise associated with local road traffic noise, which is the dominant source in the area. This includes the prevision of closed windows and an alternative means of ventilation. Therefore, by controlling noise from local road traffic, the proposed glazing and ventilation strategy will be sufficient to reduce noise levels from surrounding industrial and commercial operations, so that suitable internal amenity is achieved.

4.38. When the acoustic environment and mitigation measures for the site are considered, it is expected that nearby industrial and commercial operations will have a low impact on the proposed residential receptors at the site.

Dwellings Close to Ford Airfield Industrial Estate, Grundon Recycling Centre & Ford Airfield Market & Car Boot

4.39. Due to the nature of activities at Grundon Recycling Centre and Ford Airfield Industrial Estate, a 3dB acoustic feature correction has been applied for impulsivity during the day. During the night, a 3dB acoustic feature correction has been applied due to the activities during setup at Ford Airfield Market and Car Boot Sale. The initial assessment of likely significance from, Ford Airfield Industrial Estate, Grundon Recycling Centre and Ford Airfield Market and Car Boot Sale is shown in Table 4-2.

	Closest Proposed Dwellings	
Initial Assessment	**Day**	**Night**
Residual sound level, dB $L_{Aeq, 60min}$	44	37
Specific Sound Level dB $L_{Aeq,T}$	36	30
Acoustic Characteristic Correction, dB	+3	+3
Rating Level, dB $L_{Ar,Tr}$	39	33
Background sound level, dB $L_{A90, T}$	39	33
Excess over background, dB	0	0
Initial Assessment	Low Impact	Low Impact

Table 4-2: BS4142 Initial Assessment

4.40. The rating levels of 39dB $L_{Ar,Tr}$ and 33dB $L_{Ar,Tr}$ are 5dB and 4dB below the residual sound levels in the day and night and equal to the background sound levels during the day during the day and night, which is considered low impact when assessed in accordance with BS 4142. Therefore, existing industrial and commercial operations will not result in an adverse impact on future residents.

5. Air Source Heat Pumps

5.1. It is understood that air source heat pumps will be installed at each property across the scheme. At this stage of the development, the exact location, orientation and specifications are not known.

5.2. When more detailed information becomes available, it is recommended that an assessment is carried out in accordance with the Chartered Institute of Environmental Health (CIEH) and Institute of Acoustics (IoA): Heat Pumps Professional Advice Note.

5.3. Air source pumps will be selected, located, orientated and if necessary, attenuated, to reduce noise levels so that there will be no adverse effect on residents.

5.4. It is worth noting that the by the time the proposed development will be constructed, domestic air source heat pump technology is expected to have progressed. It is likely that quieter units will be available at the time of construction, which will be considered at the time of installation and can be controlled through a suitable worded planning condition.

6. Acoustic Design and Mitigation

6.1. The aim of this section is to discuss the acoustic design considerations and to identify mitigation measures to achieve the guidance sound levels.

6.2. The site responds to the various noise sources at the site through the inclusion of good acoustic design principles. The design of the site maximises the separation distance between dwellings, Yapton Road and the primary access road with the introduction of a landscaped area closest to the road. The layout also provides screening with the use of relatively continuous intervening buildings adjacent to Yapton Road and the primary access road.

6.3. At the majority of dwellings private amenity areas are located on the sheltered sides of buildings and habitable rooms are orientated so that they do not face noise sources, whilst taking into account other design considerations.

6.4. Where necessary the design of some dwellings will enable residents to keep windows closed and an alternative means of ventilation will be provided, the design of the site means only a limited number of dwellings require this.

6.5. It is important to note that windows would not be sealed shut and residents will have the choice of opening them, whilst noting noise levels will slightly increase. The areas where closed windows and alternative ventilation will be required is shown in Figure 6-1.

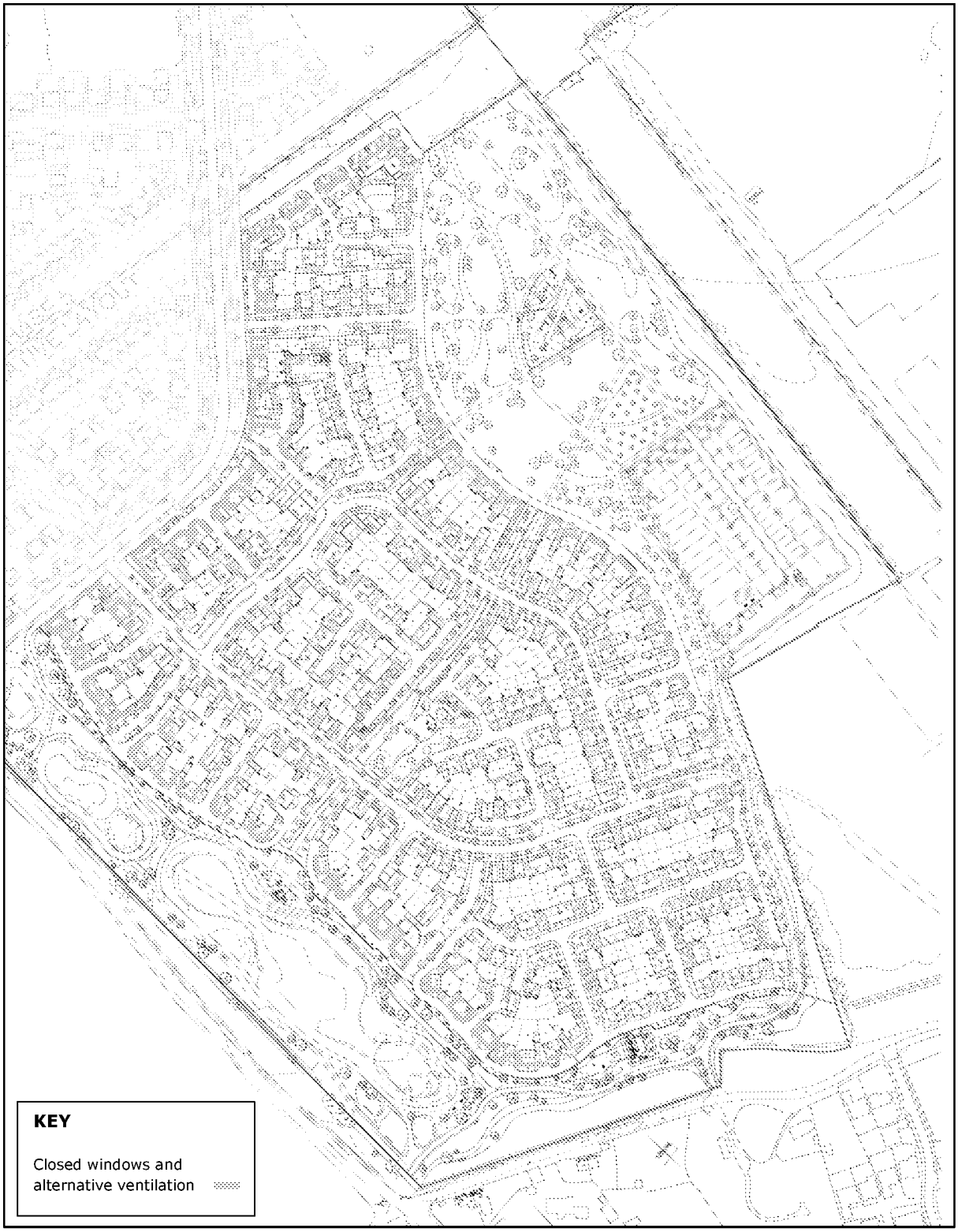


Figure 6-1: Closed Windows & Alternative Ventilation

6.6. Glazing and ventilation specifications are based on the measured noise levels and the results of the noise modelling. The calculations show worst case and representative examples to demonstrate that in principle mitigation solutions are

available and it is expected that these would be developed at detailed design stage for the site.

6.7. The calculations consider the existing noise environment, the proposed primary access road, and the commercial and industrial sources in the area. The calculations are presented in Appendix D.

6.8. As the site access roads do not currently exist, no measured noise data is available. Therefore, the mitigation measures for dwellings close to the primary access roads are based on the predicted noise levels from the noise modelling and the typical road traffic noise spectrum shown in BS EN 1793-3. A typical maximum noise spectrum which is representative of the access roads has been used for assessment.

External Building Fabric - Non-Glazed Elements

6.9. It is understood that the non-glazed external building fabric elements comprise masonry cavity walls or constructions of equivalent acoustic performance. This would typically provide a sound reduction performance of at least the figures shown in Table 6-1[1] when tested in accordance with BS EN ISO 10140-2:2010. This has been assumed as part of the assessment for both residential dwellings and the commercial units and community spaces.

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

Table 6-1: Non-glazed Elements Sound Reduction Performance

External Building Fabric - Glazing

6.10. Table 6-2 sets out the required glazing performance types for residential dwellings, these specifications take into account the glass, frame, seals and associated fittings.

[1] Figures derived from: Representative Values of Airborne SRI for Some Common Structures: Appendix B of Flakt Woods 'Guide to Noise Control'

Glazing Type	Room Type	Sound Reduction Index, R_W	Octave band centre frequency SRI, dB					
			125	250	500	1k	2k	4k
Type 1	All Rooms	31	20	18	28	38	34	38

Table 6-2: Required Minimum Sound Reduction Performance for Glazing

External Building Fabric - Ventilation

6.11. Table 6-3 sets out the required ventilation performance for residential dwellings.

Ventilation Type	Room Type	Element Normalised level difference, $D_{n,w}$	Octave band centre frequency SRI, dB					
			125	250	500	1k	2k	4k
Type 1	All Rooms	35	36	34	31	34	38	38

Table 6-3: Required Minimum Sound Reduction Performance for Ventilation

6.12. Where non-sensitive rooms and sensitive rooms form part of an open plan area, for example a living room, 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. Glass performance data alone would not necessarily demonstrate compliance with this specification.

6.14. It should be noted that there may be additional considerations for glazing such as overheating, security, thermal performance, and air quality. Alternative glazing could be used assuming the minimum acoustic performance is met.

Overheating

6.15. Noise levels place facades in close proximity to Yapton Road and the primary site access road in the low to medium categories of the Acoustics Ventilation and Overheating (AVO) guidance.

6.16. All other facades which are either sufficiently screened or far away enough from Yapton Road and the primary access road are in the negligible to low risk categories.

6.17. In these circumstances a Level 2 Overheating assessment is recommended for parts of the site which fall within the medium risk category as per the Level 1 site risk assessment. Facades at the site which fall within the medium risk category are shown in Appendix E of this report.

6.18. The strategy to provide thermal comfort and suitable internal noise levels will be developed further as part of the detailed design of the site.

External Amenity Areas

6.19. Apartment balconies and gardens are proposed across the site. Based on the results of the noise modelling, noise levels in all gardens will meet the guidance criteria. A small number of balconies which directly overlook the primary site access road will marginally exceed the criteria. The excess above the criteria is no greater than 3dB. Facades where balconies marginally exceed the guidance criteria are shown in Figure 6-2.

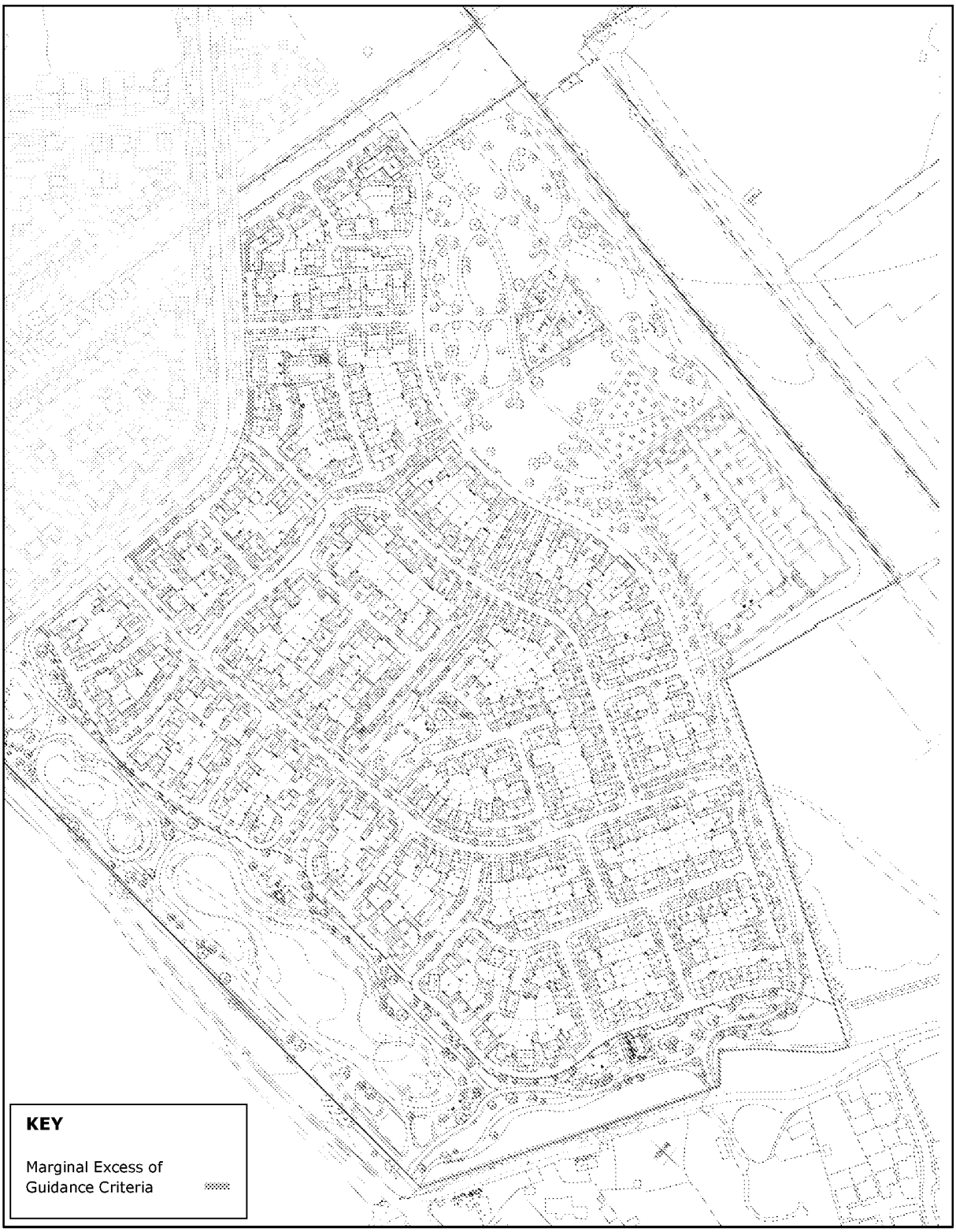


Figure 6-2: Balconies which Marginally Exceed the Guidance Criteria

6.20. A communal amenity space is proposed at the site as shown in Figure 6-3.

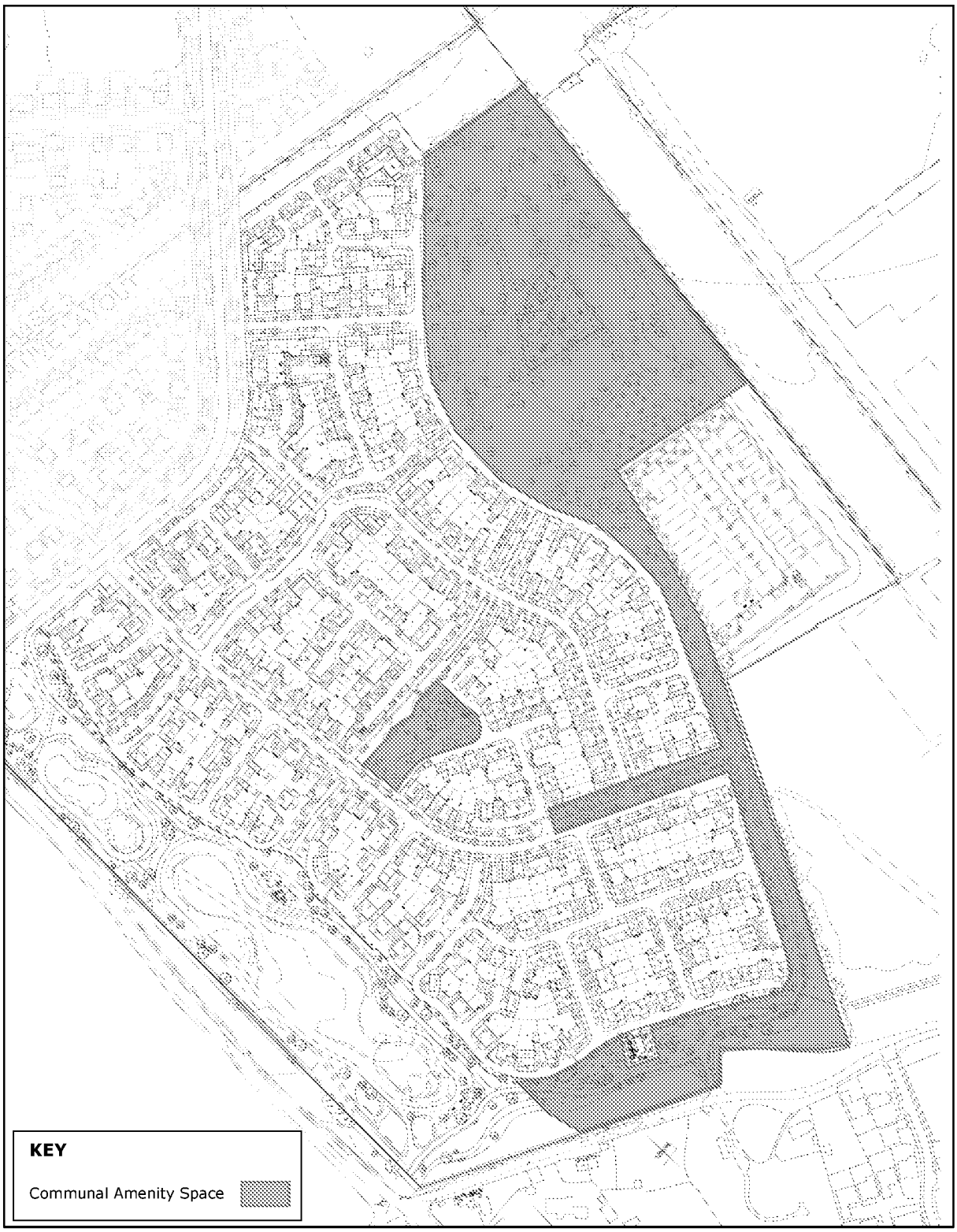


Figure 6-3: Communal Amenity Space

6.21. The noise modelling indicates that noise levels will be below 50dB $L_{Aeq,T}$ across the amenity spaces. Therefore, all residents have access to a shared amenity space with external sound levels which are lower than 50dB $L_{Aeq,T}$.

6.22. The site layout has been developed to reduce noise levels in private amenity areas by as much as possible. The site is located at the west of Ford and the wider development which is situated within and will expand upon the existing urban environment. The site is also close to the strategic highway transport network in the area.

6.23. Therefore as set out in the guidance, the marginal excess above the guidance criteria at a small number of balconies should not be a reason to prohibit development.

7. Conclusions

7.1. A noise survey has been undertaken at the wider development area, the measured noise levels and results of the noise model have been used to calculate and assess glazing and ventilation specifications, demonstrating the guidance values of the standards can be met.

7.2. The site is considered low risk in accordance with ProPG Guidance. Expert Acoustics advice has been sought to reduce noise levels to achieve guidance values in the standards and an acoustic design statement accompanies this report.

7.3. Noise associated with existing industrial and commercial uses has been assessed in accordance with BS 4142, resulting in a low impact on future residents.

7.4. It is recommended that an assessment is carried out in accordance with the Chartered Institute of Environmental Health (CIEH) and Institute of Acoustics (IoA): Heat Pumps Professional Advice Note when details become available.

7.5. Where necessary the design of some dwellings will enable residents to keep windows closed and an alternative means of ventilation will be provided. It is important to note that windows would not be sealed shut and residents will have the choice of opening them, whilst noting noise levels will slightly increase.

7.6. The risk of noise impact during overheating conditions within properties has been considered in accordance with Acoustics Ventilation and Overheating (AVO) guidance. Noise levels place facades in close proximity to Yapton Road and the primary access roads are in the low to medium risk category.

7.7. All other facades which are either sufficiently screened or far enough away from these roads are in the negligible to low risk categories. The strategy to provide thermal comfort and suitable internal noise levels will be developed further as part of the detailed design of the site.

7.8. External sound levels at the majority private amenity spaces meet the guideline values set out in the standards. A small number of balconies which directly overlook the primary site access road will marginally exceed the criteria.

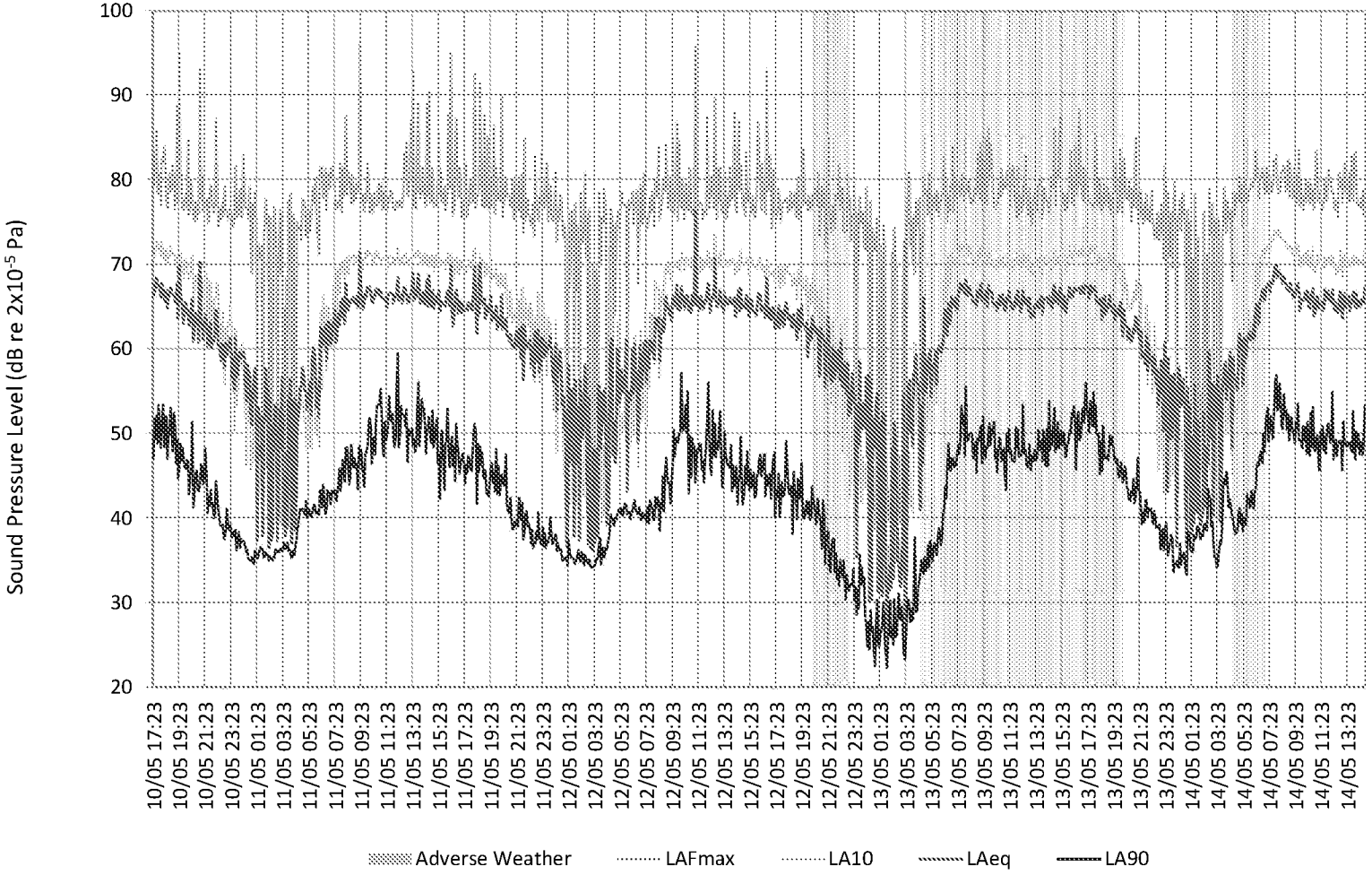
7.9. A communal amenity space is proposed at the site, which has external sound levels below 50dB $LA_{eq,T}$. Therefore, all residents have the choice of private amenity spaces

and shared amenity space with external sound levels which are lower than the criteria for private amenity spaces.

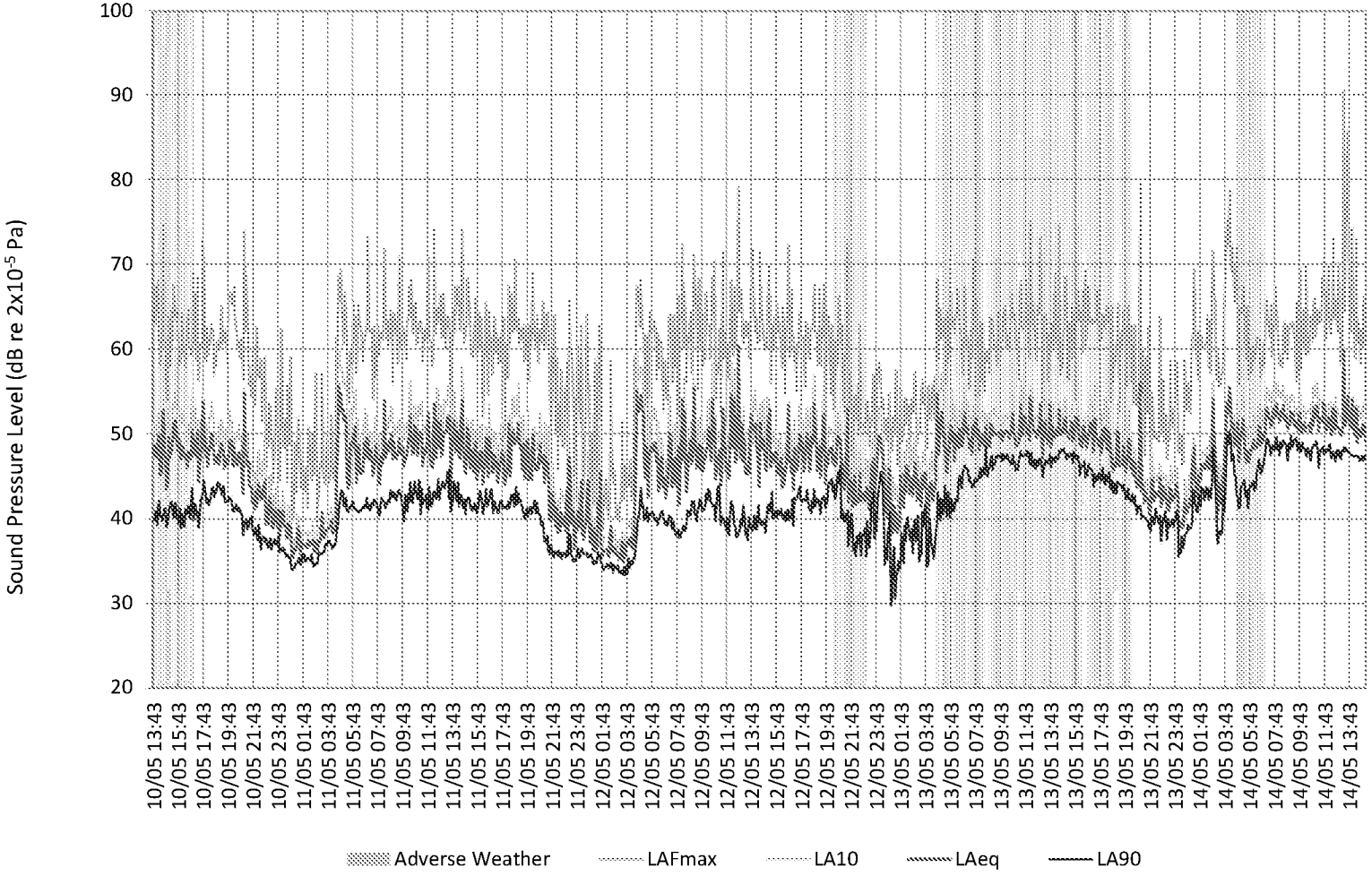
7.10. This assessment demonstrates that the site is suitable for development subject to the recommendations included in this report. Therefore, it is considered that the requirements of condition 25 have been met.

APPENDIX A

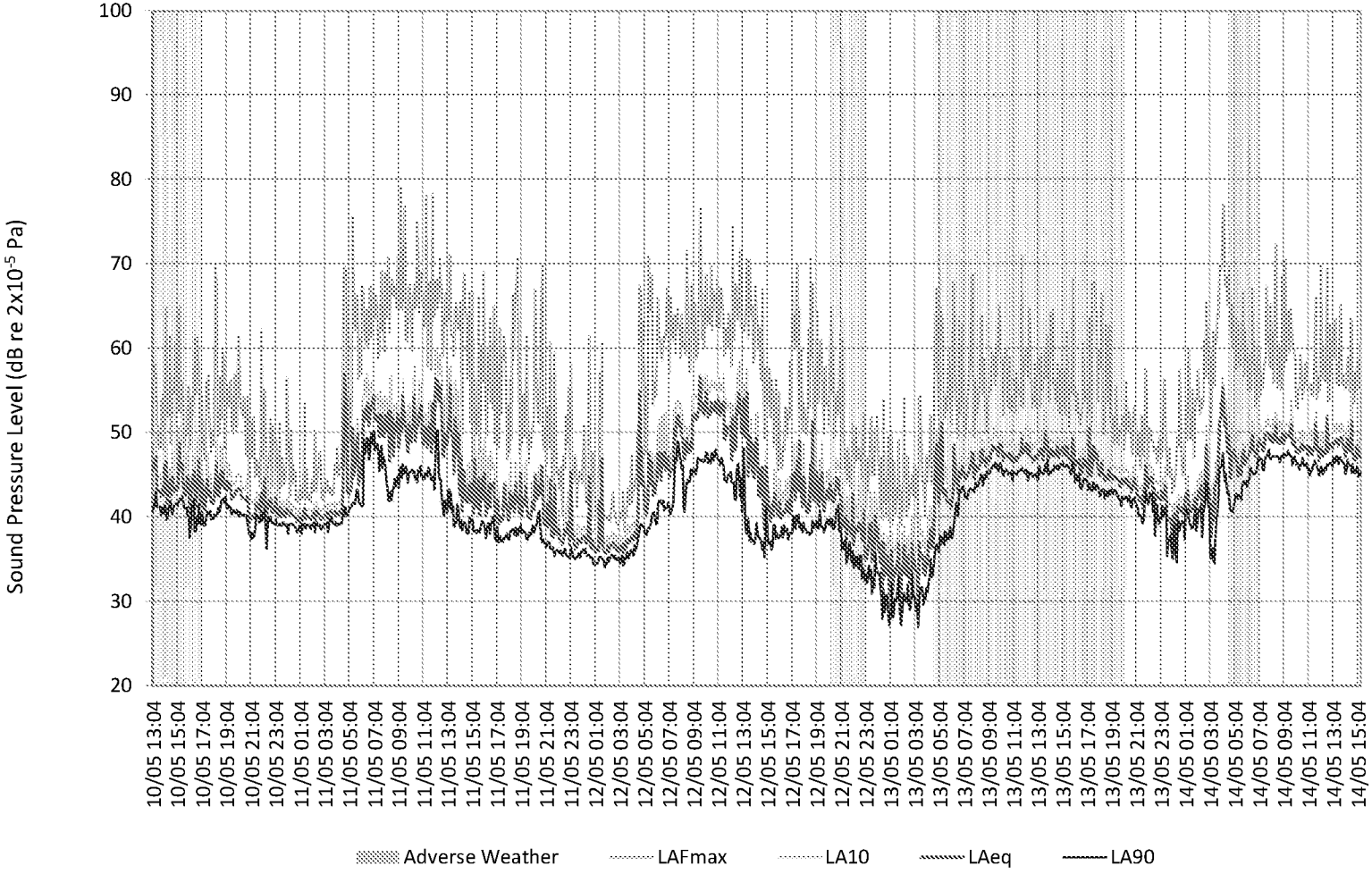
Ford Airfield, Ford - Position 1
10th May to 14th May



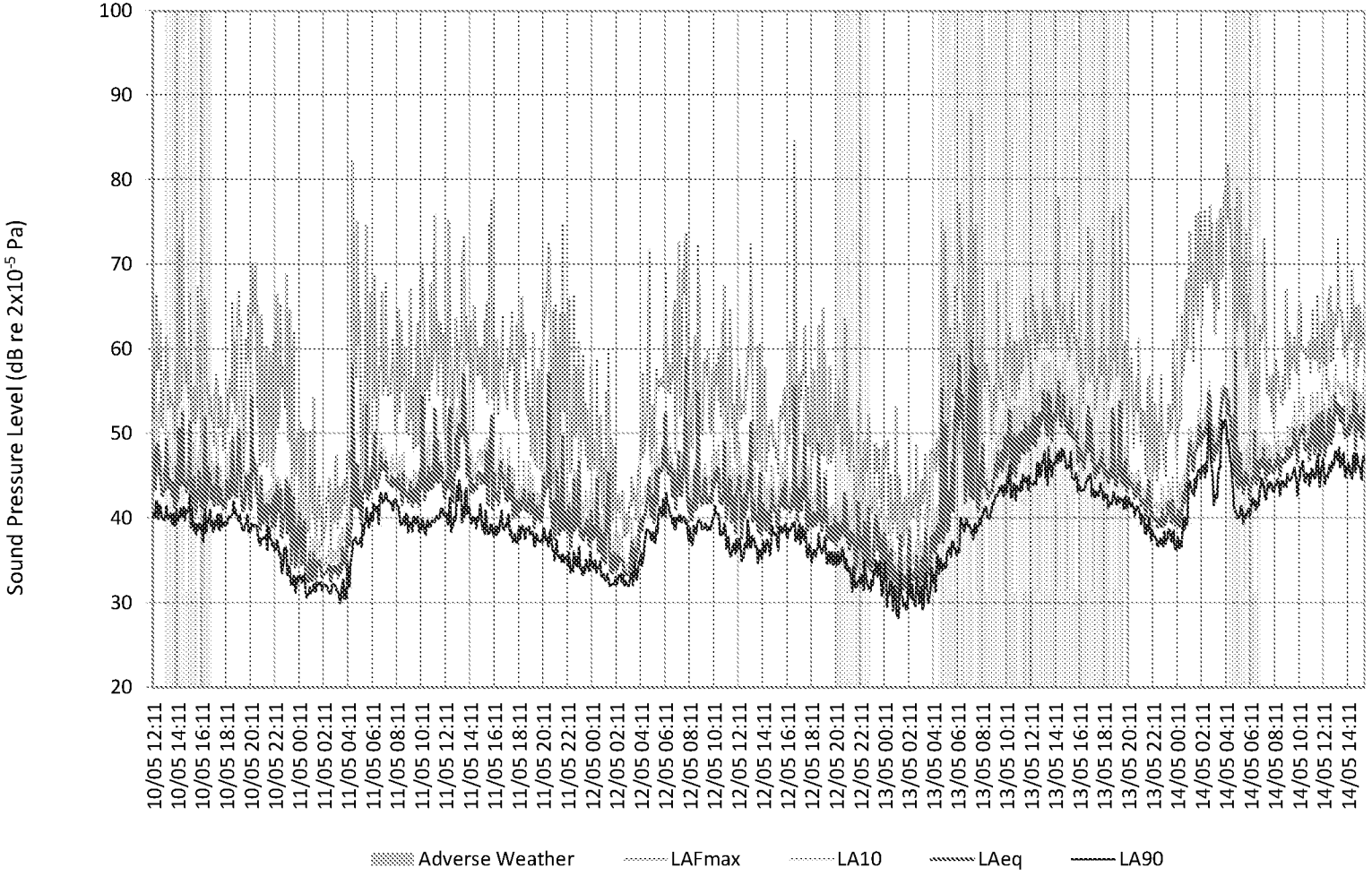
Ford Airfield, Ford - Position 2
10th May to 14th May

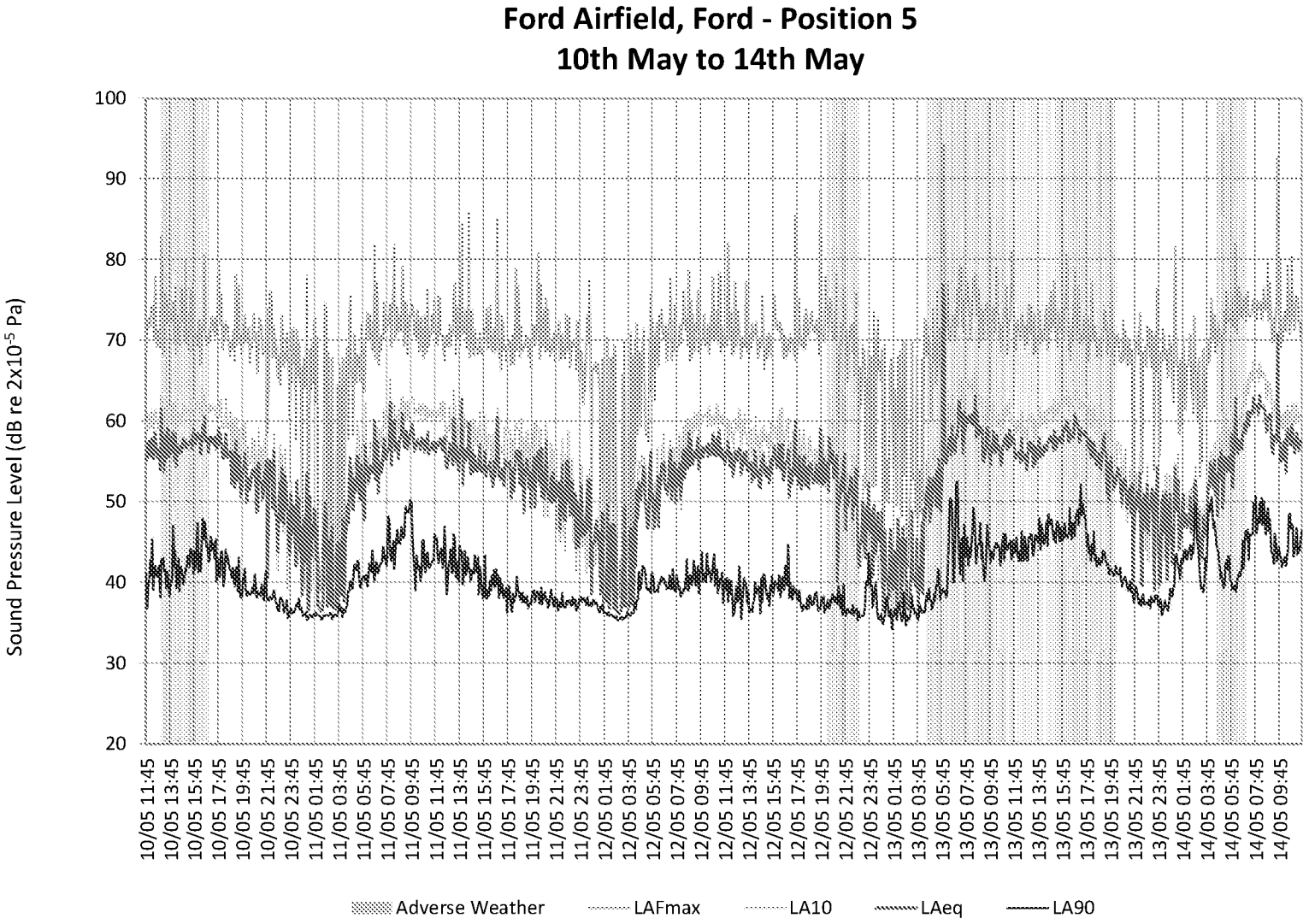


Ford Airfield, Ford - Position 3
10th May to 14th May



Ford Airfield, Ford - Position 4
10th May to 14th May




Ford Airfield, Ford - Position 5
10th May to 14th May
Sound Pressure Level (dB re 2x10-5 Pa)
100
90
80
70
60
50
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30
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10/05 13:45
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11/05 05:45
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11/05 09:45
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13/05 07:45
13/05 09:45
13/05 11:45
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13/05 21:45
13/05 23:45
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14/05 03:45
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Adverse Weather
LAFmax
LA10
LAeq
LA90

APPENDIX B


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Client:
Vistry Homes Limited
Project:
The Landings RM4 (South)
Date:
12/12/24
Site Address:
Ford Airfield, Ford
Scenario:
Baseline Noise Levels
Day dB LAeq, 16 hour
1.5m Grid Height
> 0 dB
> 35.0 dB
> 40.0 dB
> 45.0 dB
> 50.0 dB
> 55.0 dB
> 60.0 dB
> 65.0 dB
> 70.0 dB
> 75.0 dB
> 80.0 dB
> 85.0 dB
Red Line Boundary
ARDENT
CONSULTING ENGINEERS
AN EMPLOYEE OWNED COMPANY

Client:
Vistry Homes Limited

Project:
The Landings RM4 (South)

Date:
12/12/24

Site Address:
Ford Airfield, Ford

Scenario:
Baseline Noise Levels
Night dB LAeq, 8 hour
4.0m Grid Height

- > 0 dB
- > 35.0 dB
- > 40.0 dB
- > 45.0 dB
- > 50.0 dB
- > 55.0 dB
- > 60.0 dB
- > 65.0 dB
- > 70.0 dB
- > 75.0 dB
- > 80.0 dB
- > 85.0 dB

Red Line Boundary

ARDENT
CONSULTING ENGINEERS
AN EMPLOYEE OWNED COMPANY


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Client:
Vistry Homes Limited
Project:
The Landings RM4 (South)
Date:
12/12/24
Site Address:
Ford Airfield, Ford
Scenario:
Noise Levels at Site
(All Sources)
Day dB LAeq, 16 hour
1.5m Grid Height
> 0 dB
> 35.0 dB
> 40.0 dB
> 45.0 dB
> 50.0 dB
> 55.0 dB
> 60.0 dB
> 65.0 dB
> 70.0 dB
> 75.0 dB
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> 85.0 dB
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ARDENT
CONSULTING ENGINEERS
AN EMPLOYEE OWNED COMPANY


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Client:
Vistry Homes Limited
Project:
The Landings RM4 (South)
Date:
12/12/24
Site Address:
Ford Airfield, Ford
Scenario:
Noise Levels at Site
(All Sources)
Night dB LAeq, 8 hour
4.0m Grid Height
> 0 dB
> 35.0 dB
> 40.0 dB
> 45.0 dB
> 50.0 dB
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Red Line Boundary
ARDENT
CONSULTING ENGINEERS
AN EMPLOYEE OWNED COMPANY


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Client:
Vistry Homes Limited
Project:
The Landings RM4 (South)
Date:
12/12/24
Site Address:
Ford Airfield, Ford
Scenario:
Noise Levels at Site
(No Commercial/Industrial)
Day dB LAeq, 16 hour
1.5m Grid Height
> 0 dB
> 35.0 dB
> 40.0 dB
> 45.0 dB
> 50.0 dB
> 55.0 dB
> 60.0 dB
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> 85.0 dB
Red Line Boundary
ARDENT
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AN EMPLOYEE OWNED COMPANY


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Client:
Vistry Homes Limited
Project:
The Landings RM4 (South)
Date:
12/12/24
Site Address:
Ford Airfield, Ford
Scenario:
Noise Levels at Site
(No Commercial/Industrial)
Night dB LAeq, 8 hour
4.0m Grid Height
> 0 dB
> 35.0 dB
> 40.0 dB
> 45.0 dB
> 50.0 dB
> 55.0 dB
> 60.0 dB
> 65.0 dB
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Red Line Boundary
ARDENT
CONSULTING ENGINEERS
AN EMPLOYEE OWNED COMPANY


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Client:
Vistry Homes Limited
Project:
The Landings RM4 (South)
Date:
12/12/24
Site Address:
Ford Airfield, Ford
Scenario:
Noise Levels at Site
(Commercial/Industrial Only)
Day dB LAeq, 16 hour
1.5m Grid Height
> 0 dB
> 35.0 dB
> 40.0 dB
> 45.0 dB
> 50.0 dB
> 55.0 dB
> 60.0 dB
> 65.0 dB
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Red Line Boundary
ARDENT
CONSULTING ENGINEERS
AN EMPLOYEE OWNED COMPANY


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102200
Client:
Vistry Homes Limited
Project:
The Landings RM4 (South)
Date:
12/12/24
Site Address:
Ford Airfield, Ford
Scenario:
Noise Levels at Site
(Commercial/Industrial Only)
Night dB LAeq, 8 hour
4.0m Grid Height
> 0 dB
> 35.0 dB
> 40.0 dB
> 45.0 dB
> 50.0 dB
> 55.0 dB
> 60.0 dB
> 65.0 dB
> 70.0 dB
> 75.0 dB
> 80.0 dB
> 85.0 dB
Red Line Boundary
ARDENT
CONSULTING ENGINEERS
AN EMPLOYEE OWNED COMPANY

APPENDIX C

Acoustic Design Statement – Ford Airfield, Phase RM4 (South)

This Acoustic Design Statement (ADS) accompanies the Noise and Vibration Assessment for Phase RM4 (South) of the wider Ford Airfield site. The approach to the ADS is in line with that set out in ProPG: Planning & Noise, May 2017.

Stage 1 Assessment

The acoustic environment is controlled by road traffic noise on the surrounding road network, most notably Yapton Road, road traffic noise from the primary access road will also contribute to the noise environment. Noise levels are highest at the southwestern boundary and close to the primary access road. The site is considered to be a *low* risk of adverse noise impact.

Where new residential receptors are introduced, any change in the predominant noise source is expected to be due to changes in the volume of road traffic. Based on the ES noise and vibration chapter which supported the outline planning application, the number of expected movements is low in comparison to the baseline traffic conditions. Therefore it is not expected that new residential receptors will significantly increase noise levels.

Stage 2 Assessment

Element 1 – Good Acoustic Design

With a residential scheme the principles of good acoustic design are key to a successful development and to ensure there is no significant adverse noise impact on respective users of the Proposed Development.

The design team have sought to follow the best practice principles including the hierarchy of noise control wherever practicable in developing the layout of the Site. This is broadly set out as follows:

1. Noise control at source – through the careful positioning of potentially noisy activities away from sensitive receptors;

2. Noise control in the transmission path – by maximising acoustic screening with sensible layout by positioning higher sensitivity (internal and external) areas on the more sheltered sides of buildings;

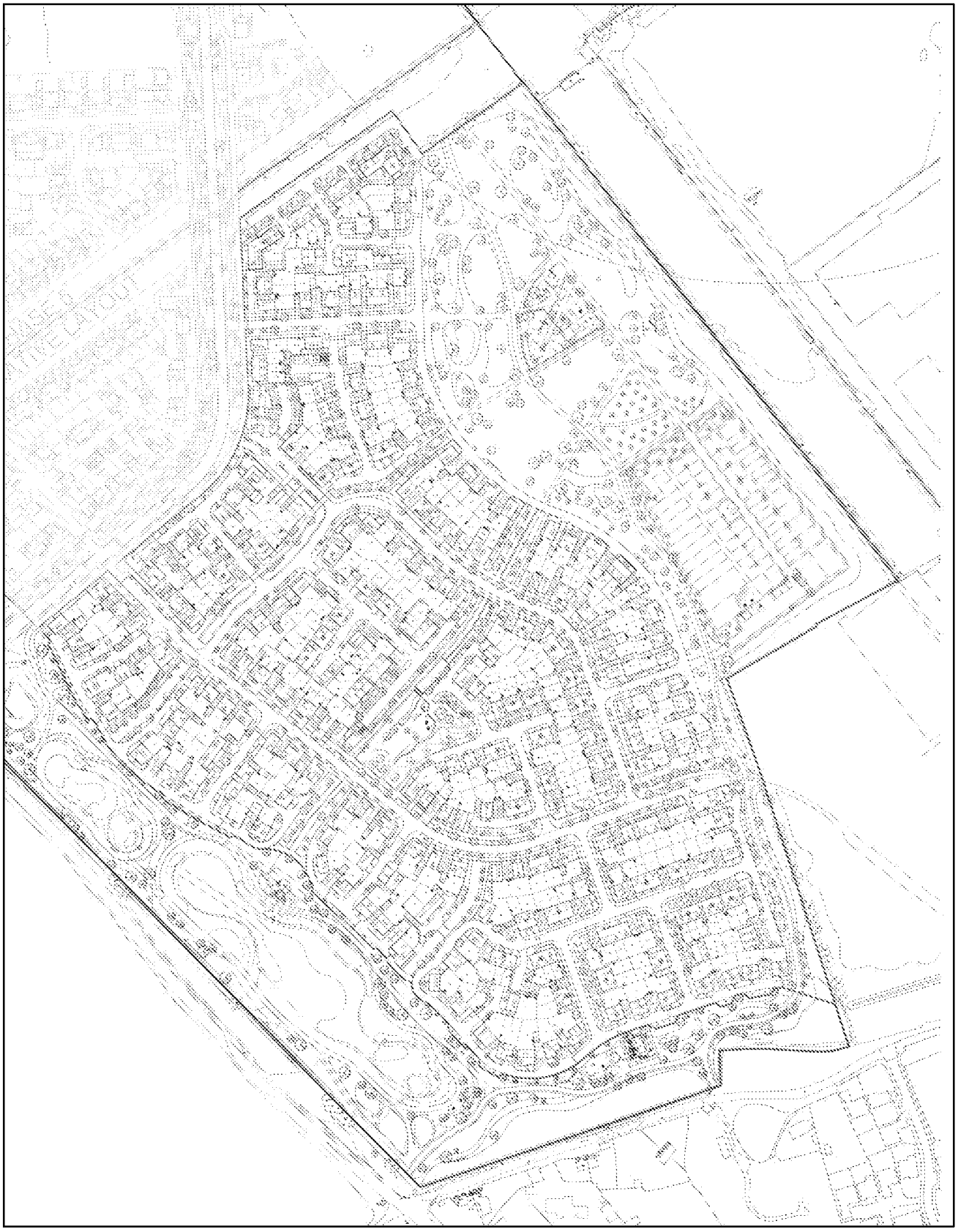
3. Noise control at receptors – through appropriate building envelope mitigation to include glazing, ventilation and separating walls and floors.

As part of the infrastructure reserved matters planning application, screening is proposed at the boundary of Ford Airfield Industrial Estate. The screening, which is 4m high, forms part of the infrastructure reserved matters planning application and is shown in drawing 2205771-100.

The screening has been optimised to reduce noise levels by as much as practicably possible, whilst also taking into account other design considerations, such as landscaping and arboriculture.

The site layout maximises the separation distance between dwellings Yapton Road and commercial and industrial operations with the introduction of a landscaped area and access roads closest to noise sources. The layout also provides screening by using relatively continuous intervening buildings adjacent to Yapton Road, the primary access road, and commercial and industrial operations. The site layout is shown in Figure C1 overleaf.

Figure C1 – Site Layout



Alternative ventilation is proposed to a number of dwellings at the site, which will enable residents to keep their windows closed whilst maintaining suitable rates of background ventilation.

Element 2 – Internal Noise Levels

Based on the measured and calculated noise levels the internal noise levels in residential units can be determined. Appropriate façade attenuation will be provided to ensure compliance with Figure 2 ProPG which incorporates the guidance in BS8233:2014. In doing so Element 2 requirements of Stage 2 are met.

Where possible sensitive rooms are located on the sheltered side of buildings to noise sources. Glazing and ventilation specification are provided in more detail in noise assessment.

Element 3 – External Amenity Area Noise Levels

External sound level at a limited number of private amenity spaces in close proximity to the primary site access road will marginally exceed the guideline values set out in the standards. At all other private amenity spaces external sound levels will meet the guideline values.

Private amenity spaces are located on the screened side of building from Yapton Road, the primary access road, and commercial and industrial operations where possible to reduce noise levels by as much as possible, given other design considerations.

In the majority of cases noise levels at private amenity spaces will meet the guidance levels in ProPG and good acoustic design principles have been incorporated to reduce potential impact as much as practicably possible.

The communal amenity spaces will have external sound levels which would be lower than 50dB $L_{Aeq,T}$. Therefore, all residents will have access to communal amenity spaces with external sound levels below 50dB $L_{Aeq,T}$.

Further detail on external amenity areas is included in noise assessment.

Element 4 – Assessment of Other Relevant Issues

The good acoustic design principles which have been followed mean that the proposed development is in general compliance with the principles of the ProPG.

Noise associated with existing industrial and commercial uses has been assessed in accordance with BS 4142, resulting in a low impact on future residents.

The proposed facade sound insulation performances mean that internal residential noise levels when windows are closed will be in line with the ProPG guidance levels.

External sound levels in private amenity spaces are generally compliant with some slight exceedances. The design of the site has reduced noise levels in private amenity spaces as far as practicable and the residual exceedances are minimal. All residents will have access to communal amenity spaces with external sound levels which are lower than the criteria for private amenity spaces.

Recommendation for the Decision Maker

In the context of the existing acoustic environment the site is considered to be a *low* risk of adverse noise impact.

Principles of good acoustic design have been followed to minimise the potential impact of noise though; careful layout and orientation of buildings; zoning; use of dual aspect and buffer zones; self-screening and where appropriate façade mitigation.

It is considered that the proposed development is suitable on noise grounds and therefore planning may be granted subject to the inclusion of suitable noise conditions.

APPENDIX D

ARDENT CONSULTING ENGINEERS

Noise Break-in Calculation - Yapton Road

Description	
Ardent CE Project No.	**2205771**
Property Address	**Ford Airfield**
Room Type	**Bedroom**
Parameter	**LAeq, 16h**

Room Dimensions and Areas		
Room volume	35.00	- Based on typical size
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

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	

Façade level	63	125	250	500	1000	2000	4000	8000	A	
Measured Noise Level	67	63	60	60	63	57	45	36	65	
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	-6	-6	-6	-6	-6	-6	-6	-6		Correction based on noise model
Noise level at façade (Leq)	61	57	54	54	57	51	39	30	59	

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw
Glazing SRI	18	21	20	26	38	37	39	44	31
Transmission Coefficient	0.015849	0.007943	0.010000	0.002512	0.000158	0.000200	0.000126	0.000040	
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	0.002977	0.001251	0.000335	0.000169	0.000150	0.000127	
Average SRI	23	26	25	29	35	38	38	39	34

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	40.3	32.9	30.6	26.8	24.1	15.1	2.6	-7.1	29	
Lp (Direct)	38.4	31.1	28.7	25.0	22.2	13.3	0.8	-9.0	27	Criteria
Lp (Rev & Direct)	43	35	33	29	26	17	5	-5	31	≤ 35
BS8233	42	35	33	29	26	17	5	-5	31	≤ 35

ARDENT CONSULTING ENGINEERS

Noise Break-in Calculation - Yapton Road

Description	
Ardent CE Project No.	**2205771**
Property Address	**Ford Airfield**
Room Type	**Bedroom**
Parameter	**LAeq, 8h**

Room Dimensions and Areas		
Room volume	35.00	- Based on typical size
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

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	

Façade level	63	125	250	500	1000	2000	4000	8000	A	
Measured Noise Level	58	53	50	52	55	50	43	40	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	-6	-6	-6	-6	-6	-6	-6	-6		Correction based on noise model
Noise level at façade (Leq)	52	47	44	46	49	44	37	34	52	

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw
Glazing SRI	18	21	20	26	38	37	39	44	31
Transmission Coefficient	0.015849	0.007943	0.010000	0.002512	0.000158	0.000200	0.000126	0.000040	
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	0.002977	0.001251	0.000335	0.000169	0.000150	0.000127	
Average SRI	23	26	25	29	35	38	38	39	34

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	31.3	22.9	20.6	18.8	16.1	8.1	0.6	-3.1	20	
Lp (Direct)	29.4	21.1	18.7	17.0	14.2	6.3	-1.2	-5.0	19	Criteria
Lp (Rev & Direct)	34	25	23	21	18	10	3	-1	23	≤ 30
BS8233	33	25	23	21	18	10	3	-1	22	≤ 30

ARDENT CONSULTING ENGINEERS

Noise Break-in Calculation - Yapton Road

Description	
Ardent CE Project No.	**2205771**
Property Address	**Ford Airfield**
Room Type	**Bedroom**
Parameter	**LAmax**

Room Dimensions and Areas		
Room volume	35.00	- Based on typical size
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

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	

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	69	65	62	59	68	65	72	67	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	-8	-8	-8	-8	-8	-8	-8	-8	
Other	0	0	0	0	0	0	0	0	
Noise level at façade (Lmax)	61	57	54	51	60	57	64	59	68

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw
Glazing SRI	18	21	20	26	38	37	39	44	31
Transmission Coefficient	0.015849	0.007943	0.010000	0.002512	0.000158	0.000200	0.000126	0.000040	
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	0.002977	0.001251	0.000335	0.000169	0.000150	0.000127	
Average SRI	23	26	25	29	35	38	38	39	34

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	40.3	32.9	30.6	23.8	27.1	21.1	27.6	21.9	33	
Lp (Direct)	38.4	31.1	28.7	22.0	25.2	19.3	25.8	20.0	31	**Criteria**
Lp (Rev & Direct)	43	35	33	26	29	23	30	24	35	**≤ 45**
BS8233	42	35	33	26	29	23	30	24	35	**≤ 45**

ARDENT CONSULTING ENGINEERS

Noise Break-in Calculation - Horsemere Lane

Description	
Ardent CE Project No.	**2205771**
Property Address	**Ford Airfield**
Room Type	**Bedroom**
Parameter	**LAeq, 16h**

Room Dimensions and Areas		
Room volume	35.00	- Based on typical size
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

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	

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	56	50	47	45	41	37	39	35	48
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	Correction based on noise model
Noise level at façade (Leq)	56	50	47	45	41	37	39	35	48

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw
Glazing SRI	18	21	20	26	38	37	39	44	31
Transmission Coefficient	0.015849	0.007943	0.010000	0.002512	0.000158	0.000200	0.000126	0.000040	
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	0.002977	0.001251	0.000335	0.000169	0.000150	0.000127	
Average SRI	23	26	25	29	35	38	38	39	34

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	35.3	25.9	23.6	17.8	8.1	1.1	2.6	-2.1	20	
Lp (Direct)	33.4	24.1	21.7	16.0	6.2	-0.7	0.8	-4.0	18	Criteria
Lp (Rev & Direct)	38	28	26	20	10	3	5	0	22	≤ 35
BS8233	37	28	26	20	10	3	5	0	22	≤ 35

ARDENT CONSULTING ENGINEERS

Noise Break-in Calculation - Horsemere Lane

Description	
Ardent CE Project No.	**2205771**
Property Address	**Ford Airfield**
Room Type	**Bedroom**
Parameter	**LAeq, 8h**

Room Dimensions and Areas		
Room volume	35.00	- Based on typical size
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

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	

Façade level	63	125	250	500	1000	2000	4000	8000	A	
Measured Noise Level	50	43	41	39	38	39	40	36	46	
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	-4	-4	-4	-4	-4	-4	-4	-4		Correction based on noise model
Noise level at façade (Leq)	46	39	37	35	34	35	36	32	42	

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw
Glazing SRI	18	21	20	26	38	37	39	44	31
Transmission Coefficient	0.015849	0.007943	0.010000	0.002512	0.000158	0.000200	0.000126	0.000040	
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	0.002977	0.001251	0.000335	0.000169	0.000150	0.000127	
Average SRI	23	26	25	29	35	38	38	39	34

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	25.3	14.9	13.6	7.8	1.1	-0.9	-0.4	-5.1	11	
Lp (Direct)	23.4	13.1	11.7	6.0	-0.8	-2.7	-2.2	-7.0	9	Criteria
Lp (Rev & Direct)	28	17	16	10	3	1	2	-3	13	≤ 30
BS8233	27	17	16	10	3	1	2	-3	13	≤ 30

ARDENT CONSULTING ENGINEERS

Noise Break-in Calculation - Horsemere Lane

Description	
Ardent CE Project No.	**2205771**
Property Address	**Ford Airfield**
Room Type	**Bedroom**
Parameter	**LAmax**

Room Dimensions and Areas		
Room volume	35.00	- Based on typical size
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

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	

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	61	60	66	69	65	65	64	60	72
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 (Lmax)	61	60	66	69	65	65	64	60	72

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw
Glazing SRI	18	21	20	26	38	37	39	44	31
Transmission Coefficient	0.015849	0.007943	0.010000	0.002512	0.000158	0.000200	0.000126	0.000040	
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	0.002977	0.001251	0.000335	0.000169	0.000150	0.000127	
Average SRI	23	26	25	29	35	38	38	39	34

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	40.3	35.9	42.6	41.8	32.1	29.1	27.6	22.9	41	
Lp (Direct)	38.4	34.1	40.7	40.0	30.2	27.3	25.8	21.0	40	**Criteria**
Lp (Rev & Direct)	43	38	45	44	34	31	30	25	44	**≤ 45**
BS8233	42	38	45	44	34	31	30	25	43	**≤ 45**

ARDENT CONSULTING ENGINEERS

Noise Break-in Calculation - Primary Access Road

Description	
Ardent CE Project No.	**2205771**
Property Address	**Ford Airfield**
Room Type	**Bedroom**
Parameter	**Leq, 16h**

Room Dimensions and Areas		
Room volume	35.00	- Based on typical size
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

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	

Façade level	63	125	250	500	1000	2000	4000	8000	A	
Measured Noise Level	62	60	57	54	54	51	45	42	58	- Based on typical specturm provided in BS EN 1793-3
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)	62	60	57	54	54	51	45	42	58	

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw
Glazing SRI	18	21	20	26	38	37	39	44	31
Transmission Coefficient	0.015849	0.007943	0.010000	0.002512	0.000158	0.000200	0.000126	0.000040	
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	0.002977	0.001251	0.000335	0.000169	0.000150	0.000127	
Average SRI	23	26	25	29	35	38	38	39	34

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	41.3	35.9	33.6	26.8	21.1	15.1	8.6	4.9	29	
Lp (Direct)	39.4	34.1	31.7	25.0	19.2	13.3	6.8	3.0	28	**Criteria**
BS8233	43	38	36	29	23	17	11	7	31	**≤ 35**

ARDENT CONSULTING ENGINEERS

Noise Break-in Calculation - Primary Access Road

Description	
Ardent CE Project No.	**2205771**
Property Address	**Ford Airfield**
Room Type	**Bedroom**
Parameter	**LAeq, 8h**

Room Dimensions and Areas		
Room volume	35.00	- Based on typical size
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

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	

Façade level	63	125	250	500	1000	2000	4000	8000	A	
Measured Noise Level	55	53	50	47	47	44	38	35	51	- Based on typical specturm provided in BS EN 1793-3
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	53	50	47	47	44	38	35	51	

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw
Glazing SRI	18	21	20	26	38	37	39	44	31
Transmission Coefficient	0.015849	0.007943	0.010000	0.002512	0.000158	0.000200	0.000126	0.000040	
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	0.002977	0.001251	0.000335	0.000169	0.000150	0.000127	
Average SRI	23	26	25	29	35	38	38	39	34

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	34.3	28.9	26.6	19.8	14.1	8.1	1.6	-2.1	22	
Lp (Direct)	32.4	27.1	24.7	18.0	12.2	6.3	-0.2	-4.0	21	**Criteria**
BS8233	36	31	29	22	16	10	4	0	24	**≤ 30**

ARDENT CONSULTING ENGINEERS

Noise Break-in Calculation - Primary Access Road

Description	
Ardent CE Project No.	**2205771**
Property Address	**Ford Airfield**
Room Type	**Bedroom**
Parameter	**LAmax**

Room Dimensions and Areas		
Room volume	35.00	- Based on typical size
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

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	

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	66	64	53	52	58	63	63	60	68
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 (Lmax)	66	64	53	52	58	63	63	60	68

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw
Glazing SRI	18	21	20	26	38	37	39	44	31
Transmission Coefficient	0.015849	0.007943	0.010000	0.002512	0.000158	0.000200	0.000126	0.000040	
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	0.002977	0.001251	0.000335	0.000169	0.000150	0.000127	
Average SRI	23	26	25	29	35	38	38	39	34

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	44.8	40.0	29.4	24.4	24.9	27.4	26.4	22.8	34	
Lp (Direct)	43.0	38.2	27.6	22.5	23.0	25.5	24.6	21.0	32	**Criteria**
Lp (Rev & Direct)	47	42	32	27	27	30	29	25	36	**≤ 45**
BS8233	47	42	31	26	27	29	28	25	36	**≤ 45**

ARDENT CONSULTING ENGINEERS

Noise Break-in Calculation - Dwellings at the northern boundary of the site

Description	
Ardent CE Project No.	**2205771**
Property Address	**Ford Airfield**
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

- Based on typical size

Total façade area	13.60

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	

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	57	53	47	46	43	39	33	25	48
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)	57	53	47	46	43	39	33	25	48

Correction based on noise model

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw
Glazing SRI	18	21	20	26	38	37	39	44	31
Transmission Coefficient	0.015849	0.007943	0.010000	0.002512	0.000158	0.000200	0.000126	0.000040	
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	0.002977	0.001251	0.000335	0.000169	0.000150	0.000127	
Average SRI	23	26	25	29	35	38	38	39	34

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	36.3	28.9	23.6	18.8	10.1	3.1	-3.4	-12.1	20	
Lp (Direct)	34.4	27.1	21.7	17.0	8.2	1.3	-5.2	-14.0	19	Criteria
Lp (Rev & Direct)	39	31	26	21	12	5	-1	-10	23	≤ 35
BS8233	38	31	26	21	12	5	-1	-10	22	≤ 35

ARDENT CONSULTING ENGINEERS

Noise Break-in Calculation - Dwellings at the northern boundary of the site

Description	
Ardent CE Project No.	**2205771**
Property Address	**Ford Airfield**
Room Type	**Bedroom**
Parameter	**LAeq, 8h**

Room Dimensions and Areas		
Room volume	35.00	- Based on typical size
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

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	

Façade level	63	125	250	500	1000	2000	4000	8000	A	
Measured Noise Level	55	49	42	40	38	38	33	28	44	
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	-3	-3	-3	-3	-3	-3	-3	-3		Correction based on noise model
Noise level at façade (Leq)	52	46	39	37	35	35	30	25	41	

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw	
Glazing SRI	18	21	20	26	38	37	39	44	31	
Transmission Coefficient	0.015849	0.007943	0.010000	0.002512	0.000158	0.000200	0.000126	0.000040		
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	0.002977	0.001251	0.000335	0.000169	0.000150	0.000127		
Average SRI	23	26	25	29	35	38	38	39	34	

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	31.3	21.9	15.6	9.8	2.1	-0.9	-6.4	-12.1	13	
Lp (Direct)	29.4	20.1	13.7	8.0	0.2	-2.7	-8.2	-14.0	11	Criteria
Lp (Rev & Direct)	34	24	18	12	4	1	-4	-10	15	≤ 30
BS8233	33	24	18	12	4	1	-4	-10	15	≤ 30

ARDENT CONSULTING ENGINEERS

Noise Break-in Calculation - Dwellings at the northern boundary of the site

Description	
Ardent CE Project No.	**2205771**
Property Address	**Ford Airfield**
Room Type	**Bedroom**
Parameter	**LAmax**

Room Dimensions and Areas		
Room volume	35.00	- Based on typical size
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

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	

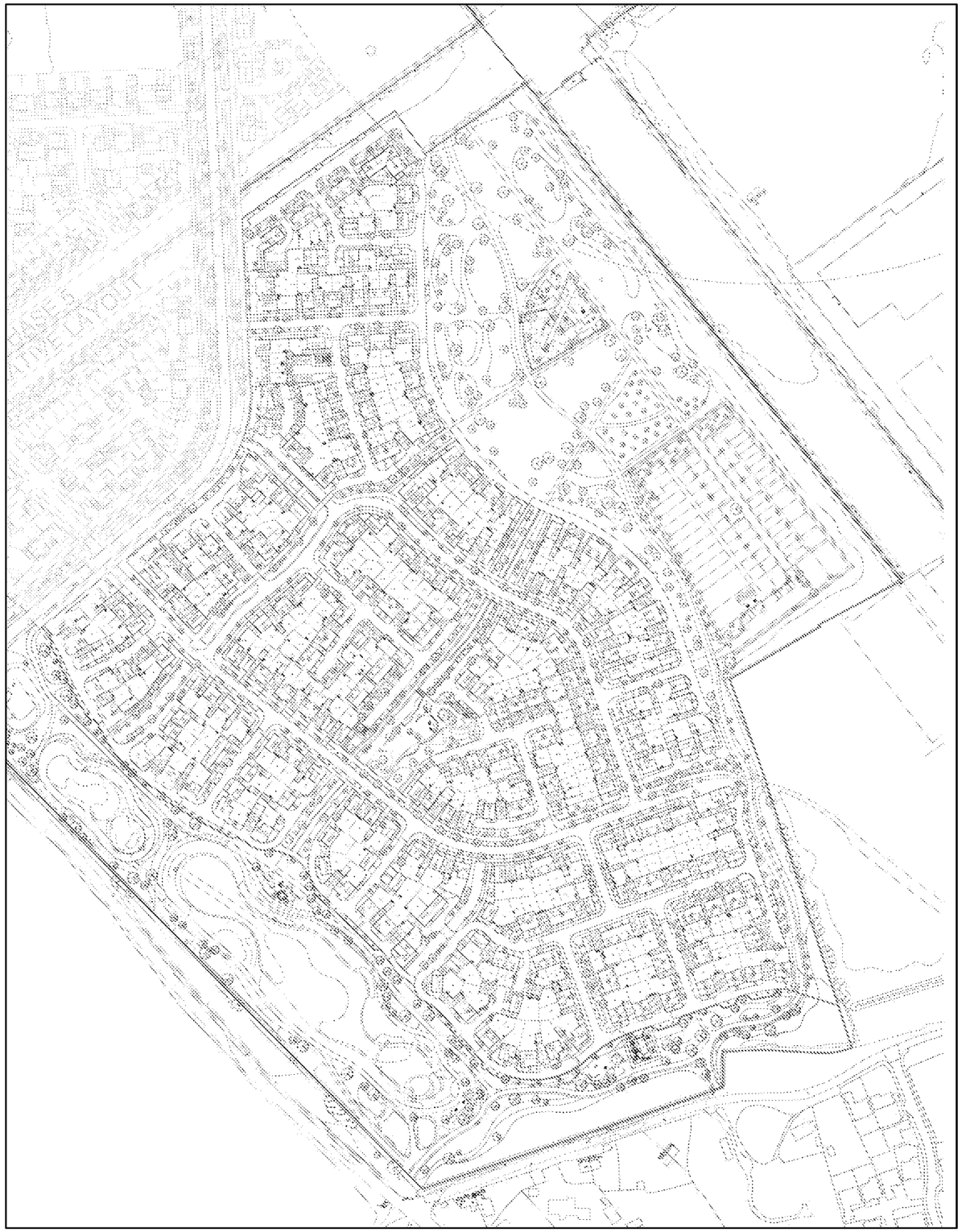
Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	66	64	53	52	58	63	63	60	68
Façade to free field	0	0	0	0	0	0	0	0	
Angle of view	0	0	0	0	0	0	0	0	
Screening (Maekewa)	0	0	0	0	0	0	0	0	
Distance correction	0	0	0	0	0	0	0	0	
Other	0	0	0	0	0	0	0	0	
Noise level at façade (Lmax)	66	64	53	52	58	63	63	60	68

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw
Glazing SRI	18	21	20	26	38	37	39	44	31
Transmission Coefficient	0.015849	0.007943	0.010000	0.002512	0.000158	0.000200	0.000126	0.000040	
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	0.002977	0.001251	0.000335	0.000169	0.000150	0.000127	
Average SRI	23	26	25	29	35	38	38	39	34

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	45.3	39.9	29.6	24.8	25.1	27.1	26.6	22.9	34	
Lp (Direct)	43.4	38.1	27.7	23.0	23.2	25.3	24.8	21.0	32	**Criteria**
Lp (Rev & Direct)	48	42	32	27	27	29	29	25	36	**≤ 45**
BS8233	47	42	32	27	27	29	29	25	36	**≤ 45**

APPENDIX E

Noise Impact During Overheating Risk Categories – Day & Night



Risk Category for Level 1 Assessment according to Table 3-2 Acoustics, Ventilation and Overheating: Residential Design Guide	
	High
	Medium
No Markup	Low
No Markup	Negligible

APPENDIX F

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:

$L_{Aeq,T}$: 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.

$L_{A10,T}$: 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'.

$L_{A90,T}$: 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.

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

$L_{Ar,T}$: 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 Rw, but measured onsite as oppose to in a laboratory

ANNEX A

RELEVANT POLICY & GUIDANCE

National Planning Policy Framework (NPPF) – December 2024

Under the NPPF: paragraph 198 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)

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.* "

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 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.

NPSE does not numerically define levels for the 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/day of the week, etc.

National Planning Practice Guidance (2014)

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

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

The guidance includes a table (as shown in Table 1) that summarises "the noise exposure hierarchy, based on the likely average response" and which offers "examples of outcomes" relevant to the 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

Table 1: Noise Exposure Hierarchy, Based on the Likely Average Response.

Calculation of Road Traffic Noise – 1988

For new developments, road traffic noise levels should be predicted in accordance with CRTN. This prediction method uses the traffic flow, vehicle speed, and percentage of heavy-duty vehicles (HDVs, over 3.5 tonnes), road gradient and other factors to calculate noise levels at receptor points.

Control of Pollution Act 1974

The local authority has powers under the Control of Pollution Act 1974 to control noise from construction sites. Section 60 of the Act allows a local authority to serve a notice of its requirements for the control of site noise. This notice may include specification of plant that is or is not to be used, hours during which the construction works can be carried out and levels of noise emission. Section 61 of the Act allows a contractor or developer to take the initiative and agree with the local authority the methods of construction, steps to minimise noise and hours of work.

The Environmental Protection Act 1990

Local authorities have a duty to deal with statutory nuisances under the Environmental Protection Act 1990. For noise to amount to a statutory nuisance, it must be "prejudicial to health or a nuisance" as outlined in Section 79 of the Act. Any proposed development should not result in a statutory nuisance being declared.

Should the Local Authority declare a development to cause a statutory nuisance, an abatement notice can be served to the developer who has up to 21 days to appeal to Magistrates' Court, as detailed in Section 80 of the Act.

The Building Regulations 2010

Building Regulations approvals are required for most new buildings and for most types of works on existing buildings. Part 10 of The Building Regulations 2010 contains provisions, including power for local authorities to test building work, take samples, and provision to ensure compliance. Part E of the Regulation 'Resistance to the passage of sound' is expanded in Approved Document E, which provides robust details to control and mitigate noise within buildings. This Document is separated over four parts which include:

- E1: Protection against sound from other parts of the building and adjoining buildings;
- E2: Protection against sound within dwelling-house etc.;
- E3: Reverberation in the common internal parts of buildings containing flats or rooms for residential purposes;
- E4: Acoustic conditions in schools.

World Health Organisation

The WHO document Guidance on Community Noise specifies additional information for noise affecting noise sensitive receptors and forms the basis of many noise limitations and design ranges for internal and external ambient noise levels. It defines noise as 'a class of sounds that are considered unwanted' (by the listener), 'that adversely affects, or may affect the physiological and psychological wellbeing of people.' Much of the research around this study is based on transportation noise.

Further guidance on the recommended levels is given in the World Health Organisation (WHO) Guidelines for Community Noise. In this document it is stated that:

"*To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55 dB* L_{Aeq} *on balconies, terraces and in outdoor living areas. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50 dB* L_{Aeq}*."*

WHO also states the following paragraph with regard to the effects of LAmax events in a night-time period:

"For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45dB L_{Amax} *more than 10-15 times per night (Vallet & Vernet 1991)."*

WHO guidance 'Night Noise Guidelines for Europe' is concerned with the longer-term average noise levels that are covered by the EU Directive on Environmental Noise, although this does appear to suggest external maximum noise levels of around 57dBA outside bedrooms during the night to achieve internal maximum levels of 42dBA.

The World Health Organisation has recently published Environmental Noise Guidelines – for the European Region (2018) to provide recommendations for protecting human health from exposure to noise sources such as transportation (road traffic, railway and aircraft), wind turbine noise and leisure noise.

The guidance document defines the 'strength' of recommendation (for protecting against noise exposure) as either 'strong' or conditional', outlined below.

Strength of Recommendation

*"A **strong** recommendation can be adopted as policy in most situations. The guideline is based on the confidence that the desirable effects of adherence to the recommendation outweigh the undesirable consequences. The quality of evidence for a net benefit – combined with information about values, preference and resources – inform this recommendation, which should be implemented in most circumstances."*

*"A **conditional** recommendation requires a policy-making process with substantial debate and involvement of various stakeholders. There is less certainty of its efficacy owing to lower quality of evidence of a net benefit, opposing values and preferences of individuals and populations affected or the high resource implications of the recommendation, meaning there may be circumstances or settings in which it will not apply."*

External (free-field) recommendations included in the Environmental Noise Guidelines for the European Region are presented in Table 3 for specific noise sources.

Noise Source	dB L_{den}	dB L_{night}	dB $L_{Aeq,\ 24hr}$ (yearly average)	Recommendation
Road Traffic	53	45	-	Strong
Railway	54	44	-	Strong
Aircraft	45	40	-	Strong
Wind Turbine	45	-	-	Conditional
Entertainment	-	-	70	Strong/Conditional

Table 3: Extract from Environmental Noise Guidelines for the European Region

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

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.

Table 2 of BS8233:2014 provides suitable internal levels for spaces such as open-plan offices and restaurants and notes that an upper and lower noise levels should be considered, as presented in Table 4.

Objective	Typical Situation	Design range dB $L_{Aeq,T}$
Typical noise levels for acoustic privacy in shared spaces	Restaurant	40 - 55
	Open plan office	45 - 50
	Night club, public house	40 - 45
	Ballroom, banqueting hall	35 - 40

Table 4: Extract from Table 2 – Indoor ambient noise levels in spaces when they are unoccupied and privacy is also important

An extract of Table 4 of the document relevant for residential development is reproduced in Table 5.

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

Table 5: Extract from Table 4 – Indoor ambient noise levels in dwellings

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 recognized that these guideline values are not*

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

ProPG: Planning and Noise - May 2017

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.

The guidance also builds upon government planning policy that noise should not be treated in isolation and there should be a holistic approach to good acoustic design.

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 1 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.

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."

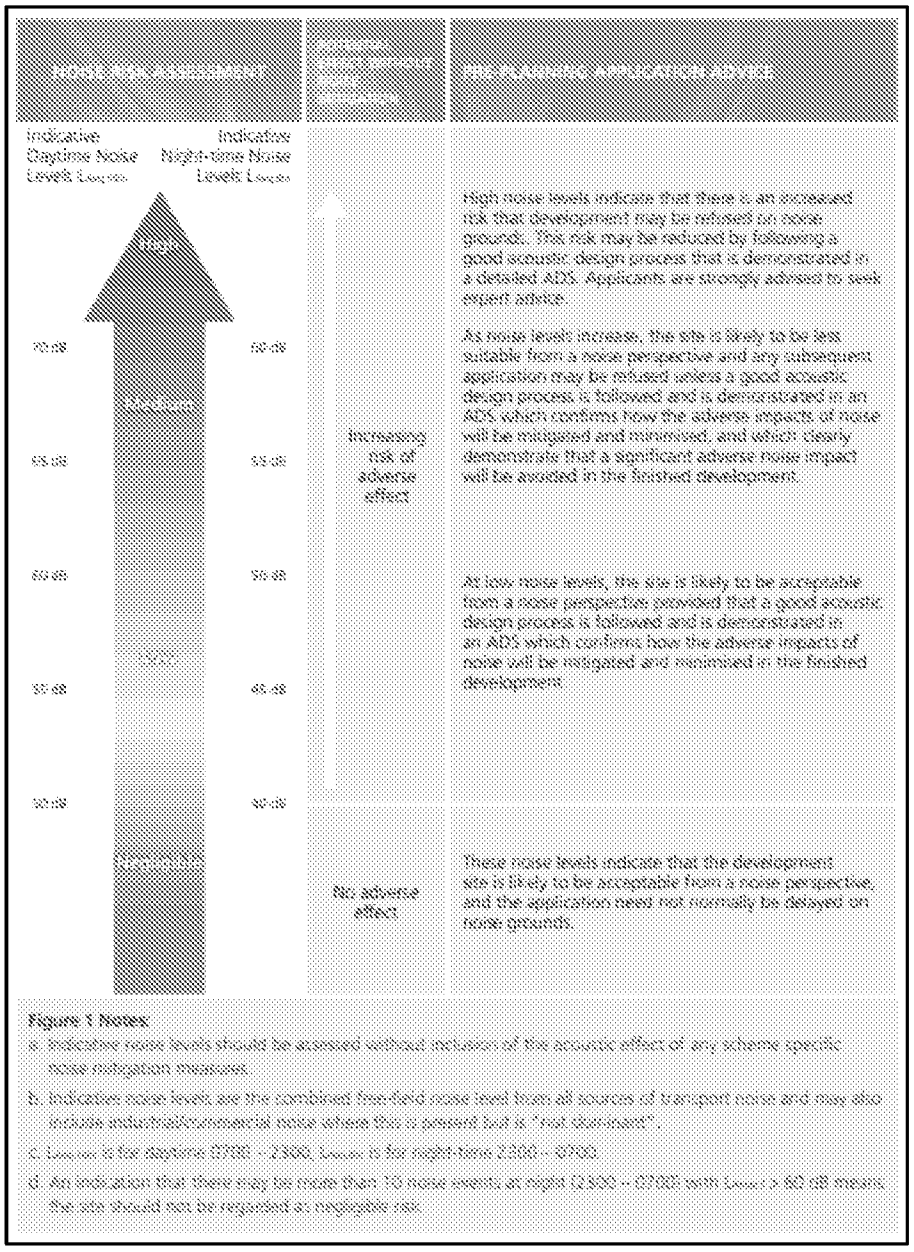


Figure 1: Extract from Figure 1 in ProPG – Initial Site Noise Risk Assessment

The second stage involves four key elements where discussion is expanded on:

- Element 1 – Good Acoustic Design Process
- Element 2 – Internal Noise Level Guidance
- Element 3 – External Amenity Area Noise Assessment
- Element 4 – Assessment of Other Relevant Issues

Having worked through the approach practitioners can present a recommendation to the decision maker.

Acoustics Ventilation and Overheating - Residential Design Guide, January 2020

Acoustics Ventilation and Overheating (AVO) recommends an approach to acoustic assessments for new residential development taking consideration for acoustics, ventilation, and overheating.

Section 3 involves a two-level risk assessment approach to estimate the potential impact on occupants in the case of overheating.

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).

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.

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)

Figure 2 explains the two-level noise assessment procedure for overheating conditions.

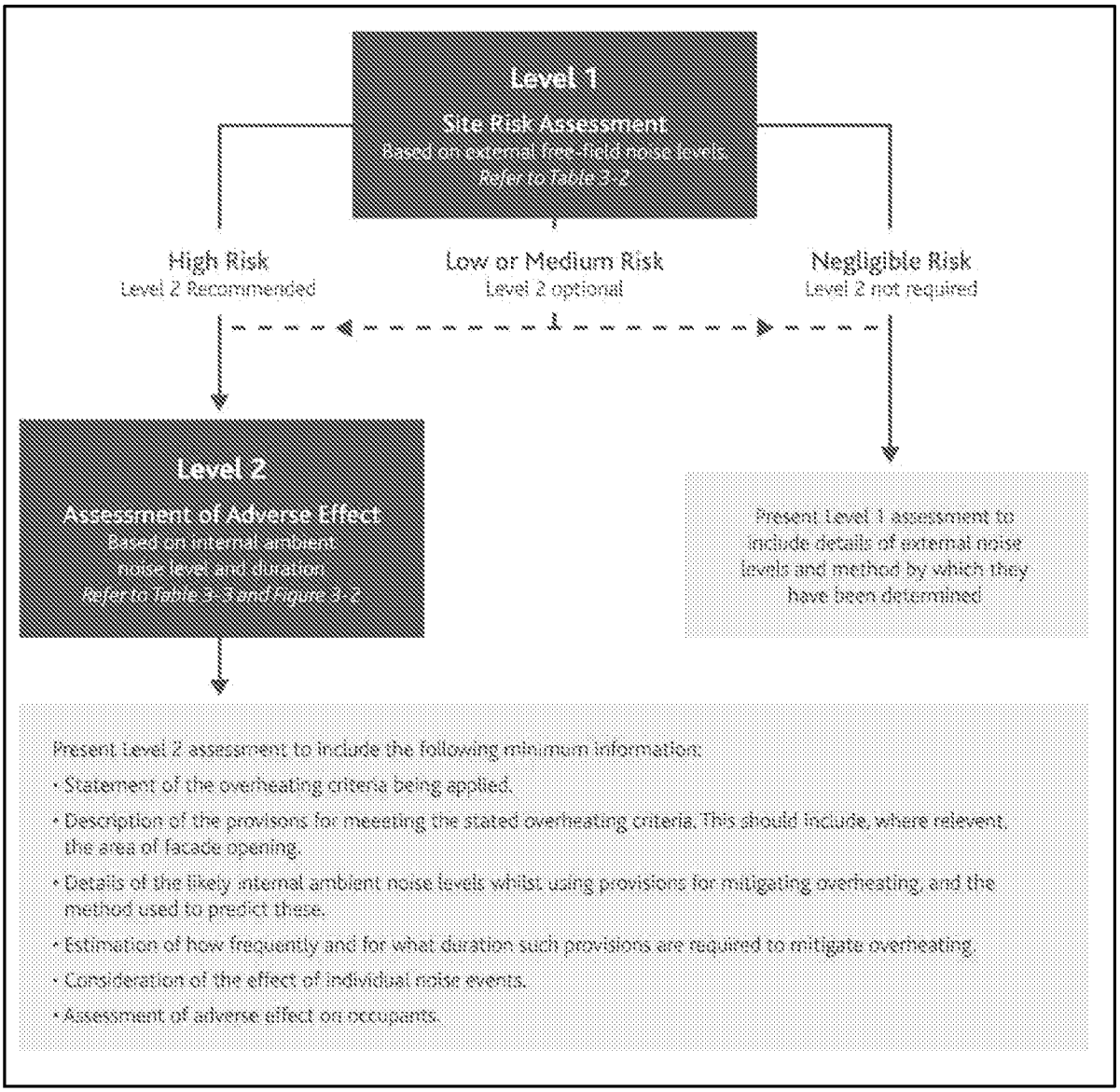
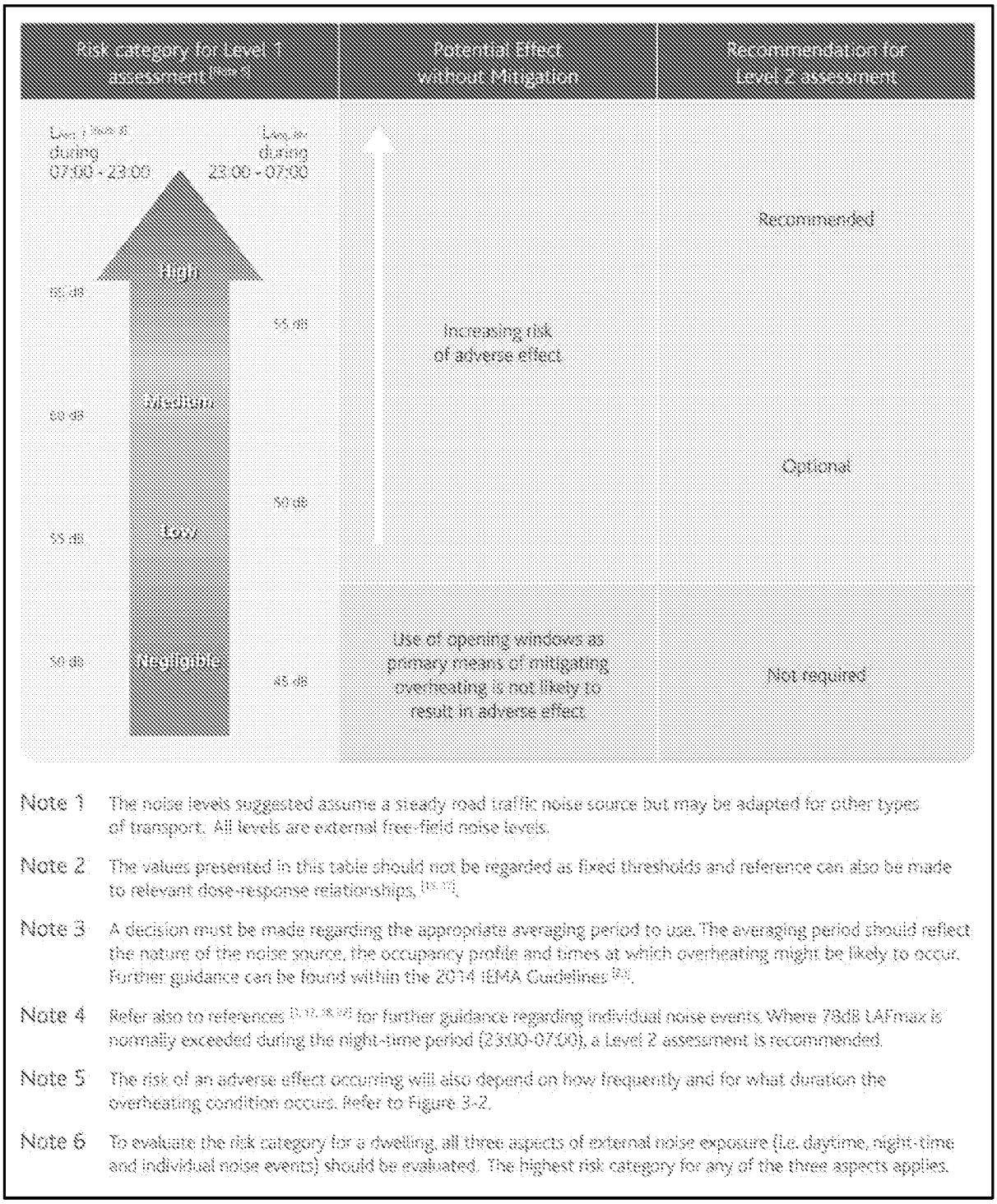


Figure 2: Two-level Assessment Procedure (Figure 3.1 of AVO Guidance)

Figure 3 shows the Level 1 site risk assessment of noise, relating to overheating conditions.



Note 1 The noise levels suggested assume a steady road traffic noise source but may be adapted for other types of transport. All levels are external free-field noise levels.

Note 2 The values presented in this table should not be regarded as fixed thresholds and reference can also be made to relevant dose-response relationships. [19, 20].

Note 3 A decision must be made regarding the appropriate averaging period to use. The averaging period should reflect the nature of the noise source, the occupancy profile and times at which overheating might be likely to occur. Further guidance can be found within the 2014 IEMA Guidelines [24].

Note 4 Refer also to references [2, 12, 28, 29] for further guidance regarding individual noise events. Where 78dB LAFmax is normally exceeded during the night-time period (23:00-07:00), a Level 2 assessment is recommended.

Note 5 The risk of an adverse effect occurring will also depend on how frequently and for what duration the overheating condition occurs. Refer to Figure 3-2.

Note 6 To evaluate the risk category for a dwelling, all three aspects of external noise exposure (i.e. daytime, night-time and individual noise events) should be evaluated. The highest risk category for any of the three aspects applies.

Figure 3: Level 1 Risk Assessment (Figure 3.2 of AVO guidance)

Figure 4 shows the Level 2 site risk assessment of noise, relating to overheating conditions.

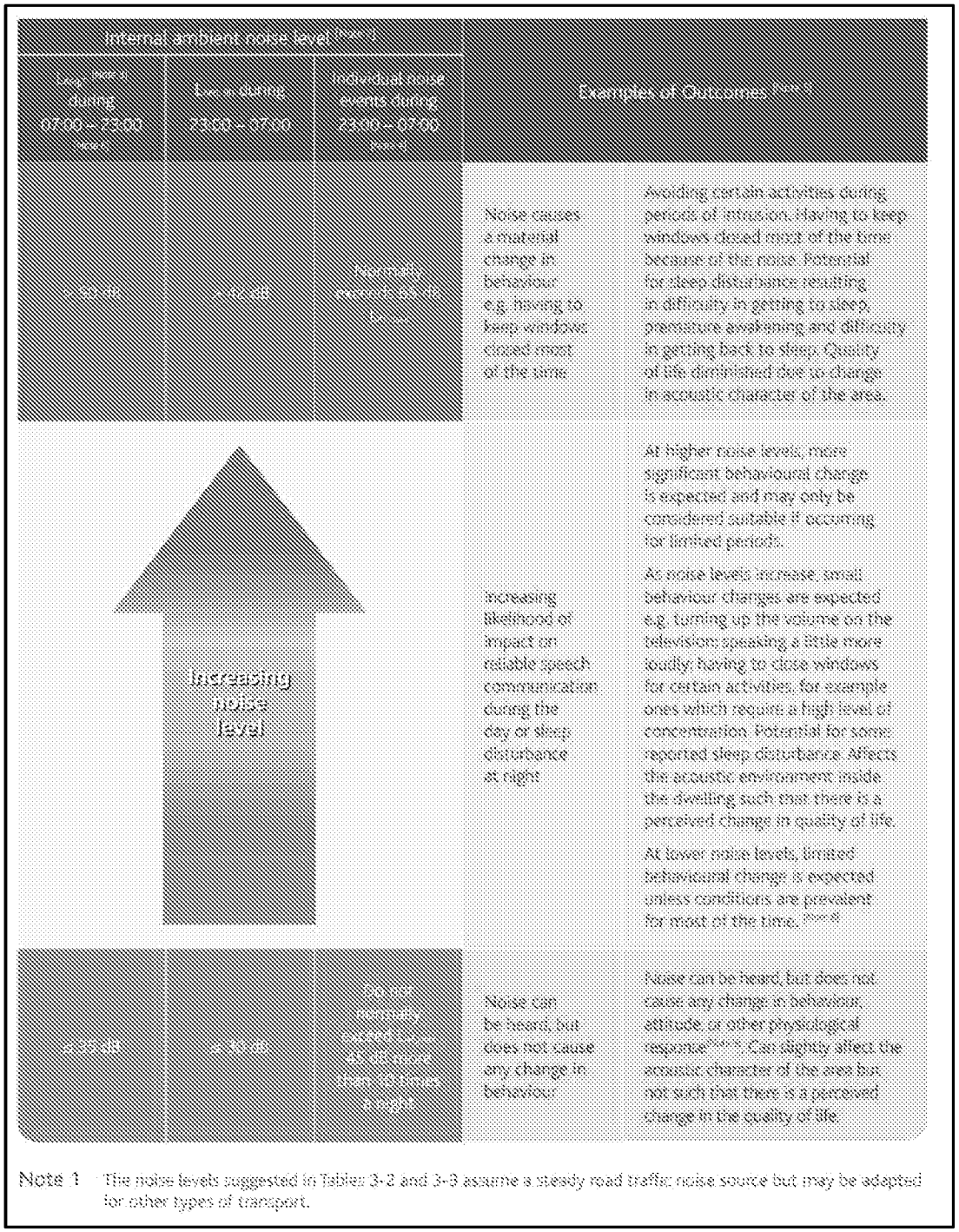


Figure 4: Level 2 Risk Assessment (Figure 3.3 of AVO guidance)

The noise levels suggested in Figure 3 and Figure 4 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.

BS4142:2014 Methods for rating industrial and commercial sound

BS4142:2014 uses a comparison between the rating and background sound levels to establish an initial estimate of the likely significance of impact. The standard notes:

a) *Typically, the greater this difference, the greater the magnitude of the impact.*

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

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

d) *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. 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.*

The context of the assessment must then be considered, which can significantly alter the outcome of the assessment. Factors that might alter the outcome of the assessment include the absolute level of sound compared to the residual sound level, the character of the sound compared to the residual, the sensitivity of the receptor etc.