

SHARPS REDMORE

ACOUSTIC CONSULTANTS ▪ Established 1990



Report

**Residential Development
and prior brick earth
extraction –
Land at Great Grovehurst
Farm, Grovehurst**

**Noise and Vibration
Assessment**

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1.0 Introduction

- 1.1 Sharps Redmore (SR) have been instructed by G H Dean & Co Ltd to undertake an environmental noise assessment on land at Great Gravenhurst Farm, Sittingbourne. The site location is shown in Figure 1 below:

FIGURE 1: Site Location



- 1.2 The site is in the village of Grovehurst which lies to the north west of Sittingbourne. The majority of the site is currently used for agriculture with approximately 22% of the site brownfield. The western section of the Sittingbourne Northern Relief Road (Swale Way) forms the northern boundary of this site, the B2005 extends along the west boundary and the Sittingbourne/Sheerness rail line is located immediately to the east. To the south of the site are existing residential properties in Danes Mead and Godwin Close. Immediately to the north of the site beyond Swale Way is Nicholls Transport yard. The site and surrounding land is allocated under Policy MU1 of the Swale Borough Council Local Plan (2017) for development.
- 1.3 Outline application is being sought for the development of up to 120 dwellings and all necessary supporting infrastructure including emergency access, roads, footpath and cycle links, open space, play areas and landscaping, parking, drainage and all utilities and service infrastructure works. All detailed matters are reserved for subsequent approval except (a) mitigation of impacts on Great Crested Newts; (b) vehicular access to Grovehurst Road and (c) extraction of brick earth.
- 1.4 The objective of the assessment is to consider the use of the land for residential development in the context of the existing noise climate, namely that generated by road traffic on Swale Way and Grovehurst Road and rail on the Sittingbourne/Sheerness rail line to the east. The report also considers the impact of the removal of the brick earth and construction of the properties on the residential properties to the South.
- 1.5 The study considers noise levels against current national and local guidelines and where appropriate recommendations are made on mitigation measures necessary to ensure an acceptable noise environment for future residents. The assessment has been undertaken principally by computer modelling (using SoundPLAN computer software). The results have been verified by noise surveys carried out at the site.

- 1.6 The report is based on the indicative layout shown in Tibbalds illustrative layout dated 17.1.18 as shown in Appendix A. This layout plan has been developed following consultation with SR.
- 1.7 Section 2.0 contains a discussion of the available methods of assessment and assessment criteria.
- 1.8 Section 3.0 of this report contains details of the environmental noise survey and initial site noise risk assessment (in accordance with the requirements of the latest ProPG planning guidance, as discussed further in Section 2).
- 1.9 Section 4.0 contains details of the Acoustic Design Statement for the site. The impact, noise and vibration, of the removal of the brick earth and construction on existing residential properties in Danes Mead and Godwin Close are considered in section 5.0. The assessment summary and conclusions are presented in section 6.0.

2.0 Assessment methodology and criteria

Planning Policy Context

National Policy

2.1 The National Planning Policy Framework (NPPF), March 2012, sets out the Government's planning policies for England and "these policies articulate the Government's vision of sustainable development." In respect of noise, Paragraph 123 of the NPPF states the following:

"Planning policies and decisions should aim to:

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

2.2 Guidance on the interpretation of the policy aims contained within the NPPF is contained within National Planning Policy Guidance (NPPG). The NPPG introduces the concept of a noise exposure hierarchy based on likely average response. The guidance contained in the NPPG is summarised in the table below:

TABLE 1: Noise Exposure Hierarchy

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, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a 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, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
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, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

2.3 The NPPF and NPPG reinforce the March 2010 DEFRA publication, “Noise Policy Statement for England” (NPSE), which states three policy aims, as follows:

“Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

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

- 2.4 Together, the first two aims require that no significant adverse impact should occur and that, where a noise level which falls between a level which represents the lowest observable adverse effect and a level which represents a significant observed adverse effect, then according to the explanatory notes in the statement:

“... all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life whilst also taking into consideration the guiding principles of sustainable development. This does not mean that such effects cannot occur.”

National Design Guidance - Noise

BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings.

- 2.5 The current nationally recommended internal noise levels for dwellings are given in BS 8233:2014 'Guidance on Sound Insulation & Noise Reduction for Buildings'. BS 8233 recommends the following internal noise standards:

TABLE 2: Guideline noise values

BS 8233:2014 Table 4 – Indoor ambient noise levels for dwellings			
Activity	Location	0700 to 2300	2300 to 0700
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

- 2.6 The previous version (1999) of BS 8233 contained two guidelines for internal criteria; good and reasonable. The difference between the good and reasonable criteria was 5 dB. Whilst the 5 dB relaxation in noise criteria is not specifically referred to in the table above, Note 7 advises that *“where development is considered necessary or despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.”*
- 2.7 There is no longer a L_{AMAX} standard for bedrooms In BS 8233. However, footnote 4 to Table 4 states that *“Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$ depending on the character and number of events per night. Sporadic noise events could require separate values.”* In this case, it is proposed that the previous BS8233 internal standard (also referenced in World Health Organisation Guidelines for Community Noise) is applied. This is 45 dB L_{AMAX} , inside bedrooms.

External Areas (Gardens)

- 2.8 For outdoor areas BS 8233:2014 recommends that *“it is desirable that the external noise level does not exceed 50 dB L_{AeqT} , with an upper guideline value of 55 dB L_{AeqT} ”* However, the document recognises that that these guideline values are not achievable in all circumstances and in higher noise areas, a compromise might be warranted. In such circumstances, development should be designed to achieve the lowest practicable levels in these external amenity spaces.

2.9 The Planning Practice Guidance on Noise, published on planningportal.gov.uk, gives further consideration relating to mitigating the impact of noise on residential developments and considers that noise may be partially off-set if residents of the dwellings have access to:

- A relatively quiet façade (containing windows to habitable rooms as part of their dwelling);
- A relatively quiet external amenity space for their sole use such as a balcony which is generally considered as desirable.
- A relatively quiet nearby external space for use by a number of residents as part of the amenity of their dwellings, and/or;
- A relatively quiet external, publicly accessible amenity space that is nearby (e.g. within a 5 minute walk)

ProPG: Planning and Noise – New Residential Development

2.10 The ProPG professional practice guidance on planning and noise has been joint produced by the Chartered Institute of Environmental Health (CIEH), Institute of Acoustic (IOA) and Association of Noise Consultants (ANC).

2.11 The ProPG recommends a 2 stage approach; an initial assessment which identifies the risk of noise on the proposed planning application, and where the results indicate that noise requires further consideration a full assessment in the form of an Acoustic Design Statement (ADS) which would include four key elements as follows:

- Element 1 – demonstrating a “Good Acoustic Design Process”;
- Element 2 – observing internal “Noise Level Guidelines.”
- Element 3 – Undertaking an “External Amenity Area Noise Assessment”
- Element 4 – Consideration of “Other Relevant Issues.”

2.12 The advice contained within ProPG is based on the policy objectives contained within the NPPF and the objective noise guidelines within BS 8233:2014. However the ProPG does not constitute an official government code of practice.

BS 5228-1:2009 + A1:2014: Code of Practice for noise and vibration on construction and open sites.

2.13 BS 5228 provides a method for predicting noise from construction activity or equipment. It is the accepted standard employed for the assessment of construction noise.

2.14 The standard also provides a framework for good working practice and guidance on the mitigation of noise.

2.15 Annexe E of the Standard provides guidance on criteria for the assessment of noise from construction sites and outlines three approaches:

- That noise levels should not exceed 70 – 75 dB L_{Aeq}
- That noise levels should not exceed thresholds determined from the existing ambient noise levels :

A – 65 dB L_{Aeq} (daytime) – where ambient noise levels (rounded to the nearest 5 dB) are less than this value.

B – 70 dB L_{Aeq} (daytime) – where ambient noise levels (rounded to the nearest 5 dB) are the same as threshold A value.

C – 75 dB L_{Aeq} (daytime) – where ambient noise levels (rounded to the nearest 5 dB) are above the threshold A value.

- That noise levels are determined to be significant if the total noise (ambient + construction noise) exceeds the pre-construction ambient noise levels by 5 dB or more, subject to a lower cut-off value of 65 dB

National Design Guidance – Vibration

2.16 With regards to vibration dose value (VDV), BS 6472-1:2015 provides guidance on the vibration in buildings with respect to human annoyance or complaints about interference with activities. VDVs relate to the levels of vibration of an event and the number of occurrences of events in a period of time. For residential buildings, BS 6472-1:2008 states, in Section 6, the following VDV ranges which might result in various probabilities of adverse comment:

TABLE 3 - BS 6472-1:2008 VDV Criteria for Residential Buildings

Vibration Dose Value ranges ($m/s^{1.75}$) which might result in various probabilities of adverse comment within residential buildings			
Place and Time	Low Probability of Adverse Comment	Adverse Comment Possible	Adverse Comment Probable
Residential buildings 16 hour day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 8 hour night	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

2.17 BS 6472-1:2008 states that *“These values May be used for both vertical and horizontal vibration”* and explains they are *“presented as ranges rather than discrete values [due to] the widely differing susceptibility to vibration evident among members of the population [and] the differing expectations of the vibration environment”*.

- 2.18 In addition to BS 6472 above, BS 5228-2 2009 is the ‘Code of Practice for noise and vibration control on construction and open sites: Part 2 Vibration’. This code recognises that if there is an interest in human reaction then measurements are recommended in terms of PPV (Peak Particle Velocity). PPV measurements have the added advantage that re-radiated noise from vibration source(s) can be predicted.
- 2.19 BS 5228-2 2009 Section B2 further discusses the human response to vibration and that ‘the threshold of perception being typically in the PPV range of 0.14 mm/s to 0.3 mm/s. Vibrations above these levels can disturb, startle, cause annoyance or interfere with work activities.’
- 2.20 BS 5228-2 2009 provides a table relating PPV’s to human perception. This table is reproduced below:

TABLE 4 – BS 5228-2 human perception of Vibration (PPV) in residential environments

Vibration Level	Effects
0.14 mm/s	<i>Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less</i>
0.3 mm/s	<i>Vibration might be just perceptible in residential environments</i>
1.0 mm/s	<i>It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning has been given to residents.</i>
10 mm/s	<i>Vibration is likely to be intolerable for any more than a very brief exposure to this level.</i>

3.0 Site Survey

3.1 A site survey was carried out to determine existing noise levels at the site. Measurements were taken between 18th and 19th October 2017 at four locations as shown in Figure 2 below and described in Table 5 below.

FIGURE 2: Noise monitoring locations

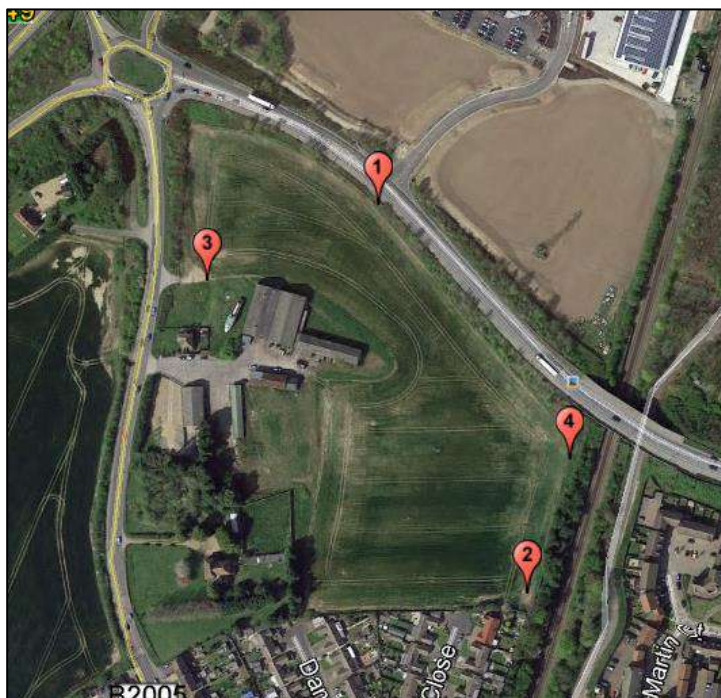


TABLE 5: Description of monitoring locations

Location	Equipment Used	Site Description
ML 1	SLM - Norsonic 118 Type 1 Calibrator – Norsonic	Microphone located approx. 3 metres from the edge of Swale way, busy road with large numbers of HGV's passing to and from A249. The microphone was located on a tri-pod approx. 1.4 metres above ground level in free-field conditions. Measurements recorded over 24 hours
ML 2	SLM - Norsonic 118 Type 1 Calibrator - Norsonic	Eastern edge of field, 14 metres from rail line, 26 metres from nearest residence. Existing noise climate dominated by vehicles on the Swale Way, particularly where the road rises over the rail line. Trains run roughly half hourly between Kemsley and Sheerness. Measurements recorded over 24 hours. Location also representative of existing residential properties in Godwin Close
ML 3	SLM - Norsonic 140 Type 1 Calibrator - Norsonic	Western edge of site, 14 metres from B2005. During day noise levels dictated by road traffic on B2005 at night road traffic on Swale Way becomes dominant. Measurements recorded over 24 hours
ML 4	SLM - Norsonic 118 Type 1 Calibrator - Norsonic	Short-term attended measurements to determine maximum, L_{Amax} from train pass-bys

- 3.2 Weather conditions were determined from site observations during the survey and were overcast and dry with light winds. Weather conditions were suitable for taking noise measurements.

Existing noise sources

- 3.3 The existing noise environment is dominated by road traffic noise on Swale Way which carries a high volume of traffic including HGV's from the industrial areas to the north including the Morrisons Distribution Centre and Nicholls Transport. Noise from rail activity was not significant compared to road traffic noise.
- 3.4 Full details of the survey results are included in Appendix B and summarised in Table 6 below. Maximum event noise levels, L_{Amax} are due to localised traffic on Swale Way.

TABLE 6: Noise survey results

Location	Day time (0700 – 2300 hrs)	Night time (2300 – 0700 hrs)	
	$L_{Aeq16hr}$	L_{Aeq8hr}^1	L_{Amax}
ML 1	80 dB	76 dB	85 dB
ML 2	51 dB	48 dB	62 dB
ML 3	64 dB	59 dB	74 dB
ML 4	--	--	65 – 68 dB ²

¹ Excludes data from unknown event between 0325 – 0630 hrs (para. 3.6 below)

² L_{Amax} from train pass-bys

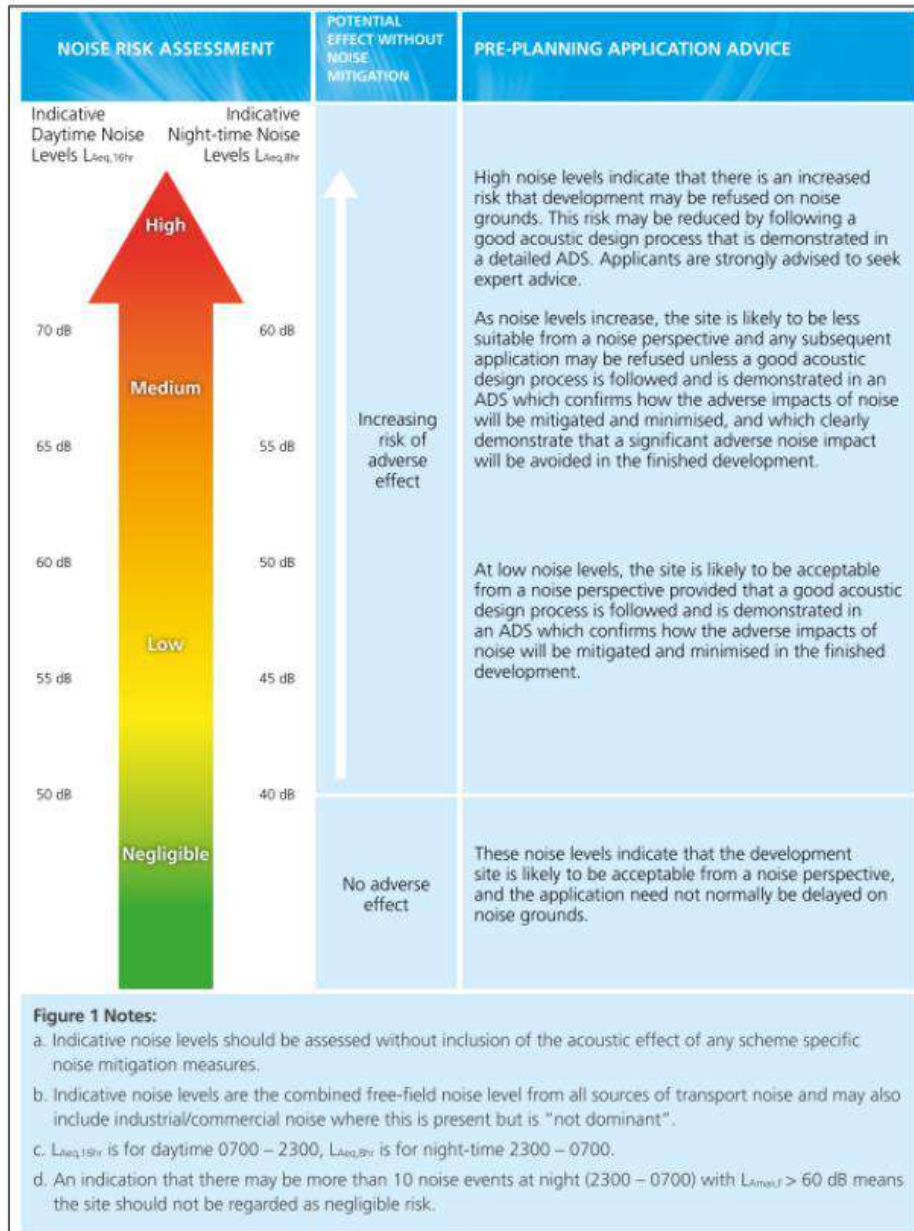
- 3.5 Using the above survey results and traffic data provided by PFA consulting Ltd including vehicles leaving the Nicholls Transport yard, the predicted noise levels across the site have been determined by noise contour modelling using SoundPlan noise modelling software. This is the preferred method of determination as stated in the Calculation of Road Traffic Noise (CRTN). The models include future traffic growth on Swale Way and the B2005.
- 3.6 During the night time period at ML1 measured noise levels were affected by an unknown event between 0325 and 0630 hours. The noise levels measured during this period have been excluded from the above results. With these results excluded measured noise levels would be consistent with those predicted based on traffic flow figures.

4.0 Noise Assessment - New Residential Development

Initial Site Noise Risk Assessment

- 4.1 The initial site noise risk assessment does not include the impact of any mitigation measures that have been incorporated into the design of the project but is intended to give an indication as to the extent of the acoustic issues that will be faced. The noise models are based on all noise sources, including road traffic on Swale Way and B2005, and activity on the Sittingbourne/Sheerness rail line immediately to the east.
- 4.2 Based on the guidance in the ProPG, as shown in Figure 3 below, the measured noise levels there is a medium risk during the day and medium/high risk during the night time period.
- 4.3 The ProPG advices states that for medium to high risk sites that *“as noise levels increase the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development.”* *“High noise levels indicate that there is an increased risk that development may be refused on noise grounds. This risk may be reduced by following a good acoustic design process that is demonstrated in a detailed ADS”*

FIGURE 3: ProPG – Initial Site Assessment Guidance



Acoustic Design Statement

4.4 As discussed in section 2.0 of the report the full assessment should cover four main elements as follows:

- Element 1 – demonstrating a “Good Acoustic Design Process”
- Element 2 – observing internal “Noise Level Guidelines”
- Element 3 – Undertaking an “External Amenity Area Noise Assessment”
- Element 4 – Consideration of “Other Relevant Issues”

Element 1 - Good Acoustic Design Process

- 4.5 Generally, there is a hierarchy of noise control that should be considered in all cases, and the layout should demonstrate that the following logical process, which would represent good design, has been followed as far as possible:
- Maximise the spatial separation of noise source(s) and receptor(s);
 - Using existing topography and existing structures to screen the proposed development site from significant sources of noise;
 - Incorporating noise barriers as part of the scheme to screen the proposed site from significant sources of noise;
 - Using the layout of the scheme to reduce noise propagation across the site;
 - Using the orientation of buildings to reduce the noise exposure of noise sensitive rooms;
 - Using the building envelope to mitigate noise to acceptable levels.
- 4.6 In other words, using the fabric of the building (i.e. acoustic glazing) to control noise should only be considered once other design and layout options have been considered. Where reliance upon the building envelope insulation with closed windows is recommended this should be justified and consideration given to any unintended adverse consequences.
- 4.7 The main source of noise is road traffic noise on Swale Way which runs along the northern boundary of the site and Grovehurst Road to the west. The application is for outline only with all matters reserved therefore it is not possible to carry out a detailed assessment at this stage. However the development has been designed in accordance with the principles of 'good acoustic design' to minimise the need to use the building envelope to control noise. These measures include the following:
- The use of a landscaped buffer zone along the northern western part of the site to maximise the distance of the proposed residential properties from Swale Way.
 - Using the built form of the development, including linked garages to the properties closest to Swale Way, this will provide acoustic screening to the remainder of the site and garden areas.
 - The provision of an acoustic fence along the rear boundary of the residential properties closest to rail line.
- 4.8 In addition to the above measures that have been incorporated into the illustrative layout screening along the northern boundary of the site has also been considered. Due to the topography of the site and the wider planning objectives including the need to have an access to the existing footpath on Swale Way, any acoustic screen along the northern boundary would not be effective.
- 4.9 To determine the impact of noise levels SR has used SoundPLAN 7.1 noise modelling software package to predict the noise levels from road traffic, in accordance with the Calculation of Road Traffic Noise (CRTN) 1988.
- 4.10 SoundPLAN calculates L_{AeqT} levels at defined receptors in accordance with the appropriate standards. The calculation is based on a number of input parameters (as outlined in

Section 3 of this report), including; source noise level data, barriers, receptor positions, topography and intervening ground conditions.

- 4.11 The noise contours can be plotted at defined intervals, and height above ground level. The resulting noise maps are included at Appendix C. Using the results of the SoundPLAN modelling the impact of road traffic and rail activity on the proposed residential development has been assessed in accordance with the guidance contained within ProPG: Planning and Noise – New Residential Development.

Element 2 – Internal Noise Level Guidelines

- 4.12 Based on experience of similar developments SR has developed design advice for the site to provide a guide to the mitigation measures that are necessary to achieve internal noise levels compliant with the guidelines in BS 8233:2014. The advice is based on achievable overall sound reduction of 40 dB (straight level difference from an external façade level from acoustic glazing/ventilation). However as stated above the use of the building envelope will only be considered after the layout of the site has designed according to good acoustic principles.

Daytime – Living Rooms

Level Free-Field)	Advice	Rationale
< 50 dB $L_{Aeq, 16Hr}$	Acceptable in all senses, no mitigation required	WHO level below which there is no moderate annoyance. 15 dB reduction for open window = 35 dB in living room.
50 – 60 dB $L_{Aeq, 16Hr}$	Standard construction and solid garden fencing will achieve acceptable levels. No special mitigation required, but layout should be considered to minimise exposure to less than 55 dB where possible	Standard double glazing would reduce top end level to 30 to 35 in living rooms. 5 to 10 dB reduction may be possible by solid garden fences to achieve garden target levels of 50 to 55 dB - WHO level below which there is no serious annoyance. 15 dB reduction from that for open window would give 40 dB (BS 8233 “Reasonable”) inside (i.e. 5 dB flexibility).
60 – 70 dB $L_{Aeq, 16Hr}$	Mitigation required - consider layout and room arrangement to minimise exposure. Acoustic glazing and ventilation likely at the higher end of the band and gardens may need to be shielded by the built form of the development where possible.	Layout to shield gardens to achieve 55 dB ought to be possible with care. 40 dB loss from acoustic glazing would achieve target levels inside.
> 70 dB $L_{Aeq, 16 Hr}$	Avoid houses or gardens in this area as far as possible, unless mitigation via bunding or high acoustic screening to the site boundary is available.	>15 dB screening to gardens is required and this is probably the most achievable from the built form (i.e. screening gardens by arrangement of the buildings). At >70 dB externally, it will be difficult to achieve internal targets without special acoustic systems.

Night time – Bedrooms

Level (Free-Field)	Advice	Rationale
< 45 dB $L_{Aeq, 8Hr}$ < 60 dB L_{AMAX}	Acceptable in all senses, no mitigation required	15 dB reduction for open window = 30 dB L_{Aeq} and 45 dB L_{AMAX} in bedroom.
45 – 55 dB $L_{Aeq, 8Hr}$ 60 – 70 dB L_{AMAX}	Standard construction. No special mitigation required, but layout should be considered to minimise exposure to less than 50 dB L_{Aeq} and 60 dB L_{AMAX} where possible.	Standard double glazing would reduce top end level to less than 30 dB L_{Aeq} and 45 dB L_{AMAX} in bedrooms. 15 dB reduction for open window from 50 dB L_{Aeq} external would give 35 dB (BS 8233 “Reasonable”) inside (i.e. 5 dB flexibility). Similarly from 60 dB L_{AMAX} to achieve 45 dB L_{AMAX} internally.
55 – 70 dB $L_{Aeq, 8Hr}$ 70 – 80 dB L_{AMAX}	Mitigation required - consider layout and room arrangement to minimise exposure. Acoustic glazing and ventilation likely at the higher end of the band.	At the top end, 40 dB loss from acoustic glazing would achieve target levels inside.
> 70 dB $L_{Aeq, 8 Hr}$ > 80 dB L_{AMAX}	Avoid houses in this area as far as possible, unless mitigation via bunding or high acoustic screening to the site boundary is available.	At >70 dB L_{Aeq} /80 dB L_{AMAX} externally, it will be difficult to achieve internal targets without special acoustic systems.

Element 3 – External Amenity

- 4.13 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 55 dB $L_{Aeq16hr}$. However the advice in BS 8233:2014 is that *“These guidelines values may not be achievable in all circumstances where development might be desirable. In such situations development should be designed to achieve the lowest practicable noise levels in these external amenity spaces but should not be prohibited.”*
- 4.14 As discussed in para 4.7 above the layout of the site will be designed to screen gardens from the main source of noise which is road traffic on Swale Way and Grovehurst Road. As a result of these measures noise levels in the majority of gardens will be less than 55 dB. The noise levels in the remaining gardens will be less than 57 dB $L_{Aeq16hr}$.
- 4.15 Taking into account the measures included in the scheme and the additional screening that will be provided by garden fences it is not considered that external noise levels will cause significant adverse impacts to future residents.

Element 4 – Assessment of other relevant issues

- 4.16 The fourth and final element of Stage 2 is an assessment of other relevant issues, including compliance with relevant national and local policy; the magnitude and extent of compliance with ProPG; likely occupants of the development; unintended adverse consequences resulting from the acoustic design and wider planning objectives.

Compliance with national and local policy

- 4.17 In terms of noise sensitive development the main aims of the NPPF is the avoidance of significant adverse effects and the mitigation and reduction of any adverse impacts to a minimum. As discussed in section 2.0 of this report, the current nationally recommended internal noise levels for dwellings are given in BS 8233:2014 'Guidance on Sound Insulation & Noise Reduction for Buildings.' These guideline values are based on the WHO Guidelines for Community Health which was released in a final form in 2000. The World Health Organisation guidance is referenced in the NPSE.
- 4.18 The WHO guideline values are appropriate to what are termed "critical health effects". This means that the limits are at the lowest noise level that would result in any psychological, physiological or sociological effect. They are, as defined by NPSE, set at the Lowest Observed Adverse Effect Level (LOAEL) and therefore exceedance of the guideline values cannot be considered to be Significant adverse effects (SOAEL).
- 4.19 The proposed site has been designed to comply with the guidance in BS 8233:2014 and therefore the site has been designed in accordance with national planning objectives.

Magnitude and Extent of compliance with ProPG

- 4.20 The site has been designed taking into account the good acoustic design principals as recommended in ProPG. However due to site constraints and topography of the site whilst these measures will reduce the reliance on the building envelope it will still be necessary to have some windows closed and alternative means of ventilation. Where alternative means of ventilation is required consideration will be given to over-heating.
- 4.21 Details of the exact mitigation measures will be determined at the detailed design stage and can be controlled by a suitable worded planning condition an example is shown below:

" Construction work shall not begin until a scheme for protecting the development from noise from road traffic noise has been submitted to and approved by the local planning authority. Internal noise levels shall meet the noise criteria in Table 4 of BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings"

TABLE 7: Summary Acoustic Design Statement

Great Grovehurst Farm – Residential Development		
Stage 1 - Initial Site Assessment	Day (0700 -2300hrs)	Medium
	Night (2300 – 0700 hrs)	Medium/High
Description of Noise Environment	Site noise dominated by road traffic from Swale Way and localised traffic on B2005 (Grovehurst Road)	
Stage 2 - Full Assessment		
Element 1 Good Acoustic Design	<ul style="list-style-type: none"> ■ Due to topography of site and wider planning objectives including access to Swale Way screening would not be effective. ■ The use of a landscaped buffer zone on the northern part of the site to maximise the distance of the proposed residential properties from Swale Way. ■ Using the built form of the development to provide acoustic screening to the site and garden areas. ■ Use of an acoustic fence along the rear gardens of the properties closest to the rail line. 	
Element 2 Internal Noise Levels	<p>The above measures will ensure number of properties where windows are closed to achieve internal noise levels are kept to a minimal.</p> <p>Where it is necessary to have windows closed alternative means of ventilation will have to be provided.</p>	
Element 3 External Noise Levels	<p>The good acoustic design measures will ensure that external noise levels for the majority of gardens are below 55 dB L_{Aeq16hr}. For the remaining sites gardens have been designed to ensure the lowest practicable levels.</p>	
Element 4 Other Relevant Issues	<ul style="list-style-type: none"> ■ The site will comply with the national policy aims of the NPPF to avoid significant adverse effects. ■ Good acoustic design measures will ensure any remaining impacts to future residents are reduced and minimised. ■ Potential issues of overheating will be dealt though a ventilation strategy which will be determined at the detailed design stage. 	

5.0 Impact of removal of brick-earth/construction noise and vibration

- 5.1 As advised in section 1.0 of this report the site is underlain with brick earth and in accordance with the policies of the Kent Minerals & Waste Local Plan this will be removed.
- 5.2 Following pre-application discussions with Mr S Wilcock, Environmental Protection Team Leader, Mid Kent Environmental Health it has been agreed that a noise assessment of the proposed works will be carried out which would consider the impact of removal of brick-earth and construction phase of the development.

Removal of brick earth

- 5.3 SR has been advised that the brick earth will be removed by the contractors Wienerberger. The process will include the stripping back of the topsoil which will be used to construct a temporary acoustic bund between the site and the nearest residential properties in Danes Mead and Godwin Close. This bund would remain in place during the subsequent brick earth extraction process and thereafter used by the house builder on a gradual basis for the formation of gardens and open spaces within the proposed residential development.
- 5.4 Based on experience of similar sites and information provided by the contractors, Wienerberger, SR has used SoundPLAN computer modelling software to predict noise levels from the proposed works on the residential properties to the south of the site. The following assumptions have been made:
- Stage 1 – Stripping back of top soil and bund construction using 1 x excavator, 1 dump truck.
 - Stage 2 – Extraction of brick earth using 2 x excavator, 2 x dump truck, includes HGV movements.
- 5.5 The results of the SoundPLAN models are shown in Appendix D and summarised in table 8 below. For the extraction of the brick earth a worst case situation of all plant operating on the southern part of the site has been assumed.

TABLE 8: Predicted Noise Levels

Receptor	Predicted Noise Level L_{AeqT} dB	
	Stage 1 – Stripping of Top Soil	Stage 2 – Removal of Brick earth
16 Danes Mead	63 – 65 dB	61 - 63 dB
15 Godwin Close	65 – 67 dB	61 - 63 dB
26 Godwin Close	63 – 65 dB	61 - 63 dB

- 5.6 Annexe E of the B 5228 provides guidance on criteria for the assessment of noise from construction sites and outlines three approaches:
- That noise levels should not exceed 70 – 75 dB L_{Aeq}
 - That noise levels should not exceed thresholds determined from the existing ambient noise levels :

A – 65 dB L_{Aeq} (daytime) – where ambient noise levels (rounded to the nearest 5 dB) are less than this value.

B – 70 dB L_{Aeq} (daytime) – where ambient noise levels (rounded to the nearest 5 dB) are the same as threshold A value.

C – 75 dB L_{Aeq} (daytime) – where ambient noise levels (rounded to the nearest 5 dB) are above the threshold A value.
 - That noise levels are determined to be significant if the total noise (ambient + construction noise) exceeds the pre-construction ambient noise levels by 5 dB or more, subject to a lower cut-off value of 65 dB
- 5.7 Using survey results from ML 2 the typical daytime (0700 – 1900 hrs) ambient noise level is 52 dB $L_{Aeq10hrs}$. In accordance with above assessment criteria noise from construction work should not exceed 65 dB L_{AeqT} .
- 5.8 Based on the predicted noise levels, with the exception of a slight exceedance (1-2 dB) at 15 Godwin Close, during the stripping of the top soil and construction of the earth bund thereafter noise from the brick earth removal will be below the 65 dB threshold.
- 5.9 Noise from the brick earth extraction will be of a limited duration, approx. 10 – 12 weeks and will be controlled by Brick earth Extraction Method Statement and Site Management Report which will include work times, machinery to be used, noise and dust suppression and traffic routing. It is therefore concluded that noise from top soil stripping and brick earth extraction will not cause significant adverse impact to local residents.

Construction Noise

- 5.10 Based on experience of similar projects the construction work will most likely be carried out in the following phases:
- Excavation, landscaping and site clearance
 - Infrastructure construction
 - Building construction
 - Highway works
- 5.11 In terms of impact to adjacent residents the main noisiest operations are typically during the excavation, landscaping and site clearance when plant such as excavators, dump trucks and bulldozers are being used. SR has used SoundPLAN computer modelling software to predict noise levels from the proposed works on the residential properties to the south of the site during the times when this equipment will be used. The results are shown in Appendix E to this report.

- 5.12 At this stage, it is not possible to be specific about construction activity since no contractor has been appointed however based on experience of similar sites predicted noise levels will be between 57 – 59 dB $L_{Aeq,10hr}$ and will be below the lower threshold of 65 dB as advised in BS 5228.
- 5.13 The impact of construction activity will depend on the following:
- i. The likely extent of construction works (where, when, duration)
 - ii. The type and number of plant to be used;
 - iii. Agreed noise amelioration measures with the local authority (amelioration and management controls) and/or noise limits
 - iv. Hours of work
- 5.14 It is therefore recommended that prior commencement of works on site that a construction works method statement is agreed with the local authority which would include all methods of work and noise control measures. This can be done through an informal undertaking or legislative process.

Vibration

- 5.15 Ground borne (structural damage) and air borne (nuisance such as window rattling and floor movement) vibration during the construction phase is often a cause for concern, particularly in relation to piling operations. Owing to the complex relationship between the force of the vibration source, the intervening geology, distance and construction of the receiving structure, it is impossible to predict the degree of vibration, which may occur during the construction phase to any degree of accuracy.
- 5.16 The levels of vibration that are required to be generated before structural damage occurs are high and unlikely to be reached in the construction of the proposed development or the brick earth extraction. The mitigation measures that will be implemented through the brick earth extraction method statement to control noise will also control any impacts from vibration.

6.0 Summary and Conclusions

6.1 Sharps Redmore has undertaken an environmental noise assessment of a proposed residential development at land at Great Grovehurst Farm, Grovehurst.

6.2 The objective of the assessment is to determine the following:

- The impact of road traffic and rail noise on the proposed development;
- The impact of construction activity, including the removal or the brick earth on existing residential properties.

6.3 Noise assessment criteria were selected by reference to relevant government and international guidance documents.

Noise impact of road traffic on proposed residential properties

6.4 The impact of road traffic noise has been assessed in accordance with the Professional Practice Guidance ProPG Planning and Noise for new residential developments.

6.5 The initial site noise assessment indicates a medium to high risk and consideration must be given to good acoustic design measures.

6.6 The application is for outline consent only, however the following measures will be incorporated into the scheme:

- The use of a landscaped buffer zone on the northern part of the site to maximise the distance of the proposed residential properties from Swale Way.
- Using the built form of the development to provide acoustic screening to the site and garden areas.
- Use of an acoustic fence along the rear gardens of the properties closest to the rail line.

6.7 This assessment concludes noise from road traffic on Swale Way would not cause significant disturbance to proposed future residents, and is therefore in accordance with the policy aims of National Planning Policy Framework.

Noise and Vibration impact from brick earth removal and construction

6.8 With the exception of a slight exceedance (1-2 dB) at 15 Godwin Close, during the initial striping of the top-soil, prior to construction of the earth bund, noise levels will be within the recommended noise criteria.

6.9 Noise from the brick earth extraction will be of a limited duration and will be controlled by Brick earth Extraction Method Statement and Site Management Report which will include work times, machinery to be used, noise and dust suppression and traffic routing.

6.10 Noise from the construction phase will depend on the final construction method and will not be determined until a contractor has been appointed. Noise levels during the construction phase will be controlled through a noise management plan to be agreed with the local authority.

6.11 Vibration for the brick earth extraction and construction phase is unlikely to cause significant adverse impact to existing residents. However the mitigation measures that will be implemented through the brick earth extraction and construction method statement to control noise will also control any impacts from vibration.