Report

Land to the North of Hill Wootton Road, Leek Wootton, Warwickshire Technical Appraisal

Prepared for
Bloor Homes

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Contents

Land to the North of Hill Wootton Road, Leek Wootton, Warwickshire

1 Introduction

Terms of Reference

CH2M HILL (formerly Halcrow Group Ltd) has been appointed by Bloor Homes to provide a Technical Appraisal for land to the north of Hill Wootton Road to the east of Leek Wootton, Warwickshire.

This Technical Appraisal considers the development constraints and opportunities for the development of the site in terms of:

- Drainage
- Noise
- Ecology
- Trees

The report is based on information provided by Bloor Homes, a Developer Enquiry from Severn Trent Water, site visits and information freely available on the internet.

Site Location and Description

The 1.9ha site is located to the east of Leek Wootton, Warwickshire. The site is centred on Ordnance Survey grid reference SP 292685 and lies approximately 2km south of Kenilworth. Figure 1.1 below shows the indicative site location.

The site is bounded to the south by Hill Wootton Road, to the east by the A46 and to the west by residential dwellings of Leek Wootton, an agricultural field lies directly to the north of the site. The site falls within the administrative area of Warwick District Council. The site is divided into two by a fence and falls in a south-easterly direction.

Figure 1.1: Leek Wootton Site Location

2 Drainage

A developer enquiry has been submitted to Severn Trent Water (STW) to establish location, capacity and preferred connection points to the surface water and the foul sewer system, STW's response to the developer enquiry is included in Appendix B and referred to in the relevant sections below.

Site description

The site is located to the east of Leek Wootton to the north of Hill Wootton Road as shown in Figure 2.1 below. In addition to the site the developer has control of a large area of land to the south of Hill Wootton Road as shown in Figure 2.1 below.

2

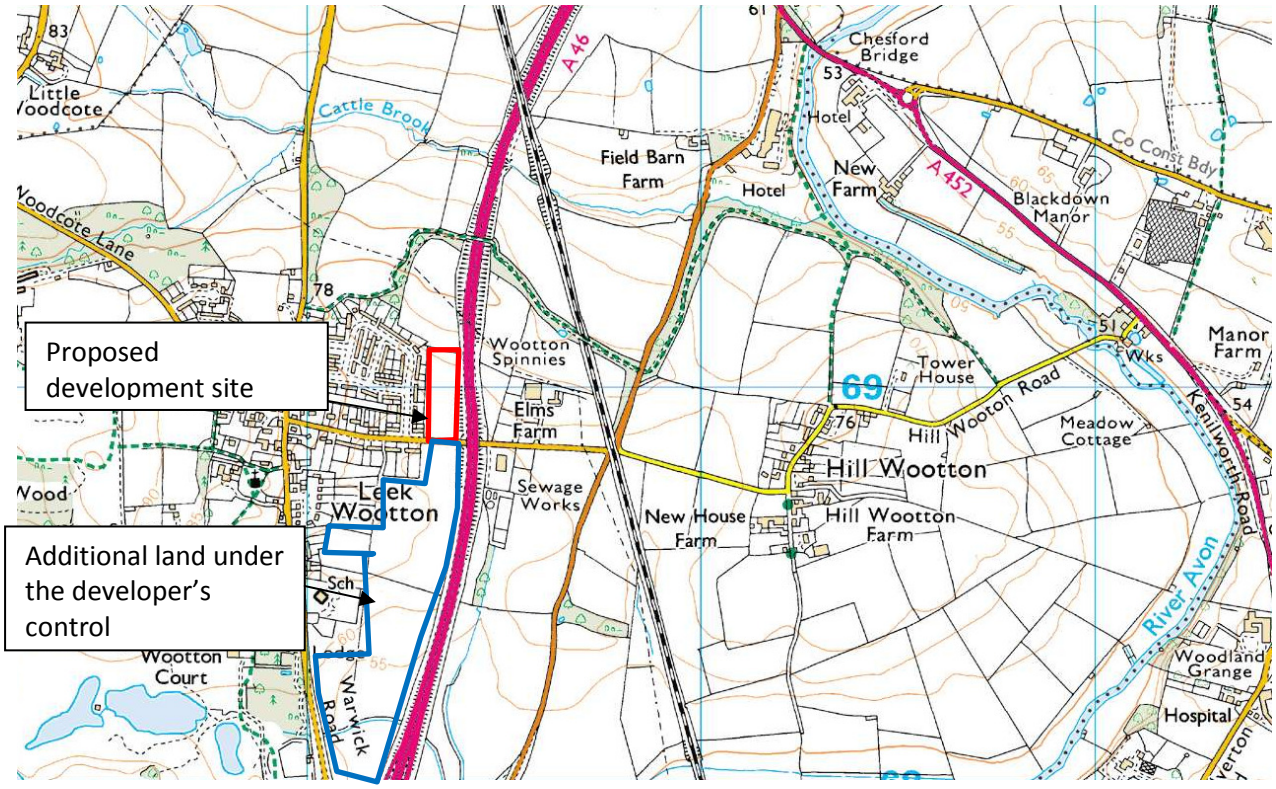


Figure 2.1 Site location, topography and proximity to watercourses

A tributary of the River Avon flows through the south of the land under the developers control in an easterly direction and merges with the River Avon approximately 530m to the south-east of the site within land under the developer's control.

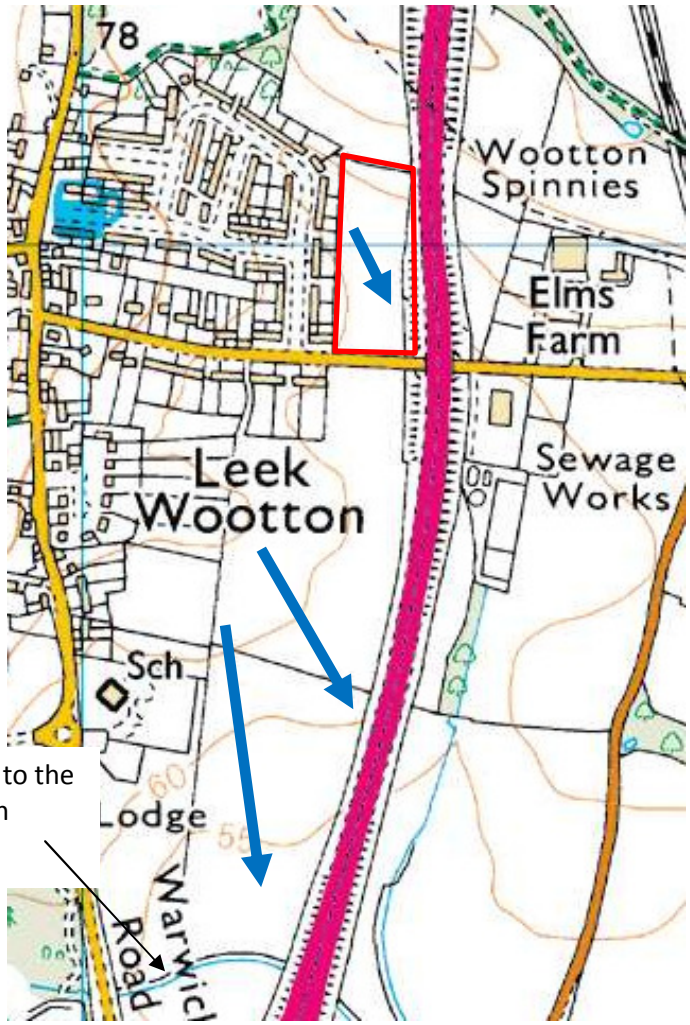


Figure 2.2 Surface water flowpaths

The site (to the north of Hill Wootton Road falls from approximately 65mAOD in the north east corner and along the western boundary of the site to approximately 60mAOD at the south east corner of the site.

The land to the south of Hill Wootton Road which is within the developer's control falls from approximately 62mAOD at Hill Wootton Road to approximately 55mAOD at the tributary to the river avon.

A site walkover identified that a culverted watercourse appears to run under the site, beyond the western boundary of the site the culvert runs as an open watercourse for approximately 1 metre before going into culvert again to run underneath the A46. There is no evidence (on maps or satellite images) of where this culvert runs after it crosses under the A46 culvert, however it is likely that it discharges either into the River Avon or one of its tributaries to the east of the site.

4

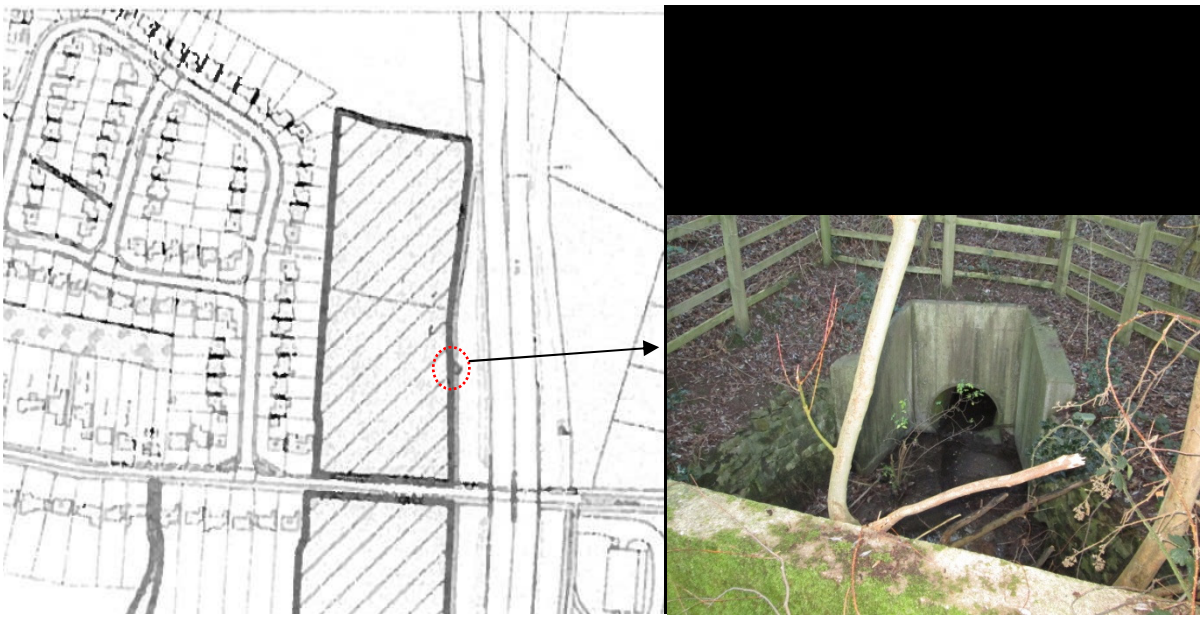


Figure 2.3 Open watercourse coming out of and going into culvert under the A46

A monitoring borehole was also identified on the site, it is unclear what the purpose of this borehole is but it could have been installed to monitor groundwater levels or levels of water in the watercourse.

Figure 2.4 Monitoring borehole identified onsite

Existing Sewers

Severn Trent Water have provided plans of their existing sewers along with their developer enquirty (see Appendix B). Figure 2.5 below is and extract of the plans and shows the following:

- 150mm diameter combined sewer running along Hill Wootton Road which discharges to the sewage works to the east of the A46 and south of Hill Wootton Road.
- An abandoned 300mm diameter combined sewer which runs alongside a live 900mm diameter storm storage sewer, both crossing the site.

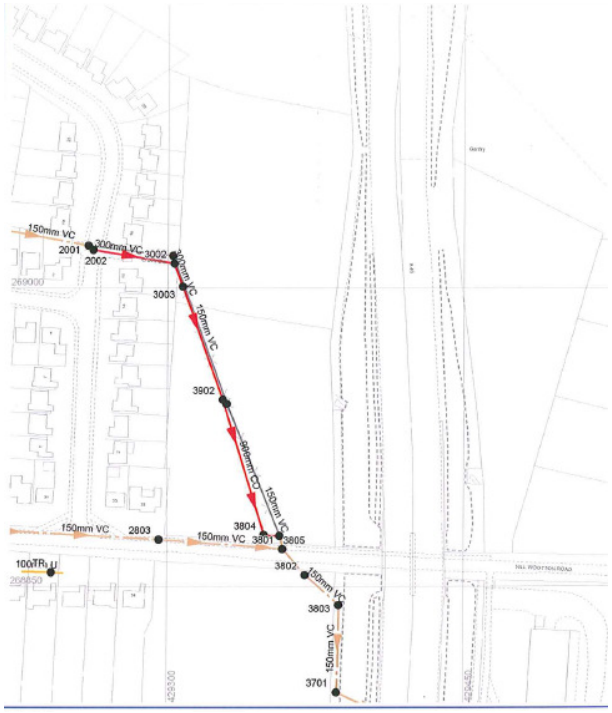


Figure 2.5 Extract from Severn Trent Water existing sewer plans

Surface Water Drainage Requirements

In accordance with the NPPF and the TGNPPF, any new or re-development should apply and give priority to Sustainable Drainage Systems (SuDS), which are designed to control surface water runoff close to where it falls and mimic natural drainage as closely as possible. Therefore in accordance with planning policy the development should implement a site storm drainage system that provides sustainable drainage measures consistent with the recommendations of NPPF, guidance contained within the local SFRA and with due regard to the following industry standards:

- Draft National Standards for Sustainable Drainage Systems (Defra, 2011);
- The SuDS Manual CIRIA C697;
- Defra/EA Flood & Coastal Erosion Risk Management R&D Programme – Preliminary Rainfall Runoff

Management for Developments Rev E (2012);
- EA's pollution prevention guidelines (PPGs); and
- Sewers for Adoption 7th Edition.

When appraising suitable storm water discharge options for a development site, Part H of the Building Regulations 2002 provides the following hierarchy, listed in order of priority:

- an adequate soakaway or some other adequate infiltration system; or where that is not reasonably practicable
- a watercourse; or where that is not reasonably practicable
- a sewer.

If the site investigation concludes that soil conditions at the site will not facilitate an effective soakaway system due to slow infiltration rates the next preferred method of surface water disposal will be to a watercourse. In such cases the Rainfall Runoff Management for Developments (Defra/EA) procedure sets out two objectives:

- Storm water runoff discharged from urban developments to replicate or achieve a reduction from greenfield response of the site over an extended range of storm probabilities (return periods).

6

- Manage runoff on site for extreme events.

Surface Water Drainage Proposals

The site does not currently have the benefit of a ground investigation, therefore it is unknown whether the ground would be suitable for soakaways as a solution to deal with the surface water arising from the proposed development. Therefore it is prudent to investigate other means of disposing of surface water arising from the site.

Based on the information currently available there are three options for draining the site,:

1. Outfall the site surface water drainage into the existing culvert under the A46 (see figure 2.3). It is anticipated that it would be possible to drain the majority of the site by gravity to this culvert. However there is a small area of the site (the south eastern corner along Hill Wootton Road) that may require ground raising to enable drainage by gravity to this outfall.

2. Outfall the site surface water drainage to the River Avon Tributary located to the south of the site on land within the developer's control. Based on the contour information available there is a fall of approximately 8 metres from the southern point of the development site (at Hill Wootton Road) to the watercourse to the south of the site, this maybe enough fall to drain the site by gravity, however a more detailed topographic survey would be required to determine whether this is the case.

3. If it is not possible to drain the site by soakaways or by gravity as described in options 1 and 2 Severn Trent Water will consider allowing a connection to the 150mm combined sewer that runs along Hill Wootton Road (see appendix B). This would be subject to Severn Trent Water undertaking modelling works to establish the capacity of the sewer.

Attenuation requirements

Surface water leaving the site will need to be restricted to Greenfield runoff rate and as such all of the options described above would need to incorporate water quality improvements and a form of attenuation to allow the restriction of surface water off the site.

The site is a Greenfield development, therefore to comply with the code for sustainable home the discharge will be limited to a Qbar Greenfield run-off rate (to be agreed with the Environment Agency but assessed as 4.1litres per second per hectare). Assuming that 1.9 ha of the developed site is 60% impermeable the surface water discharge rate from these areas would be:

4.1 x 1.9 x 0.6 = 4.7 l/s

Please note that hydraulic controls are not usually limited to below 5 l/s and therefore the assumed discharge rate for the development would be set to this value.

For a 1in100 year storm event, allowing for 30% climate change and a 5 l/s discharge rate a storage tank or attenuation pond capable of storing a volume of 720m3 of surface water would be required to limit flows off the site to Greenfield runoff rate, this could be accommodated within the site north of Hill Wootton Road or for option 2 potentially in the land to the south of Hill Wootton Road.

Diversions

There is likely to be an easement associated with the existing culvert which appears to run through the development site, further investigation is required to establish the route of the culvert and where it is conveying water to and from. Depending on the depth of the culvert under the site it may also be necessary to either divert or open up the watercourse.

The Severn Trent Water sewers which cross the site (see Figure 2.5 above) require a 10metre easement (5m either side of the pipe) where no building should be erected. These sewers may be diverted, however due to the size of the storm storage sewer (900m diameter) it can only be diverted by Severn

Trent Water under a s185 Sewer Diversion Scheme. Severn Trent Water have also confirmed that the 150mm diameter sewer crossing the site parallel with the 900mm storage sewer has been abandoned.

Correspondence from Severn Trent Water regarding the above is included in Appendix B.

Flood Risk

The EA provides a web based Indicative Flood Mapping Service (IFM) which shows the likelihood and magnitude of fluvial flooding within England and Wales. The latest publication of the IFM (January 2014) identifies there to be no significant fluvial flooding within the vicinity of the site (site falls within Flood Zone 1). The IFM represents the likelihood of flood risk on main watercourses and does not represent the risk of flooding on smaller watercourses or tributaries.

Foul Sewerage Proposals

A 150mm diameter foul water sewer exists in Hill Wootton Road and drains to the sewage works located to the east of the A46 and south of Hill Wootton Road (see Appendix B).

Based on the ground levels at the site and the depth of the sewer as indicated on the Severn Trent Water records it is anticipated that it will be possible to drain the site by gravity and connect into the existing foul sewer via one of the manholes located in Hill Wootton Road .

Severn Trent Water's developer enquiry response states that:

A gravity foul discharge from 40 properties can be accommodated in the 150mm diameter combined sewer downstream (of the site).

Conclusion

It is anticipated that the site can be satisfactorily drained of surface water and foul sewage arising from the development of the site. There are a number of options for draining the surface water from the site by gravity and in accordance with NPPF and the TGNPPF. An attenuation volume is given which will restrict the flow off the site to greenfield runoff rate. Appropriate provision of Sustainable Urban Drainage Systems on the site will provide water quality treatment of the surface water arising from the site. It is anticipated that foul sewage arising from the development of the site can be drained from the site by gravity and accommodated in the Severn Trent Water combined sewer in Hill Wootton Road.

8

3 Noise

This report provides an assessment of noise, based upon the measurement of existing baseline noise levels at locations within the site.

The noise assessment has been carried out with reference to the *National Planning Policy Framework* (2012) and the *Noise Policy Statement for England* (2010). Further detail regarding the assessment methodologies and additional guidance used in order to determine the noise impacts, together with the results of surveys, conclusions and recommendations for mitigation measures are presented below.

As the subject is a technically complex matter, a more detailed Introduction to Noise and a Glossary of Acoustic Terms is attached as Appendix A.

The survey has been undertaken utilising equipment complying with the requirements of BS EN 60651:1994, and operating as a Type 1 meter complying with BS EN 60804:2001 (IEC 60804:2000).

Noise measurements have been taken in accordance with the methodology contained in BS7445-1:2003 *'Description and measurement of environmental noise Part 1 Guide to quantities and procedures'*.

Key Guidance Documents

The following key guidance documents have been referenced within this assessment.

- National Planning Policy Framework, (Department for Communities and Local Government), 2012;
- Noise Policy Statement for England, (Department for Environment Food and Rural Affairs), 2010;
- World Health Organisation Guidelines for Community Noise, 1999;
- BS 8233 'Sound Insulation and Noise Reduction For Buildings – Code Of Practice', 1999.

Noise Planning Policy Framework

In March 2012 the Department for Communities and Local Government published the National Planning Policy Framework (NPPF). The NPPF sets out the Government's planning policies for England and how these are expected to be applied. It sets out the Government's requirements for the planning system only to the extent that it is relevant, proportionate and necessary to do so. It provides a framework within which local people and their accountable councils can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.

The NPPF revoked and replaced many planning guidance documents, including Planning Policy Guidance 24: Planning and Noise (October 1994) which was the guidance for the noise assessment of an area when considering the suitability for residential development.

With respect to the natural environment, the NPPF states that '*The planning system should contribute to and enhance the natural and local environment by:*

- *protecting and enhancing valued landscapes, geological conservation interests and soils;*
- *recognising the wider benefits of ecosystem services;*
- *minimising impacts on biodiversity and providing net gains in biodiversity where possible, contributing to the Government's commitment to halt the overall decline in biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures;*
- *preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability; and*
- *remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.'*

More specifically to noise the NPPF states that 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.*

For what constitutes a *significant* adverse impact, the NPPF references the Noise Policy Statement for England which is described below.

Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) was published by the Department for Environment Food and Rural Affairs (Defra) in March 2010. The NPSE states that *'The Government is committed to sustainable development and Defra plays an important role in this by working to secure a healthy environment in which we and future generations can prosper. One aspect of meeting these objectives is the need to manage noise for which Defra has the overall responsibility in England.'*

Three aims are described in the NPSE which are to be achieved through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development. These aims are:

- *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.*

The phrase significant adverse impact from the NPPF is expanded within the NPSE as follows:

'There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:

NOEL – No Observed Effect Level: This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL – Lowest Observed Adverse Effect Level: This is the level above which adverse effects on health and quality of life can be detected.

Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

SOAEL – Significant Observed Adverse Effect Level: This is the level above which significant adverse effects on health and quality of life occur.

It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available.'

British Standard 8233

The scope of BS 8233: 1999: *'Sound Insulation and Noise Reduction for Buildings – Code of Practice'* is the provision of recommendations for the control of noise in and around buildings.

This standard suggests suitable internal noise levels within different types of buildings, including residential dwellings. It suggests that an internal noise level of 30 dB $L_{Aeq,T}$ within living rooms is a *'good'*

standard, whilst 40 dB $L_{Aeq,T}$ is a *'reasonable'* standard. For bedrooms the standard recommends 30 dB $L_{Aeq,T}$ as a *'good'* standard and 35 dB $L_{Aeq,T}$ as being a *'reasonable'* standard. BS 8233 also states that individual noise events that exceed 45 dB L_{AFmax} in bedrooms at night should be limited if possible. The recommended noise levels in BS 8233 are based on recommendations by the World Health Organisation, which also suggests the number of events exceeding a level of 60 dB LAFmax outside bedrooms should be limited.

The standard also provides guidelines for reasonable speech communication within kitchens and washrooms. For kitchens, a 'good' standard is 50dB LAeq,T, and a 'reasonable' standard 55dB LAeq,T. For wash-rooms and toilets, a 'good' standard is 45dB LAeq,T, and a 'reasonable' standard 55dB LAeq,T.

This standard also provides advice as to the sound attenuation of noise entering a building from the outside via a typical window. The attenuation provided by a partially open window ranges between 10-15dB, and the attenuation provided by a closed single glazed window is 22-30dB, increasing to 33-35dB for a closed standard double glazed window.

For gardens or balconies, it is desirable that the steady average noise level does not exceed 50dB LAeq,T, and 55dB LAeq,T should be regarded as the upper limit.

The recommended noise levels in BS 8233 are based on recommendations by the World Health Organisation 'Guidelines for Community Noise' (1999).

Existing Environment

Measurements of the existing daytime noise climate were undertaken on the 13th January 2014 at five positions around the application site. Figure 3.1 indicates the measurement positions used for the survey.

The equipment used during the survey was:

Item	Make & Model	Serial Number
Sound Level Meter	01dB Blue Solo	60502
Calibrator	CEL 284/2	0227010

Table 3-1: Summary of equipment used during background survey

The Sound Level Meter (SLM) was configured during the survey to collect A-weighted Leq, L90, L10 and Lmax noise level data (as a minimum) with a 'fast' time response. The microphone was mounted on a tripod at a height of approximately 1.5 metres above ground level in free-field conditions at each location. An acoustic consultant was on-site during all measurements to make observations of noise sources and levels.

Measurements of 10 minute intervals were made across all measurement positions for a period of three consecutive hours between 11:20 and 14:25 on the 13th January 2014.

Weather conditions in the morning and afternoon on the 13th January were dull but dry, with light wind speeds in any direction less than 5m/s, and therefore considered acceptable for environmental noise measurements. The light wind was further developed as a light breeze at times but still within acceptable limits without affecting the noise measurements.

Figure 3.1: Measurement Positions

Measurement Position 1

Measurement positions 1, 3 and 5 were selected to investigate the variation of noise exposure along the east site boundary. Position 1 was located at the north end of the eastern boundary at 10m in from the east boundary fence which lies to the west of the highway noise barrier. This position was chosen to be representative of the noise climate along the eastern site boundary in this area to potential dwellings exposed to road traffic from the A46. A summary of the day time noise survey results is presented in Table 3-2.

Date	Start time	Duration (minutes)	Measured Noise Level dB			
			LAeq,T	LA90,T	LA10,T	LAFmax
	11:51	10	67.1	64.6	68.6	74.9
13/01/2014	12:49	10	66.7	64.0	68.5	71.3
	13:48	10	67.6	65.0	69.1	73.0
Average Levels & Maxima			67.1	64.5	68.7	74.9

Table 3-2: Summary of day time noise levels at position 1

The predominant noise source throughout the surveys at this location was road traffic noise from the A46.

12

Measurement Position 2

Position 2 was located approximately 10m from the Western boundary of the site towards the North end of the site in order to ascertain the diminution of road traffic noise levels across the site. A summary of the day time noise survey results is presented in Table 3-3.

Date	Start time	Duration (minutes)	Measured Noise Level dB			
			$L_{Aeq,T}$	$L_{A90,T}$	$L_{A10,T}$	L_{AFmax}
	12:02	10	64.2	62.0	65.6	68.5
13/01/2014	13:00	10	63.9	61.9	65.5	69.5
	13:59	10	64.4	62.9	65.8	70.7
Average Levels & Maxima			**64.2**	**62.3**	**65.6**	**70.7**

Table 3-3: Summary of day time noise levels at position 2

The predominant noise source throughout the surveys at this location was road traffic noise from the A46.

Measurement Position 3

Position 3 was located approximately half way along the eastern boundary of the application site. The position was selected to ascertain the level of change of noise level along the eastern boundary. A summary of the day time noise survey results is presented in Table 3-4.

Date	Start time	Duration (minutes)	Measured Noise Level dB			
			$L_{Aeq,T}$	$L_{A90,T}$	$L_{A10,T}$	L_{AFmax}
	11:39	10	64.3	61.6	65.9	68.3
13/01/2014	12:37	10	64.5	61.7	66.6	70.2
	13:36	10	66.3	63.3	68.1	74.3
Average Levels & Maxima			**65.1**	**62.2**	**66.9**	**74.3**

Table 3-4: Summary of day time noise levels at position 3

The predominant noise source throughout the surveys at this location was road traffic noise from the A46.

Measurement Position 4

Position 4 was positioned towards the Southern end of the western site boundary. This position was selected to be representative of noise levels along the western of the site. The predominant noise source throughout the surveys at this location was road traffic noise from the A46. A summary of the day time noise survey results is presented in Table 3-5.

Date	Start time	Duration (minutes)	Measured Noise Level dB			
			$L_{Aeq,T}$	$L_{A90,T}$	$L_{A10,T}$	L_{AFmax}
	12:14	10	64.6	62.5	66.0	69.9
13/01/2014	13:13	10	64.3	61.9	65.8	70.7
	14:11	10	65.5	63.1	67.3	71.7
Average Levels & Maxima			**64.8**	**62.5**	**66.4**	**71.7**

Table 3-5: Summary of day time noise levels at position 4

Measurement Position 5

Position 5 was located close to the southern corner to the development site along the eastern boundary. This position was selected to be representative of the dwellings that could be closest to Hill Wooton Road, where the noise barrier on the A46 is at its tallest. A summary of the day time noise survey results is presented in Table 3-6.

Date	Start time	Duration (minutes)	Measured Noise Level dB			
			LAeq,T	LA90,T	LA10,T	LAFmax
	11:28	10	64.3	62.0	65.8	68.3
13/01/2014	12:25	10	63.3	60.8	65.0	68.1
	13:24	10	64.0	61.5	65.7	72.2
Average Levels & Maxima			63.9	61.4	65.5	72.2

Table 3-6: Summary of day time noise levels at position 5

Table 3-7 below illustrates the variation of noise levels at each measurement position, rounded to the nearest decibel. The variation of noise level at an individual measurement position is solely attributed to the influence of road traffic noise. As this was seen to be the case the night-time LAmax levels are likely to be similar to the daytime levels, whilst as a cautious approach, noise levels at night were considered to be 5dB lower than Daytime levels.

Measurement Position	Daytime LAeq,10min dB	Night-time LAeq,T dB (inferred)	Night-time LAmax,T dB (inferred)
1	67 - 68	62 - 63	75
2	64	59	71
3	64 - 66	59 - 61	74

14

Measurement Position	Daytime LAeq,10min dB	Night-time LAeq,T dB (inferred)	Night-time LAmax,T dB (inferred)
4	64 - 66	59 - 61	72
5	63 - 64	58 - 59	72

Table 3-7: Summary of noise measurements across the site

Noise Assessment

The existing noise sources at the site stem solely from the A46 and the road traffic noise on that road. As discussed, the noise measurements around the development site were carried out at 10 – minute intervals over a period of three consecutive hours as recommended by the shortened measurement procedure in the Calculation of Road Traffic Noise (CRTN).

The road traffic noise contribution to the overall noise exposure of the site lies within 63 – 68 dB $L_{Aeq, 10mins}$. It is dictated by traffic on the A46 and it is noted that the spatial variation across the site from east to west is found to be minimal.

Assessment – Design Noise Levels

Based on the above considerations, the recommended design noise limits, allowing, used to determine the suitability for development and the noise mitigation measures required are summarised below. The design noise levels shown are based on the measurements carried out on site and can be considered as the worst case. As night-time noise levels were not measured, we have taken the cautious assumption of a 5dB night-time reduction in noise levels.

Room	Daytime External Noise Level, dB $L_{Aeq,16hours}$	Night-time External Noise Level, dB $L_{Aeq,8hours}$	Night-time L_{AFmax} dB
Eastern site boundary	63 - 68	58 – 63	72 - 75
Western site boundary	64 - 66	59 - 61	71 - 72

Table 3-8: Design Noise Levels

To determine suitability for development, the daytime and night-time levels are compared against the guidance provided by BS8233. That is:

- For gardens or balconies, it is desirable that the steady average noise level does not exceed 50dB $L_{Aeq,T}$, and 55dB $L_{Aeq,T}$ should be regarded as the upper limit. From Table 3-7 above can be seen that for dwellings across the site in the absence of any mitigation the upper limit for gardens is likely to be exceeded.
- For day time internal noise levels, BS8233 recommends 30 dB $L_{Aeq,T}$ as a good standard for living rooms, 45 dB $L_{Aeq,T}$ as being a good standard for bathrooms, and 50 dB $L_{Aeq,T}$ as a good standard for kitchens. According to BS8233, a partially open window typically provides attenuation of between 10 and 15 dB(A). While this attenuation would achieve the good standard for kitchens and some bathrooms, the good standard would not be achieved for living rooms. The mitigation required (i.e. a specified standard of glazing) to achieve these levels is discussed below.
- For night-time internal noise levels, BS8233 recommends 30 dB $L_{Aeq,T}$ as a good standard, together with limited individual noise events that exceed 45dB L_{AFmax}. To achieve this level some mitigation would be required and this is discussed below.

Mitigation

The noise measurement results and subsequent assessments indicate that specific mitigation measures will need to be considered in some areas of the site.

As stated above, recommendations and advice for internal noise levels for residential properties are contained in BS 8233. The guidance appropriate to this development, taken from this standard, is outlined below;

- *Bedrooms (at night) – Good standard 30dB $L_{Aeq,8hr}$; Reasonable standard 35dB $L_{Aeq,8hr}$ and 45dB L_{AFmax}*
- *Living Rooms - Good standard 30dB $L_{Aeq,T}$; Reasonable standard 40dB $L_{Aeq,T}$*
- *Kitchens - Good standard 50dB $L_{Aeq,T}$; Reasonable standard 55dB $L_{Aeq,T}$*
- *Bathrooms - Good standard 45dB $L_{Aeq,T}$; Reasonable standard 55dB $L_{Aeq,T}$*
- *Gardens – Upper Limit 55dB $L_{Aeq,T}$*

Given the location and the proximity of the major noise sources we have assumed that the 'good' standard should be achieved where possible.

Options for Mitigation

Options for mitigation may include one or a combination of the following measures in different areas of the site. Between the A46 and the site there is currently a noise bund of approximately 1.5m high, with the land then dropping to the site. The boundary of the highway and site is at the bottom of the embankment, and therefore any noise barrier would need to be placed at this position. A barrier at the bottom of the embankment would not be effective due to it providing little screening. As a result alternative methods of mitigation need to be considered. The following are options that could be considered:

Development Layout

Given the major noise source on the eastern side of the site, and the noise levels generated from that source, acceptable noise levels cannot be expected within gardens and outdoor spaces. As a result the development layout should be set out to protect any gardens and open spaces through built development between the A46 and the gardens and open spaces. This could be through the development of a barrier block of housing along the eastern side of the site. With no gaps in the built form, this would provide sufficient protection to ensure acceptable noise levels in gardens and open spaces. Such a development form may result in the requirements to consider the internal layout of the development

Internal Layout

In some cases it may be appropriate to consider the internal layout of each plot, particularly those on the eastern side of the site, in relation to the incident noise sources. Where there is an external noise source of concern noise sensitive rooms, such as bedrooms and living rooms, could be oriented to face away from the noise source, or could be treated with acoustic glazing and ventilation treatments.

Rooms that are less sensitive to noise are usually considered to be kitchens, utility rooms, bathrooms, hallways, landings and dressing rooms.

Acoustic Glazing

The overall sound reduction performance achieved against external noise is dependent upon the composite performance of the external building envelope i.e. the composite masonry wall and glazed window areas of the residential housing. Information regarding structures of the walls and glazing design

16

and proposed internal layout are not as yet available, therefore it is not possible at this stage to undertake detailed calculations of the glazing required.

In the absence of this information, the sound reduction performance required of the entire residential building façades has been calculated, assuming each to be fully glazed. The sound reduction performance requirement will apply to the overall performance of the external building fabric envelope. As the glazing units are typically the weakest link in the overall sound reduction performance of the external building fabric, the indicative performance requirements should provide a conservative approach.

The assessments presented below are based on single figure performance data, which have been corrected to allow the typical frequency content of road traffic noise and other noises with a low-frequency component. The resultant measured noise attenuation, in decibels, gives a very useful guide to the in-situ sound reduction performance of the window for situations where various sources of noise dominate.

The performance index relevant to traffic noise is Rw+Ctr. The Rw component is an indication of the sound reduction performance to a random 'white' noise source, and the addition of the Ctr is an indication of the sound reduction performance to noise sources with a strong low frequency component, such as road traffic and some industrial noise sources.

Considering the worst case noise levels on the eastern side of the site Table 3-9 reports the required levels of glazing performance in order to achieve the 'good' standard for these rooms as reported in BS8233:1999:

Room	Measured External Level, dB(A)	Target Internal Noise Level	Required Sound Reduction, dB
Bedrooms, $L_{Aeq,T}$	63	30	$R_w + C_{tr}$ 33
Bedrooms, L_{AFmax}	75	45	$R_w + C_{tr}$ 30
Living Rooms, $L_{Aeq,T}$	68	30	$R_w + C_{tr}$ 38
Kitchens, $L_{Aeq,T}$	68	50	$R_w + C_{tr}$ 18
Bathrooms, $L_{Aeq,T}$	68	45	Rw + C_{tr} 23

Table 3-9: Indicative Glazing Performance required for dwellings along eastern site boundary

Considering the worst case noise levels on the western side of the site Table 3-10 reports the required levels of glazing performance in order to achieve the 'good' standard for these rooms as reported in BS8233:1999:

Room	Measured External Level, dB(A)	Target Internal Noise Level	Required Sound Reduction, dB
Bedrooms, $L_{Aeq,T}$	61	30	$R_w + C_{tr}$ 31
Bedrooms, L_{AFmax}	72	45	$R_w + C_{tr}$ 27
Living Rooms, $L_{Aeq,T}$	66	30	$R_w + C_{tr}$ 36
Kitchens, $L_{Aeq,T}$	66	50	$R_w + C_{tr}$ 16
Bathrooms, $L_{Aeq,T}$	66	45	Rw + C_{tr} 21

Table 3-10: Indicative Glazing Performance required for dwellings along western site boundary

A partially open window typically provides attenuation of between 10 and 15 dB(A), so for bedrooms and living rooms suitable internal noise levels cannot be achieved unless the windows remain closed. Therefore an acoustically treated ventilation system will also be required so that when windows are closed an adequate means of ventilation is provided. The required performance of attenuation / ventilation from the glazing units can be achieved through the use of standard products.

Ventilation

In the event that closed windows are required to achieve suitable internal noise levels, a suitable means of alternative ventilation will need to be provided.

The Building Research Establishment (BRE) has published an Information Paper on the acoustic performance of passive ventilation systems. IP4/99: 'Ventilators: Ventilation and Acoustic Effectiveness' (October 1999) details a study into the sound reduction performance of 14 different window-mounted trickle ventilators and 7 different through-wall passive ventilators. The measured sound reduction performance taking into account flanking transmissions (that is, paths that do not travel directly through the ventilation unit itself) and the effective area of the ventilator are shown in Table 3-11.

Window Mounted Trickle Vents (open)	**Passive Through-Wall Ventilators (open)**
From 14 to 40 dB (depending on model)	From 30-46dB (depending on model)
Note: Figures corrected for effective area of ventilator	

Table 3-11: Range of Measured Sound Reduction Performance of Passive Ventilators, with Vents Open and Corrected for the Effective Area of the Ventilator

Either trickle vents or passive wall ventilators are available that would meet the requirements of the Building Regulations Document F and would provide a sound reduction performance that meets or exceeds that required from the glazing elements given the current noise environment.

Conclusions

An assessment of the suitability of an area of land located off Hill Wooton Road, Leek Wooton, Warwickshire for residential development has been undertaken.

In order to inform the assessment, a noise survey of existing conditions was undertaken in January 2014. Noise measurements were undertaken at five locations around the area of the application site proposed for development, to characterise the noise climate in different areas of the site.

The noise survey has shown a small variation in noise levels across the site, where the noise environment is dominated by road traffic from the A46 to the East. With careful consideration of noise mitigation in some areas, the site could be developed for a residential end use.

For some locations within the site, glazing units would need to be selected to meet certain levels of noise mitigation. These units would also require acoustic ventilation to the same level of noise mitigation.

18

4 Ecology

The ecology study is detailed in a separate Ecological Scoping Appraisal report.

4 Trees

A preliminary arboricultural assessment has been undertaken using desktop mapping tools and publicly available data.

Warwick District Council planning enforcement department have confirmed that there are no tree protection orders (TPO) covering any of the trees on the site and that the site is not within the boundary of a conservation area.

Existing Trees

Trees are present within the eastern, southern and western boundaries of the site, while the northern boundary appears to be made up of hedgerow and scrub. There are no other trees within the site other than those on the boundaries. Figures 4.1 and 4.2 below show the locations of the trees along the site boundaries.

Figure 4.1 Land to the north of Hill Wootton Road – Existing Trees

20

Figure 4.2 Trees along the northern footway of Hill Wooton Road

A row of individual trees line both sides of Hill Wootton Road, species appear to include ash and birch trees.

Development of site and impact on trees

The site can be developed without the need to disturb the existing trees, with the exception of the removal of one or two trees along Hill Wootton Road in order to allow an access to be formed into the site. Trees will be planted on the site as part of the proposals to help mitigate for any tree loss.

All existing trees to be retained will be protected in accordance with BS5837:2012 (trees in relation to design demolition and construction recommendations) from potential damage that maybe caused during construction.

5 Conclusion

Drainage

It is anticipated that the site can be satisfactorily drained of surface water and foul sewage arising from the development of the site. There are a number of options for draining the surface water from the site by gravity and in accordance with NPPF and the TGNPPF. An attenuation volume is given which will restrict the flow off the site to greenfield runoff rate. Appropriate provision of Sustainable Urban Drainage Systems on the site will provide water quality treatment of the surface water arising from the site. It is anticipated that foul sewage arising from the development of the site can be drained from the site by gravity and accommodated in the Severn Trent Water infrastructure in Hill Wootton Road.

Noise

An assessment of the suitability of an area of land located off Hill Wooton Road, Leek Wooton, Warwickshire for residential development has been undertaken.

In order to inform the assessment, a noise survey of existing conditions was undertaken in January 2014. Noise measurements were undertaken at five locations around the area of the application site proposed for development, to characterise the noise climate in different areas of the site.

The noise survey has shown a small variation in noise levels across the site, where the noise environment is dominated by road traffic from the A46 to the East. With careful consideration of noise mitigation in some areas, the site could be developed for a residential end use.

For some locations within the site, glazing units would need to be selected to meet certain levels of noise mitigation, as outlined in the Mitigation Section above. These units would also require acoustic ventilation to the same level of noise mitigation.

Ecology

It is considered that there are few ecological constraints on the site and any potential ecological constraints can be investigated with a full desk study and additional protected species surveys to inform any mitigation required to be in accordance with relevant legislation. There are many opportunities for ecological enhancement of the site in any potential future development of the site.

Trees

The site can be developed without the need to disturb the existing trees, with the exception of the removal of one or two trees along Hill Wootton Road in order to allow an access to be formed into the site. Trees will be planted on the site as part of the proposals to help mitigate for any tree loss.

All existing trees to be retained will be protected in accordance with BS5837:2012 (trees in relation to design demolition and construction recommendations) from potential damage that maybe caused during construction.

22

Appendix A

Introduction to Noise

Human Perception

Noise is commonly defined as unwanted sound, and is subjective.

The human perception of noise is influenced by physical, physiological and psychological factors. Physical factors include the sound pressure level at the position of the listener, physiological factors include the acuity of hearing, and psychological factors include acclimatisation to steady noise and the activity that an individual is undertaking while the noise is present.

Sound consists of vibrations transmitted to the ear as rapid variations in air pressure which can be measured accurately. The more rapid the fluctuation the higher the frequency of the sound. Frequency is the number of pressure fluctuations per second and is expressed in Hertz (Hz).

The ear can detect both loudness and frequency of sound. However, the sensitivity of the human ear varies with frequency, and therefore noise is commonly measured using the A-weighted filter network which mimics the frequency response characteristics of the human ear. The 'A' notation is used to indicate when noise levels have been filtered using the A-weighting network.

Noise levels range from the threshold of hearing at 0dB(A) to levels of over 130dB(A) at which point the noise becomes painful. Noise levels over 80dB(A) are considered potentially damaging to hearing. The table below presents guide to the A-weighted sound pressure levels due to common objects and activities.

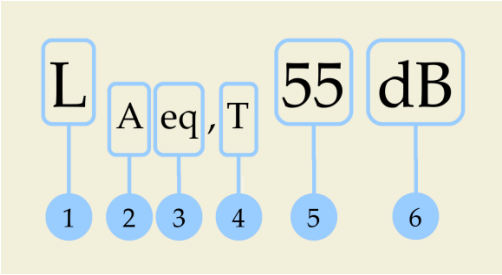
Source	Sound Pressure Level, dB(A)
Threshold of hearing – silent	0
Quiet bedroom	25-35
Quiet rural area	45-50
Suburban areas away from main traffic routes	50-60
Conversational speech at 1m distance	60-70
Busy urban street corner	70-80
Passenger car at 60Km/hr and 7m distance	72
Health & safety 'first action' level to prevent damage to hearing	80
Heavy diesel lorry at 40 Km/hr and 7 m distance	85
Pneumatic drill (un-silenced) at 7 m distance	95
Threshold of pain	130-140

Generally, a change of 3dB(A) in environmental noise is the minimum change perceptible. A change of around 5dB is easily perceptible and most people perceive a 10dB change as halving or doubling the noise level.

Acoustic Descriptors

Outdoor noise levels fluctuate rapidly over time, and therefore to describe the acoustic environment it is necessary to collect statistical data on the distribution of noise levels during the period of interest.

The nomenclature used to represent statistical acoustic quantities can appear complicated, however once understood it becomes a logical and efficient way of qualifying measures. Take for instance the upper limit recommended by BS8233 for noise levels in gardens and balconies of $L_{Aeq,T}$ 55dB:



The above descriptor is comprised as follows:

1. The first grouping ('L') indicates that the quantity is a sound pressure level. Other common quantities are sound intensity (L_I) and sound power (L_W).
2. The second grouping ('A') denotes that the sound pressure level is evaluated using the A-weighted filter network.
3. The third grouping of characters identify the statistical descriptor. In this example, the letters indicate that the quantity is in terms of the equivalent continuous noise level ($_{eq}$), which has some similarities with the concept of an average noise level. Numerical values are also shown, and these indicate the level exceeded for n per cent of the measurement (e.g. a value of $L_{A90,T}$ 45dB indicates that the A-weighted sound pressure level exceeds 45dB for 90% of the period analysed).
4. The quantity ('T') shown after the statistical descriptor is the duration over which the quantity is evaluated. This is typically represented in minutes or hours, e.g. $_{15min}$, $_{16hr}$.
5. The fifth part of the statistical descriptor identifies its numeric value. This value is usually given as a whole number or to one decimal place.
6. The sixth and final group of characters indicate that the units of the sound pressure level are decibels.

A variety of statistical indices are used to quantify noise in different situations.

Ambient noise level

General environmental noise from commercial, industrial or unidentified sources is often expressed in terms of the equivalent continuous sound pressure level over the time period of interest ($L_{Aeq,T}$). This is the notional continuous constant noise that contains the same sound energy over the period of interest as the actual fluctuating noise. This is not an 'average' sound level over a period, but the concept has some similarities and provides a single figure quantity that can be used to compare noise levels which fluctuate with time.

Background noise level

The $L_{A90,T}$ index identifies the noise level exceeded for 90% of the period of interest, and provides a good indication of the background noise level that remain in a location in the absence of any easily identifiable sources.

Maximum sound level

The maximum sound level (L_{Amax}) is the highest time-weighted sound level measured during a period. The time constant of the measure may either be fast (125 ms), slow (1 s) or impulsive (35 ms), and it is usual to identify the time constant in the notation – e.g. L_{AFmax} indicates that the maximum sound level was measured with the fast time-weighting. The longer the time constant over which the measurement is integrated, the greater the smoothing effect of the time-weighting, which gives a lower numeric value of the measurement.

Road traffic noise

The index adopted by the Government to quantify traffic noise is the $L_{A10,18hr}$ which is the arithmetic mean of the noise levels exceeded for 10% of the time in each of the 18 one-hour periods between 6am and midnight. The $L_{A10,18hr}$ index has been shown to have the best relationship with annoyance caused by

road traffic noise, which has a strong low frequency content and is often more steady over the course of a day than other sources of environmental noise.

Glossary of Acoustic Terminology

A-weighting

This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.

dB

Abbreviation of decibel.

dB(A)

Abbreviation of A-weighted decibel.

Decibel

The scale on which sound pressure level is expressed. In air it is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure ($2x10^{-5}$Pa).

D_{nT} or $D_{nT,w}$

Standardised Level Difference, D_{nT}, (dB)

This is the level difference between rooms standardised on the logarithmic ratio of the receiving room reverberation time to a reference reverberation time (for dwellings of 0.5s).

The receiving room reverberation time can be measured quickly and accurately on site using an impulsive sound source and any Type 1 sound level meter equipped with basic building acoustics functions. This makes the standardised level difference relatively easy to determine on site and the single number rating of this quantity (weighted standardised level difference, $D_{nT,w}$) is used to express performance requirements in the Building Regulations Approved Document Part E.

$D_{nT,w} + C_{tr}$

The weighted standardised level difference, but with the addition of the low frequency adaption term (C_{tr}) which better expresses the in-situ sound insulation performance to noise with a strong low frequency content, such as road traffic noise or music.

Equivalent Continuous Sound Pressure Level

The Equivalent Continuous Sound Pressure Level is the notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.

L_{10} or L_{A10}

Acoustic nomenclature indicating that the value is exceeded for 10% of the period of interest. This index, evaluated over the period 06.00hrs to 24.00hrs, is often used to describe road traffic noise.

L_{90} or L_{A90}

Acoustic nomenclature indicating that the value is exceeded for 90% of the period of interest. This index is taken to be a good indicator of the 'background' noise level remaining at a location in the absence of any readily identifiable sources.

L_{eq} or L_{Aeq}

Acoustic nomenclature indicating that a value is expressed in terms of the Equivalent Continuous Sound Pressure Level.

Reverberation Time

Reverberation time is the length of time taken for the reverberant sound energy within a room to reduce by 60dB when the source is stopped abruptly. Reverberation time is frequency dependant and is a

function of the room surface absorption coefficients and the volume of the room. Often reverberation time is measured as the time taken for the sound energy to decay by 30dB and extrapolated from this, as it can be impractical to generate a reverberant sound field 65dB or more above the room background noise level.

RT

Abbreviation of Reverberation Time.

R_w (dB) - Sound Reduction Index

At the design stage a method of estimating the sound insulation performance of a building construction from its constituent elements is necessary.

The sound reduction index provides a quantity for expressing the sound insulation performance of a building element independently of the situation in which it is to be installed. This is normally done be measuring the performance of a sample of the building element in a laboratory where it is mounted in such a fashion that flanking transmission is negligible. The test procedure for the laboratory measurement of the sound reduction index of a material is given in EN ISO 140-3.

It is common for manufactures of building materials to state the performance of their products in terms of the sound reduction index R_w. Whilst these values can be compared in a catalogue to evaluate the relative performance of materials, the R_w cannot be compared directly to performance criteria expressed in terms of the weighed standardised level difference $D_{nT,w}$, or the apparent sound reduction index R'_w despite these quantities all having common units (dB).

Appendix B