Eastern Urban Extension, Tiverton

Waddeton Park Limited

Technical Report 12-IAC024

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Waddeton Park Limited

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1	Report	04/04/2012	NAM	MPD
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1 INTRODUCTION

1.1 Innovate Acoustics has been commissioned by Waddeton Park Limited to assess the impact of noise at a site known as the Tiverton Eastern Urban Extension (TUE), in respect of the site's suitability for residential development. As no specific development proposals have been presented at this stage, the approach adopted, has been with a view to providing an open-site constraints analysis of the site.

1.2 This exercise has been undertaken in order to provide a strategic overview of the acoustic environment across the proposed development site, based on the significant sources of noise generation affecting the area, such that it can inform the master planning of the development.

1.3 The assessment has been based on detailed environmental noise measurements and predicted noise levels across the proposed development site.

1.4 The noise predictions have been carried out using noise modelling suite Cadna/A, in accordance with the Calculations of Road Traffic Noise (CRTN)[1].

1.5 Whilst every effort has been made to ensure that this report is easily understood, it is technical in nature; a glossary of terms is included in Appendix A to assist the reader.

[1] Department of Environment 1988: Calculation of Road Traffic Noise. HMSO

2 SITE DESCRIPTION

2.1 The proposed development site is located, as identified in Figure 1.

2.2 The existing noise climate in the area is dominated by road traffic noise, in particular from the A361, with contributions from Post Hill / Blundell's Road.

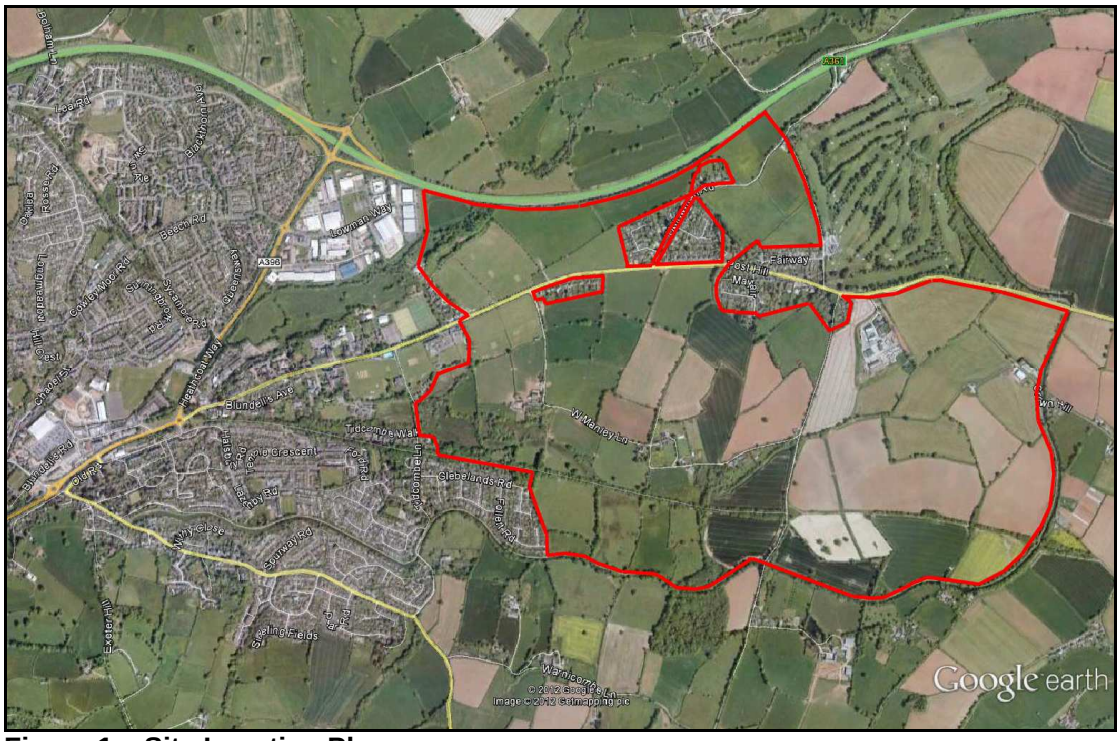

Figure 1 – Site Location Plan

3 ASSESSMENT CRITERIA

3.1 Although the National Planning Policy Framework[2], published on 27th March 2012 repealed many PPG and PPS documents; no alternatives have been introduced suggesting acceptable assessment criteria. Therefore, the assessment has been undertaken in accordance with the previously existing Planning Policy Guidance, in order to contextualise its findings against tangible, accepted benchmarking criteria.

Planning Policy Guidance 24

3.2 Planning Policy Guidance 24 (PPG24)[3] has been used to determine the suitability of the site for residential development. PPG24 set out the Government's policies on noise-related planning issues. It set out the overarching policy context for the management of noise within the planning system, in terms of how both noise-generating developments and noise-sensitive developments should be considered.

3.3 PPG24 gave guidance to local authorities in England on the use of their planning powers to minimise the adverse impact of noise. Specifically, PPG24:

- outlined the considerations to be taken into account when determining planning applications for both noise-sensitive developments and for those activities which will generate noise;
- set out noise exposure categories for residential development, encourages their use and recommends appropriate levels for exposure to different sources of noise; and
- advised on the use of planning conditions to minimise the impact of noise.

3.4 The four noise exposure category bands set out in PPG24 (or NECs) were designed to assist local planning authorities in evaluating applications for residential development in noisy areas. Table 1 summarises the noise levels that correspond to each NEC band for road traffic noise sources, which are the most relevant to this development.

[2] Department for Communities and Local Government, March 2012. National Planning Policy Framework. HMSO.
[3] Planning Policy Guidance 24 (1994), Planning and noise, Department of the Environment

TABLE 1 - NOISE LEVELS CORRESPONDING TO NECS FOR NEW DWELLINGS, $L_{AEQ,T}$ - dB				
Noise Source and Time Period	**Noise Exposure Category**			
	A	**B**	**C**	**D**
Road Traffic				
0700-2300	<55	55 - 63	63 - 72	>72
2300-0700	<45	45 - 57	57 - 66	>66

3.5 The relevant planning advice to the local authority with respect to each NEC is presented in Table 2 below.

TABLE 2 - PLANNING ADVICE CORRESPONDING TO NECS FOR NEW DWELLINGS	
NEC	**Advice to Local Planning Authority**
A	Noise need not be considered as a determining factor in granting planning permission, although noise at the high end of the category should not be regarded as a desirable level.
B	Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection against noise.
C	Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.
D	Planning permission should normally be refused.

4 NOISE MEASUREMENTS

4.1 The noise conditions in the area have been determined by an environmental noise survey conducted during both daytime and night-time periods. The measurements commenced at 12:00 on 14th of March 2012 and concluded at 18:44 on the 15th of March 2012.

Measurement Details

4.2 All noise measurements were undertaken by a consultant certified as competent in environmental noise monitoring, and, in accordance with the principles of BS 7445[4] and following the guidance given in PPG 24.

4.3 All acoustic measurement equipment used during the noise survey conformed to Type 1 specification of British Standard 61672[5]. A full inventory of this equipment is shown in Table 2 below:

TABLE 2: INVENTORY OF ACOUSTIC MEASUREMENT EQUIPMENT

Item	Make & Model	Serial Number
A - Sound Level Meter	Rion NL-31	773028
A - Preamplifier	Rion NH-21	25039
A - Microphone	Rion UC-53A	316034
B - Sound Level Meter	Rion NL-31	583267
B – Preamplifier	Rion NH-21	27497
B – Microphone	Rion UC-53A	312273
Calibrator	Rion NC-74	34315165

4.4 The noise measurement equipment used during the survey was calibrated at the start and end of each measurement. The calibrator used had itself been calibrated by a UKAS accredited calibration laboratory within the twelve months preceding the measurements. No significant drift in calibration was found to have occurred on either sound level meter.

4.5 The weather conditions during the measurements meant it was necessary to extend the measurement period, in order to ensure the capture of data covering a full 24 hour period where the weather conditions were acceptable for noise

[4] British Standard 7445: 2003: *Description and measurement of environmental noise*. BSI
[5] British Standard 61672: 2003: *Electroacoustics. Sound level meters*. Part 1 *Specifications.* BSI.

measurement, it being dry with a very light westerly breeze, from source to receptor, with wind speeds varying between flat calm and 0.5 ms^{-1}.

4.6 The microphones were fitted with protective windshields for the measurements, which are described in greater detail below.

4.7 Measurements were carried at locations in the vicinity of the A361 and Post Hill; being the significant noise sources affecting the area, in order to derive source noise levels for these roads to inform the modelling process. These positions are marked as Measurement Positions 1 and 2 in Figure 2, below.

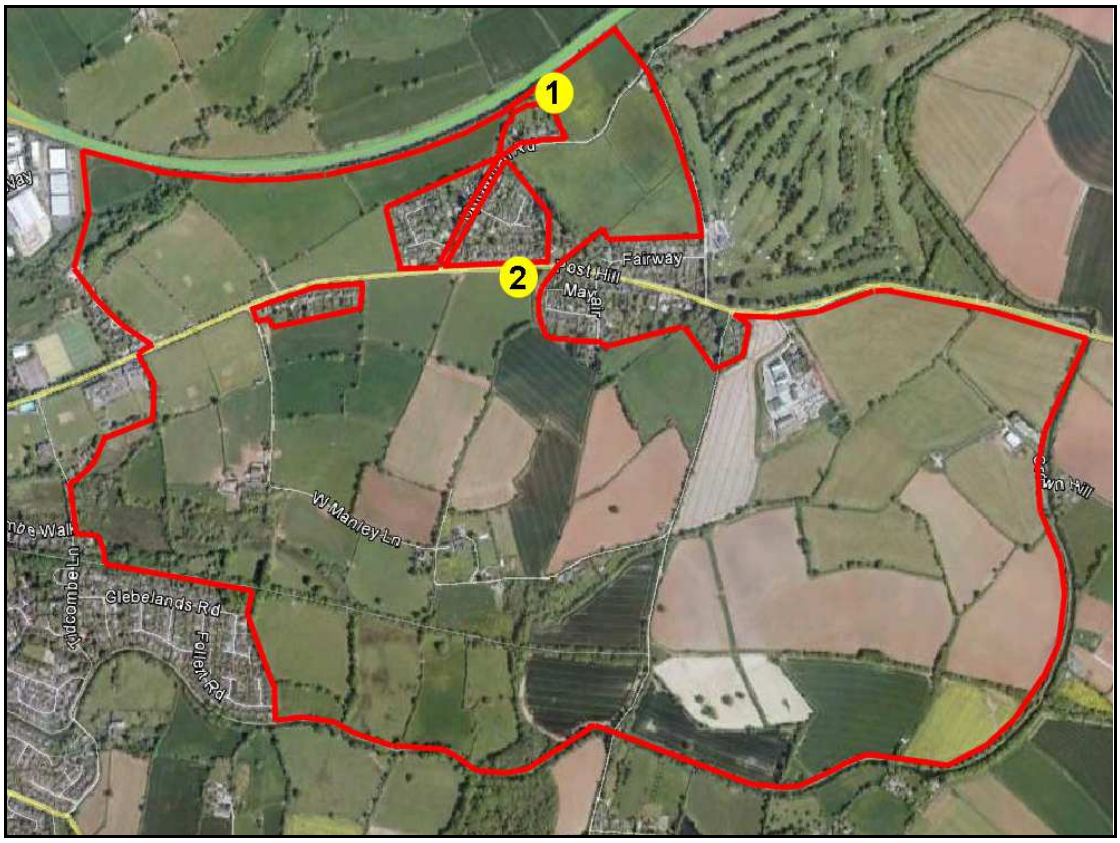

Figure 2 - Measurement Locations

4.8 The noise climate at the site was dominated by road traffic noise, originating from the A361, with contributions from Post Hill / Blundell's Road.

4.9 The summarised results of the environmental noise measurements carried out between the 14th and 15th of March 2012 are presented in Table 3 below.

TABLE 4: SUMMARY OF NOISE MEASUREMENT RESULTS					
Position	**Period**	**Noise Level, dB**			
		$L_{Aeq,T}$	L_{A90}	L_{A10}	L_{AFmax}
1	Day (07:00-23:00)	75.9	59.1	79.6	91.9
	Night (23:00 – 07:00)	67.4	32.7	58.1	88.9
2	Day (07:00-23:00)	68.9	47.2	71.6	98.3
	Night (23:00 – 07:00)	59.8	27.6	43.7	88.4

5 NOISE ASSESSMENT

PPG 24 Assessment

5.1 The baseline noise measurements presented above have been used to predict noise levels across the proposed development site.

5.2 The predictions have been carried out using the noise-modelling suite Cadna/A, in accordance with the CRTN prediction methodology for road traffic noise.

5.3 The overall results in Table 4 have been processed to determine appropriate noise emission rates for the adjacent roads. The $L_{Aeq,16hour}$ daytime (0700-2300) and $L_{Aeq,8hour}$ night-time (2300-0700) noise levels at a distance of 10 metres from each road have been determined as required to populate the noise model. The model was then run to validate the assumptions.

5.4 In addition to the derived road traffic source noise level used in the predictions, the model also considers the effects of the topographical conditions throughout the area, ground absorption, atmospheric absorption, acoustic reflections, acoustic screening as well as applying a light downwind propagation correction to represent worst case.

5.5 The model has been used to determine 'daytime $L_{Aeq,16hour}$ (0700 to 2300) and night-time $L_{Aeq,8hour}$ (2300 to 0700) noise levels across the site and surrounding area. The output from the daytime and night-time noise models presented in the form of noise maps overlaid on a base map of the area are presented in Figures 3 and 4 below.

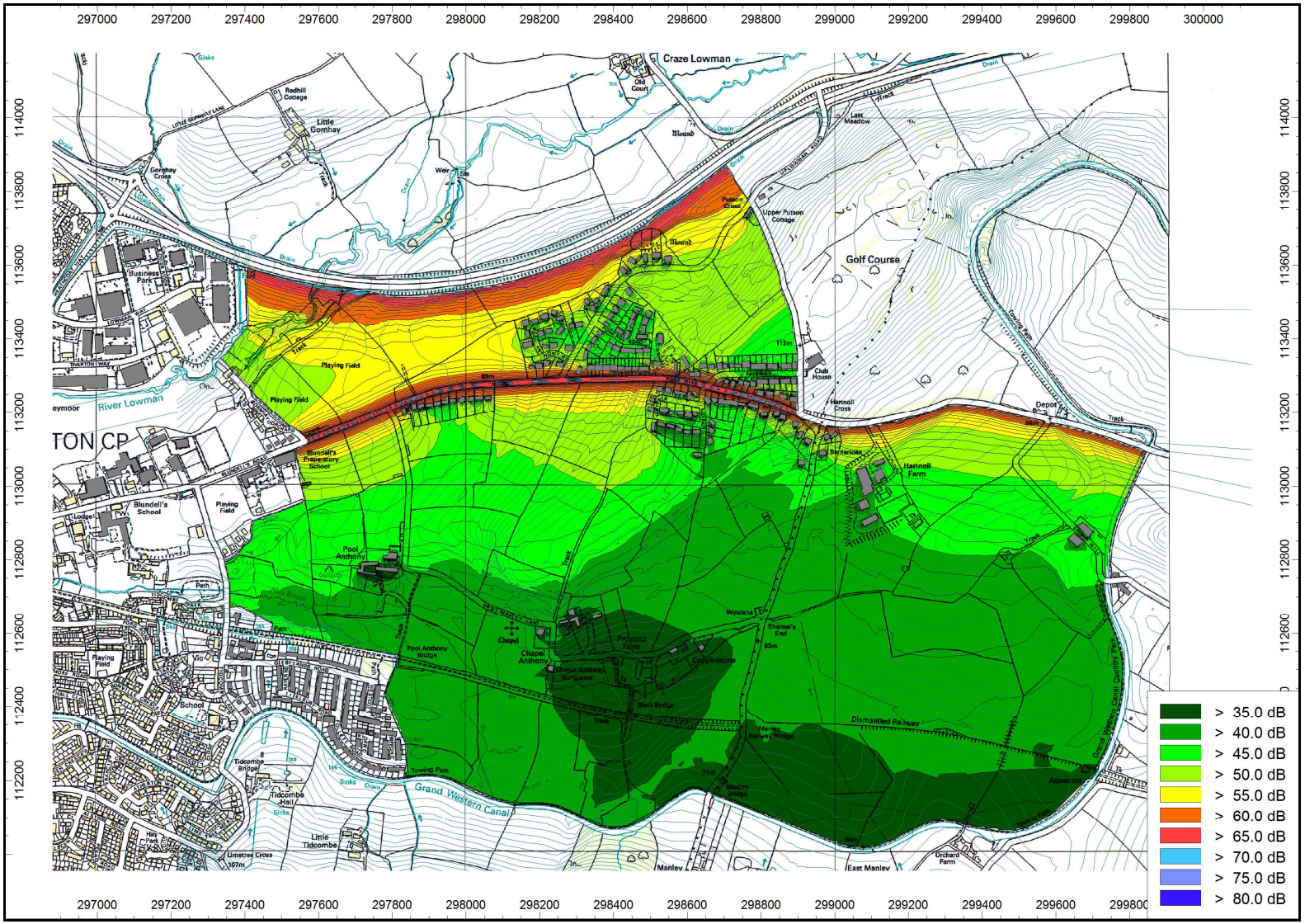

Figure 3 – Daytime Noise Contours

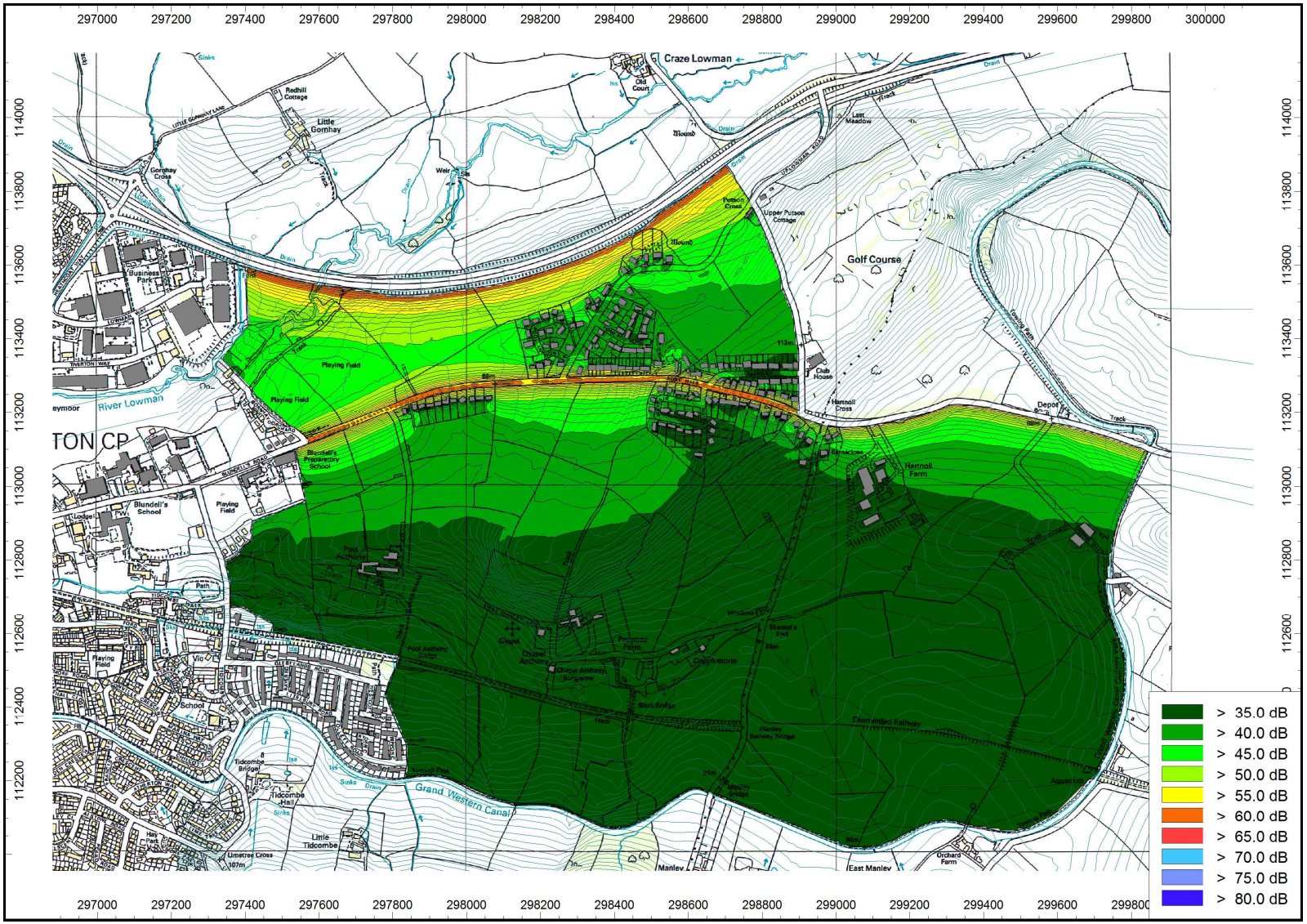

Figure 4 – Night-time Noise Contours

5.6 The suitability of the site for residential development has been determined by plotting PPG 24 NECs across the site. These are presented in Figures 5 and 6 below, for both the daytime and night-time periods.

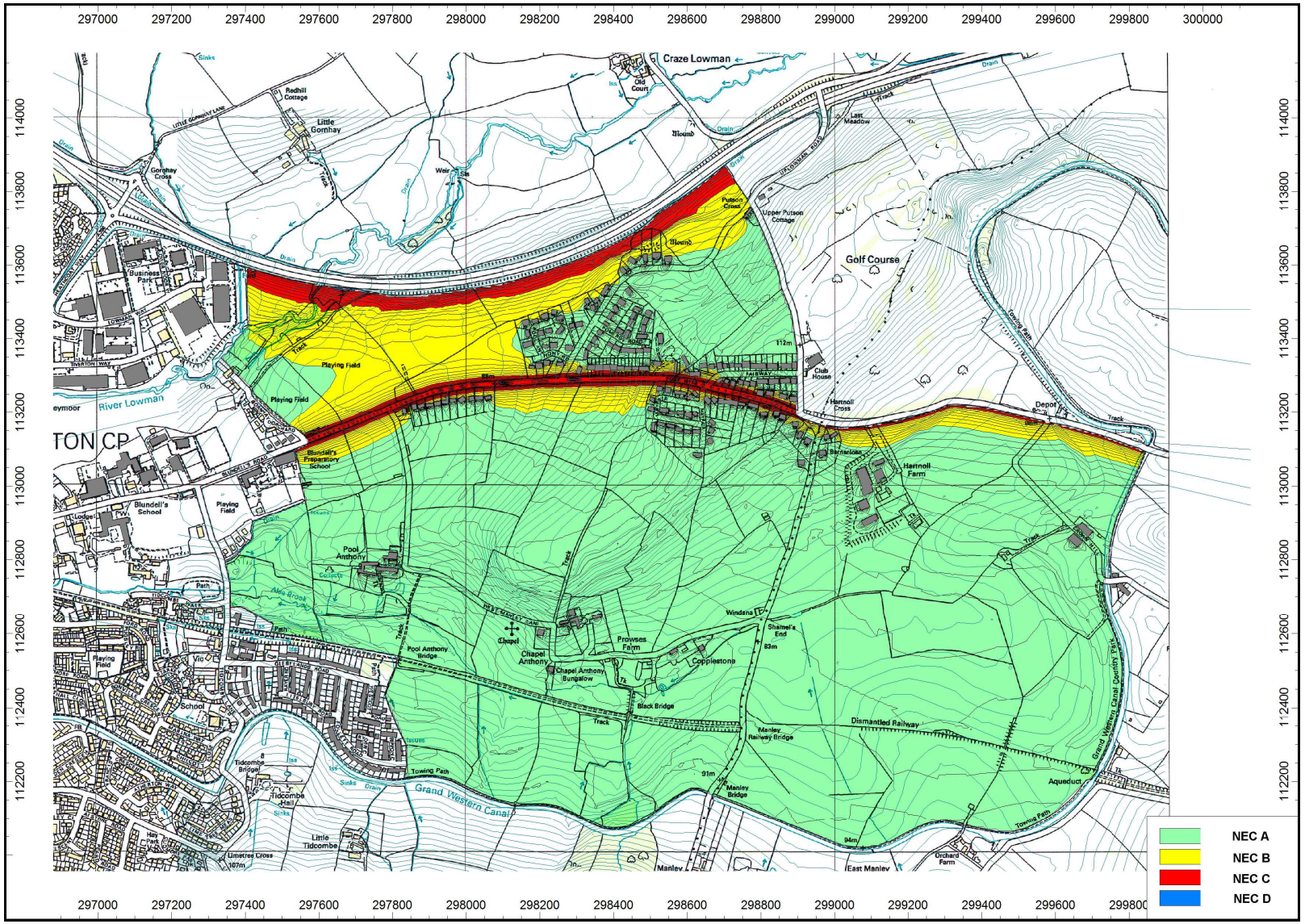

Figure 4 – Daytime PPG 24 NECs

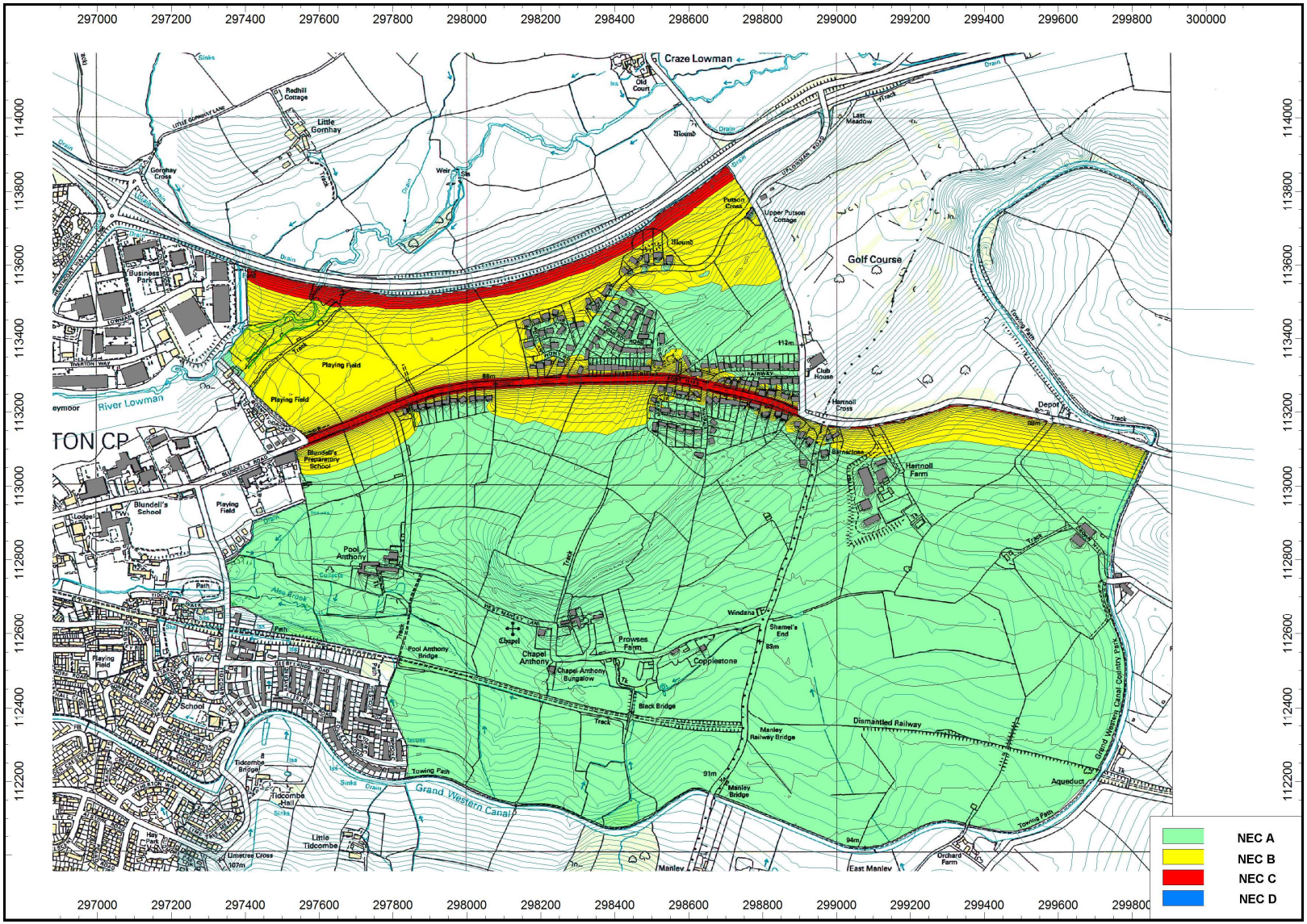

Figure 5 – Night-time PPG 24 NECs

5.7 The NECs presented in Figures 4 and 5 identify that noise levels across the site range from NEC A across the majority of the site area, through NEC B across northern parts of the site, to NEC C adjacent to the A361 corridor.

5.8 The guidance presented in PPG 24 for sites in NEC A is, '*Noise need not be considered as a determining factor in granting planning permission, although noise at the high end of the category should not be regarded as a desirable level.'.*

5.9 The guidance presented in PPG 24 for sites in NEC B is, *'Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection against noise'*.

5.10 The guidance presented in PPG 24 for sites in NEC C is *'Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise'*.

5.11 The typical approach would be to use the NEC B / NEC C boundary as the build line limit for residential properties, with proposed residential properties falling within NEC B requiring an assessment of the likely levels of mitigation required in order to ensure appropriate internal noise levels. However, as the land within the applicant's control runs right up to the A361 highway boundary; the opportunity exists to construct barriers or bunds along this boundary to screen the site from noise contributions from this source, thus minimising land sterilisation and overall noise exposure across the area. A mitigation design exercise is recommended under the detailed stage of design, once cut and fill volumes and landscape limitations are known.

5.12 Consideration will also be given to the orientation of the proposed properties to ensure that noise levels within external amenity areas are maintained below the 55 dB(A) criterion, quoted by the WHO.

6 CONCLUSION

6.1 Innovate Acoustics has been commissioned by Waddeton Park Limited to assess the impact of noise at a site known as the Tiverton Eastern Urban Extension (TUE), in respect of the site's suitability for residential development. As no specific development proposals have been presented at this stage, the approach adopted, has been with a view to providing an open-site constraints analysis of the site.

6.2 Although the NPPF document published on 27th March 2012 has repealed PPG24; no alternative has been introduced to replace it, so the over-arching guidance contained within this document has been utilised in order to contextualise the predicted noise levels across the site.

6.3 In order to determine noise exposure levels across the site in accordance with the procedures described PPG 24, an environmental noise survey has been undertaken at the site over full 24-hour midweek period. The assessment has been based on these detailed environmental noise measurements and predicted noise levels across the proposed development site.

6.4 The noise predictions have been carried using the noise modelling suite Cadna/A, in accordance with the Calculation of Road Traffic Noise (CRTN) prediction methodology, on the basis of noise measurements taken at the site.

6.5 The suitability of the site for residential development has been assessed on an open-site constraints basis, which has shown that the majority of the site falls within NEC A of PPG24, with a areas towards the north falling within NEC B, with areas immediately adjacent to the A361 falling within NEC C. Carefully considered mitigation measures during detailed design, will minimise the proportion of the site falling within NECs B and C.

6.6 Advice within PPG 24 for areas of the site classified as NEC A is that '*Noise need not be considered as a determining factor in granting planning permission, although noise at the high end of the category should not be regarded as a desirable level.'.*

6.7 Advice within PPG 24 for areas of the site classified as NEC B is that ''*Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection against noise".*

6.8 The guidance presented in PPG 24 for sites in NEC C is *'Planning permission should not normally be granted. Where it is considered that permission should be given, for example*

because there are no quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise'.

6.9 It is therefore considered that noise will not be a significant constraint with regard to the residential development of this site.

APPENDIX A – GLOSSARY OF ACOUSTIC TERMINOLOGY

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20µPa (20x10-6 Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1 / s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20µPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Facade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS 5969.
Music Noise Level (MNL)	The L_{Aeq} of the music noise measured at a particular location.

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

TABLE A1: TYPICAL SOUND LEVELS FOUND IN THE ENVIRONMENT	
Sound Level	**Location**
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory
100 to 110dB(A)	Burglar alarm at 1m away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A).

In accordance with logarithmic addition, combining two sources with equal noise levels would result in an increase of 3 dB(A) in the noise level from a single source.

A change of 3 dB(A) is generally regarded as the smallest change in broadband continuous noise which the human ear can detect (although in certain controlled circumstances a change of 1 dB(A) is just perceptible). Therefore, a 2 dB(A) increase would not be normally be perceptible. A 10 dB(A) increase in noise represents a subjective doubling of loudness.

A noise impact on a community is deemed to occur when a new noise is introduced that is out of character with the area, or when a significant increase above the pre-existing ambient noise level occurs.

For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a

percentage of the time period of interest. In the UK, traffic noise is measured as the L_{A10}, the noise level exceeded for 10% of the measurement period. The L_{A90} is the level exceeded for 90% of the time and has been adopted to represent the background noise level in the absence of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, L_{Aeq}.

This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound.

To put these quantities into context, where a receiver is predominantly affected by continuous flows of road traffic, a doubling or halving of the flows would result in a just perceptible change of 3 dB, while an increase of more than 25%, or a decrease of more than 20%, in traffic flows represent changes of 1 dB in traffic noise levels (assuming no alteration in the mix of traffic or flow speeds).

Note that the time constant and the period of the noise measurement should be specified. For example, BS 4142 specifies background noise measurement periods of 1 hour during the day and 5 minutes during the night. The noise levels are commonly symbolised as $L_{A90,1hour}$ dB and $L_{A90,5mins}$ dB. The noise measurement should be recorded using a 'FAST' time response equivalent to 0.125 ms.

APPENDIX B – NOISE MEASUREMENT RESULTS

TABLE B1 – FULL NOISE MEASUREMENT RESULTS POSITION 1				
Start time	**$L_{Aeq,5\text{-}minute}$**	**$L_{A90,5\text{-}minute}$**	**$L_{A10,5\text{-}minute}$**	**L_{AFmax}**
14/03/2012 12:00	75.2	58.5	80.2	90.9
14/03/2012 13:00	75.5	59.2	80.5	87.6
14/03/2012 14:00	75.6	58.2	80.8	88.5
14/03/2012 15:00	76.1	60.1	81.1	88.7
14/03/2012 16:00	77.3	64.0	82.1	88.8
14/03/2012 17:00	77.8	65.9	82.3	90.3
14/03/2012 18:00	76.5	60.2	81.2	89.9
14/03/2012 19:00	74.0	53.4	78.5	87.8
14/03/2012 20:00	72.7	48.3	76.4	87.5
14/03/2012 21:00	71.5	44.2	73.2	89.3
14/03/2012 22:00	70.0	39.8	70.1	89.9
14/03/2012 23:00	68.8	34.9	66.0	87.2
15/03/2012 00:00	65.3	28.6	54.0	88.9
15/03/2012 01:00	62.3	25.6	47.9	86.5
15/03/2012 02:00	62.8	23.5	44.4	86.2
15/03/2012 03:00	64.9	26.0	54.1	88.0
15/03/2012 04:00	64.5	29.1	55.7	86.7
15/03/2012 05:00	68.4	41.6	68.1	86.5
15/03/2012 06:00	72.3	51.9	74.4	87.1
15/03/2012 07:00	76.6	63.4	81.2	88.4
15/03/2012 08:00	77.5	67.0	81.9	88.7
15/03/2012 09:00	76.9	64.6	81.5	91.4
15/03/2012 10:00	76.1	62.5	81.0	88.4
15/03/2012 11:00	75.8	61.2	80.6	87.5
15/03/2012 12:00	76.0	62.1	80.8	88.9
15/03/2012 13:00	75.7	59.9	80.8	87.5
15/03/2012 14:00	76.2	62.7	81.1	87.8
15/03/2012 15:00	76.8	63.5	81.4	91.9
15/03/2012 16:00	77.4	65.1	81.9	89.8
15/03/2012 17:00	78.1	66.9	82.4	88.4

TABLE B2 – FULL NOISE MEASUREMENT RESULTS POSITION 2				
Start time	$L_{Aeq,5\text{-}minute}$	$L_{A90,5\text{-}minute}$	$L_{A10,5\text{-}minute}$	L_{AFmax}
14/03/2012 13:00	68.8	46.3	72.9	88.5
14/03/2012 14:00	68.7	45.6	73.2	84.9
14/03/2012 15:00	69.4	49.3	73.6	86.9
14/03/2012 16:00	70.8	49.6	74.6	97.3
14/03/2012 17:00	70.6	51.7	75.0	89.4
14/03/2012 18:00	68.1	46.7	72.1	83.4
14/03/2012 19:00	66.2	39.2	69.6	83.3
14/03/2012 20:00	65.4	36.4	66.6	84.8
14/03/2012 21:00	64.4	33.5	65.0	82.2
14/03/2012 22:00	63.3	30.1	59.1	87.9
14/03/2012 23:00	59.8	25.2	45.3	84.6
15/03/2012 00:00	59.8	21.1	36.1	88.4
15/03/2012 01:00	49.8	18.9	24.8	80.0
15/03/2012 02:00	52.4	18.2	28.9	83.0
15/03/2012 03:00	55.4	23.4	38.1	84.8
15/03/2012 04:00	59.1	29.5	52.5	81.5
15/03/2012 05:00	62.0	40.7	60.1	82.1
15/03/2012 06:00	64.2	43.6	64.2	83.3
15/03/2012 07:00	68.9	47.1	72.4	84.2
15/03/2012 08:00	71.0	52.4	75.5	88.2
15/03/2012 09:00	70.0	50.5	73.9	97.9
15/03/2012 10:00	69.6	52.5	74.1	84.7
15/03/2012 11:00	69.7	52.7	74.0	86.6
15/03/2012 12:00	68.7	51.3	73.1	82.9
15/03/2012 13:00	69.2	50.5	73.5	86.0
15/03/2012 14:00	69.0	50.5	73.5	88.1
15/03/2012 15:00	70.2	53.0	74.0	98.3
15/03/2012 16:00	70.4	54.3	74.5	90.0
15/03/2012 17:00	70.4	54.7	74.7	85.6
14/03/2012 13:00	68.8	46.3	72.9	88.5
14/03/2012 14:00	68.7	45.6	73.2	84.9
15/03/2012 15:00	70.2	53.0	74.0	98.3
15/03/2012 16:00	70.4	54.3	74.5	90.0
15/03/2012 17:00	70.4	54.7	74.7	85.6