
11.0 NOISE

11.1 INTRODUCTION

The Acoustics and Vibration Group of Bureau Veritas has undertaken a noise and vibration impact assessment for a mixed-use urban extension on land to the east of Luton, known as the Brickkiln development.

The existing site and the proposed development are described in *Chapter 3* of the ES.

11.2 POTENTIAL EFFECTS

It is envisaged that the existing main noise source during the daytime and night time periods will be road traffic along Luton Road, Chalk Hill, Eaton Green Road and Brick Kiln Lane in addition to individual vehicular movements along other nearby local roads together with aircraft noise. The site does not fall within Luton Airport's 57 dB(A) noise contours. It is likely that during the night time period, low noise levels will be expected towards the south and east of the site.

The nearest existing off-site noise sensitive receptors are residences to the west, south west and north west of the development. There is also a primary school (Cockernhoe Endowed C of E Primary School) to the north west of the development.

There is the potential for the development to increase traffic flows in the area, the noise from which could have an impact on nearby existing residential properties, dependant on the change in noise levels.

It is understood that there will be various traffic control measures to be put in place to minimise the increase in traffic due to the development on the existing road network through the villages of Cockernhoe and Tea Green, hence minimising the impact on the existing sensitive receivers.

There is also the potential for noise from proposed commercial units associated with the local centre and the school to cause disturbance to the existing and proposed residences, from operational noise, building services and vehicles associate with these development.

The Local Authority was originally consulted to determine any specific requirements they have for the assessment including the scope of the baseline noise survey and the assessment methodologies to be adopted for each impact area. The scoping opinions have requested the following issues to be considered:

- Noise from construction activities;
- Traffic noise;
- Aircraft noise;

- Measures to protect existing and future residents from noise;
- Potential impacts on premises such as community centres, schools and other potential sources of noise with regard to housing.

The assessment considers the noise that will be generated by the construction and the noise that will be generated by the operation of the proposed development. The assessment has been undertaken with reference to British Standards and National and International Guidance as well as the Local Strategy Plan on noise and vibration impacts. The standards and criteria against which the assessment has been made are described in detail in *Section 11.3* below.

As there will be no impact piling, it is unlikely that construction vibration will have an impact on nearby sensitive receptors.

11.3 ASSESSMENT METHODOLOGY

The significance of existing ambient noise levels were assessed according to planning policy guidance PPG24 which provides guidance on acceptability of residential development with respect to noise. Where necessary British Standard 8233: 1999 – ‘Code of Practice for Sound Insulation and Noise Reduction for Buildings’ was also used to determine any potential noise impact on the proposed dwellings.

The potential impact of road traffic on existing dwellings due to the development was assessed using the methodology described in the Design Manual for Roads and Bridges (DMRB).

A three-dimensional noise model has been developed to assess the potential impact due to road traffic. All road traffic noise calculations will be carried out using the principles of Calculation of Road Traffic Noise 1988 (CRTN).

The potential for noise impacts from fixed plant was assessed using the principles of British Standard 4142: 1997 - ‘Method for rating industrial noise affecting mixed residential and industrial areas’.

Construction impact was assessed using the methodology outlined in British Standard 5228: 2009 – ‘Code of practice for noise and vibration control on construction and open sites’.

The noise and vibration assessment has been completed using the latest development masterplan number 390-2-40A.

11.3.1 Planning Policy Guidance 24: Planning and Noise, 1994 (PPG 24)

PPG 24 sets out the range of noise issues that planning authorities need to be aware of in formulating development plans, making decisions on planning applications and in taking enforcement action to preserve and enhance environmental quality. PPG 24 proposes noise exposure categories, in respect of which, local planning authorities should consider the

appropriateness of introducing residential properties. The advice relating to these categories is presented in *Tables 11.1* and *11.2* below.

Table 11.1 - PPG 24 NEC's and advice	
NEC	Advice
A	Noise need not be considered as a determining factor in granting planning permission, although the noise level 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 alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.
D	Planning permission should normally be refused.

Table 11.2 - NEC's for new dwellings near existing noise sources					
Noise Levels Corresponding to the NEC's for New Dwellings $L_{Aeq,T}$ dB					
		Noise Exposure Category			
Noise Source	Time	A	B	C	D
Road Traffic	07.00 – 23.00	<55	55 - 63	63 – 72	>72
	23.00 – 07.00	<45	45 - 57	57 – 66	>66
Rail Traffic	07.00 – 23.00	<55	55 - 66	66 – 74	>74
	23.00 – 07.00	<45	45 - 59	59 – 66	>66
Air Traffic	07.00 – 23.00	<57	57 - 66	66 – 72	>72
	23.00 – 07.00	<48	48 - 57	57 – 66	>66
Mixed Sources	07.00 – 23.00	<55	55 - 63	63 – 72	>72
	23.00 – 07.00	<45	45 - 57	57 – 66	>66

Night time noise levels (23.00 – 07.00) sites where individual noise levels regularly exceed 82dB L_{Amax} (S time weighting) several times in any hour during this period should be treated as being in NEC C, regardless of the $L_{Aeq, 8h}$ (except where $L_{Aeq, 8hr}$ already puts the site in NEC D)

Road Traffic Impact

An assessment of increased traffic flows upon existing sensitive receivers has been carried out using future road traffic flow predictions. Calculation methods set out in the DfT document 'Calculation of Road Traffic Noise' (CRTN) have been employed. The extent of the impact has been determined using the principles of Design Manual for Roads and Bridges (DMRB) and by comparison of traffic flows with and without the development on completion of the development and 15 years after completion.

11.3.2 The Calculation of Road Traffic Noise (CRTN) and The Design Manual for Roads & Bridges (DMRB)

The Calculation of Road Traffic Noise (CRTN) specifies procedures for calculating levels of road traffic noise for use in assessing not only the entitlement for compensation under the Noise Insulation Regulations 1975 (as amended 1988) but also for more general applications such as the environmental appraisal of road schemes and land use planning.

The Highways Agency document 'Design Manual for Roads and Bridges (DMRB)' sets out the steps to be taken in assessing the noise impacts of a road scheme. Although much of the document is of no direct application to the development, the document does cite the significant impact due to the effect of changes in road traffic noise levels - see *Table 11.3*.

Noise Change $L_{A10,18h}$	Magnitude of Impact
0	No Change
0.1 – 0.9	Negligible
1.0 – 2.9	Minor
3.0 – 4.9	Moderate
5.0 +	Major

For consistency with other chapters of the ES, the significance of impacts has been defined as substantial, moderate and minor which corresponds to major, moderate and minor in *Table 11.3*.

Traffic Data

The traffic data used to inform the road traffic noise assessment contain the full transport assessment for the development, produced on behalf of the applicant by David Tucker Associates (see Chapter 9 Transport & Accessibility for further details).

The development will involve the construction of a small network of new roads to support the site and provide access to the proposed properties. Predicted traffic flows for these new roads have been provided as part of the transport assessment.

The development is designed to result in minimal traffic impacts to existing villages of Cockernhoe and Tea Green. Traffic measures will be put in place to divert traffic from these villages and onto Crawley Green Road, Eaton Green Road and Chalk Hill.

Impact onto new residential dwellings

Introducing new residential development to an area requires careful planning to ensure that the internal and external living areas are commensurately protected against noise. This has been assessed against the following standard.

11.3.3 British Standard BS8233: 1999, Code of Practice for Sound Insulation and Noise Reduction for Buildings

The scope of British Standard 8233: 1999 is the provision of recommendations for the control of noise in and around buildings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new or refurbished buildings undergoing a change of use rather than to assess the effect of changes in the external noise climate.

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 bedrooms is a 'good' standard, whilst 35 dB $L_{Aeq,T}$ is a 'reasonable' standard. For living areas in the daytime, the standard recommends 30 dB $L_{Aeq,T}$ as a 'good' standard and 40 dB $L_{Aeq,T}$ as being a 'reasonable' standard.

For reasonable outdoor living areas, BS8233: 1999 suggests that 50 dB $L_{Aeq,T}$ is a 'good' standard and 55 dB $L_{Aeq,T}$ is a 'reasonable' standard.

Noise from Fixed Plant

In introducing educational and community facilities as part of the development, there may be various processes and machinery that generate noise which have the potential to impact on nearby existing or proposed sensitive receptors. This has been assessed against the following standard.

11.3.4 British Standard BS4142: 1997 Method for rating industrial noise affecting mixed residential and industrial areas

BS4142: 1997 is intended to be used for assessment of whether noise from sources, including fixed installations, is likely to give rise to complaints from people residing in nearby dwellings.

The procedure contained in BS4142: 1997 for assessing the likelihood of complaint is to compare the measured or predicted noise level from the source in question, the 'specific noise level', at the assessment position with the background noise level. Where the noise contains a 'distinguishable, discreet, continuous note (whine, hiss, screech, hum etc.) or if there are distinct impulses in the noise (bangs, clicks, clatters or thumps), or if the noise is irregular enough to attract attention' then a correction of 5 dB is added to the specific noise level to obtain the 'rating level'. If the noise is tonal or impulsive, it attracts a 5 dB penalty.

To assess the likelihood of complaints, the measured background noise level is subtracted from the rating noise level at the nearest sensitive receptors. BS4142: 1997 states that a difference of around 10 dB or higher indicates that complaints are likely. A difference of around 5 dB is of marginal significance. At a difference below 5 dB, the lower the value the less likelihood there is that complaints will occur. A difference of -10 dB is a positive indication that complaints are unlikely.'

PPG 24 also states that 'the BS4142 rating level' should be used when stipulating the level of noise that can be permitted in any planning conditions.

Based on the criteria described in BS4142: 1997, a criterion of 5 dB less than the marginal significance level has been selected for the assessment i.e. not exceeding the existing background for the residential development.

Construction Noise

Assessment of the potential impact of construction noise has been predicted using methods described in BS5228: 2009 'Noise and Vibration Control on Construction and Open Sites'. The assessment has been conducted to a level of detail that is proportionate to the level of risk to the existing receptors, and has focused on any potential impact on new residences based on phasing.

11.3.5 British Standard BS5228: 2009 Code of practice for noise and vibration control on construction and open sites

There are no current British Standards or other recognised criteria for the assessment of construction noise. The Control of Pollution Act 1974 allows local authorities to recommend criteria appropriate to their area of jurisdiction. A figure that is often quoted as being an acceptable level of noise from construction sites is 70-75 dB L_{Aeq} measured at the external façade of an occupied building over the normal working day.

BS 5228: 2009 refers to DoE Advisory Leaflet (AL) 72 Noise control on building site (now out of print) which suggests that for a rural or suburban area away from main road traffic and industrial noise, a level of 70 dB façade $L_{Aeq,12h}$ is appropriate, and in an urban area near main roads in heavy industrial areas a level of 75dB façade $L_{Aeq,12hr}$. In this situation a 75 dB L_{Aeq} criterion has been selected as the site is located near to main roads, industry and an airport.

Noise Modelling

In order to assess the potential road traffic noise impacts on the existing and proposed residential dwellings due to the development, a three-dimensional (3D) environmental computer model of the development and surrounding areas was constructed in a noise mapping software, CadnaA. The model takes into consideration ground absorption, noise sources around the development (traffic noise), screening and reflection by obstacles (e.g. barriers and buildings) and ground topography. In the model, all the residential buildings were assumed to be 8 metres high and a reflection order of 1 was assumed. Receptor calculations were carried out at 1.5 and 4 metres above the ground to represent ground and first floor residential levels respectively surrounding and in the development.

For traffic noise, the calculation module based on the Calculation of Road Traffic Noise 1988 (CRTN) was employed. The road traffic noise source data was based on the traffic data provided by the traffic consultant and site measurements.

Figure G1.1 presents screen shots of the 3D noise model.

11.4 BASELINE CONDITIONS

A noise survey of the existing area was undertaken to establish the baseline noise environment for noise sensitive receivers both within and outside the proposed site boundary.

The survey was designed to capture variation in the background noise environment for different time periods in a typical weekday. In addition, maximum noise level of events during the night time period was also measured for an assessment against Planning Policy Guidance 24.

The survey included a combination of 24-hour monitoring supported by short-term attended measurements.

The monitoring was conducted at a range of locations in order to provide an indication of the variation in noise across the site area. The monitoring locations are specified in *Appendix G2* and consist of:

- Two 24 hour noise monitors located at M1 and M2
- Five short term measurements at S1 to S5.

Location M1 was chosen for long term, unattended monitoring of the noise climate at the middle of the site to monitor the background noise levels in this area. Location M2 was chosen to monitor the background noise levels around the Tea Green area.

In addition to the long term monitoring, attended noise monitoring was carried at selected times over the 24 hour period. Their locations are described in *Table 11.4* below. All measurements were undertaken at a height of approximately 1.5 metres above the ground and away from any reflective surfaces besides ground.

Location	Description
M1	In the middle of the site - south of Cockernhoe Farm.
M2	Near to the east boundary of the site - at Tea Green.
S1	Western boundary of the site on Luton Road near junction of Crawley Green Road and Hedley Rise.
S2	Northern boundary of the site on Chalk Hill section between Luton Road and Brick Kiln Lane.
S3	Northern boundary of the site on Chalk Hill section between Brick Kiln Lane and Lilley Bottom.
S4	Eastern boundary of the site on Brick Kiln Lane.
S5	Southern boundary of the site on Eaton Green Road.

Short term measurements at locations S1 to S5 were to measure traffic noise using the shortened measurement procedure outlined in the CRTN. Night time measurements were also carried out at these locations between 2300 and 0200.

The baseline noise survey of the existing area was undertaken over two time periods, from 1st August 2008 to 2nd August 2008 and 8th September 2009.

The weather conditions during the survey were dry and mild, with negligible winds. The conditions were suitable for noise monitoring.

The noise survey was carried out using the monitoring equipment set out in *Table 11.5* below. All of the instrumentation is controlled within the Bureau Veritas ISO 9001 accredited management system and has been verified to traceable standards by an accredited calibration laboratory within the last 2 years. A calibration check was performed on the sound level meters before and after use; no drift in calibration was noted.

Table 11.5 - Monitoring equipment used during noise survey			
No	Manufacturer	Type	Description
1	Bruel & Kjaer	2260	Real Time Sound Analyzer
2	Bruel & Kjaer	4189	1/2" Microphone
3	Bruel & Kjaer	4231	Sound Calibrator
4	Larsen-Davis	820	Real Time Sound Analyzer
5	G.R.A.S	40AE	Condenser Microphone

At the measurement locations, the following noise level parameters were recorded:

- $L_{Aeq,T}$ The equivalent continuous A-weighted sound level over the measurement period, T. This is the level of a notional steady sound, which contains the same amount of sound energy as the fluctuating sound actually recorded.
- $L_{A10,T}$ The A-weighted sound level exceeded for 10% of the time during the measurement period, T. This parameter is generally used to describe road traffic noise.
- $L_{A90,T}$ The A-weighted sound level exceeded for 90% of the time during the measurement period, T. This parameter is generally used to describe background noise.
- $L_{Amax,T}$ The maximum RMS A-weighted sound level over the measurement period, T.

Noise parameters were recorded in 5 – 15 minute samples (dependant on location and ultimate use). For short term measurements, noise levels in 1/3 octave band were also recorded.

A summary of the measured noise levels is presented in *Table 11.6*. The full tabulated data is presented in *Appendix G2*.

Table 11.6 - Summary of measured data			
Monitor ID	Measurement dates	L_{Aeq,16h} daytime level dB	L_{Aeq,8h} night-time level dB
M1	01/08/2007	46	38
M2	01/08/2007	50	43
S1	01/08/2007, 08/09/2009	51*	50-52
S2	08/09/2009	48*	43-45
S3	08/09/2009	48*	38-41
S4	08/09/2009	47*	35-42
S5	01/08/2007, 08/09/2009	48*	34-41

*CRTN short term measurements.

The daytime noise climate in the area is dominated by road traffic noise along Luton Road, Chalk Hill, Eaton Green Road and Brick Kiln Lane in addition to individual vehicular movements along other nearby local roads together with aircraft noise. Distant traffic noise from the M1 motorway was just audible during the attended survey.

Daytime measurements ranged from 46 – 51 dB(A) L_{Aeq,16h}. All daytime measurements fall below 55 dB(A), the noise level for PPG24 Category A.

During the night-time period it was noted that the main source of noise over much of the site was local single road vehicle events along Luton Road, Chalk Hill, Eaton Green Road, Brick Kiln Lane and distant general road traffic noise from the wider area. The noise levels experienced to the east and south of the site were considered to be low.

Night time measurements ranged from 38 – 52 dB(A) L_{Aeq,8h}. Of the 7 night time measurements 6 fall below 45 dB(A) the noise level for PPG24 NEC category A, with noise levels at location S1 near to Luton Road measured between 50 and 52 dB(A). Over the measurement period there were no individual night time noise events exceeding the PPG24 limit of 82 dB(A) L_{Amax} (S).

The vast majority of the site is therefore currently within PPG24 NEC A where the planning guidance is that "Noise need not be considered as a determining factor in granting planning permission". A very small region near to Luton Road falls in Category B where noise may be needed to be taken into account.

Figures G1.2 and G1.3 present noise contour maps plotted in PPG24 NEC levels for the proposed development site for the daytime and night time at 1.5 metres above the ground respectively.

The site does not fall within the Luton Airport 57 dB(A) noise contour based on the air noise contours published by the airport. Therefore aircraft movements will not have any significant effect on the site's NEC.

11.5 MITIGATION MEASURES

Detailed information with regard to the layout of the proposed residential development is not available at this stage. As a general principle where possible bedrooms and living rooms should not be located on facades facing noise sources such as roads or fixed plant. However where properties are adjacent to roads or fixed plant, they may require acoustic trickle vents fitted in windows to ensure that night time levels in bedrooms achieve the good standard specified in BS 8233: 1999. When more detailed internal layouts are available, a thorough noise assessment can be carried out to be able to determine which residences, if any, may require acoustic upgrading to the envelope of the building.

Where doors and patio doors are situated facing noise sources suitable seals should be used such as rubber or neoprene to give an airtight seal and hence increased noise insulation.

Where possible gardens should be designed to be situated on the quiet facade of buildings. Alternatively a noise barrier can be used to protect the gardens to achieve the good standard specified in BS 8233: 1999. Any such barrier needs to be of a close boarded design (i.e. constructed so that no air gaps exist in the structure) and be constructed of a material with surface density of at least 15 kg/m².

Although this chapter primarily examines the noise and vibration impact of the operation of the development, there is also potential for noise and vibration impacts during the construction phase. To keep construction noise and vibration to a minimum, the contractor will commit to good practice including noise and vibration management mitigation measures as an integral part of their Construction Code of Practice (CoCP). The CoCP will include measures designed to mitigate the impact of a number of environmental concerns associated with construction including noise and vibration.

11.6 ASSESSMENT OF IMPACTS

11.6.1 Road Traffic Noise

The impact of road traffic noise due to the development has been assessed using the noise model at 58 existing residential properties and 12 proposed residential properties on and in the area around the Brickkiln development. The receptor locations are presented in *Figure G1.4*. Road traffic noise levels have been calculated for the proposed opening year 2016 and design year 2031 with and without the development.

Tables 11.7 and 11.8 present a summary of the calculated noise levels for the 2016 and 2031 with and without the development for selective existing sensitive receivers and the magnitude of impact. The noise levels presented are free field noise levels. The results of all receptors are presented in *Appendix G1.5*.

Table 11.7 - Road traffic noise changes with and without the development for year 2016 and 2031 at ground floor height (1.5 metre) for selected existing sensitive receivers.

Receptor	DS2031 (dB) LA10,18h	DM2031 (dB) LA10,18h	Changes	Magnitude of Impact	DS2016 (dB) LA10,18h	DM2016 (dB) LA10,18h	Changes	Magnitude of Impact
R1	67.9	67.8	0.1	Negligible adverse	67.1	67.0	0.1	Negligible adverse
R3	70.4	70.2	0.2	Negligible adverse	69.6	69.3	0.3	Negligible adverse
R5	65.4	65.2	0.2	Negligible adverse	64.6	64.4	0.2	Negligible adverse
R6	64.1	64	0.1	Negligible adverse	63.3	63.2	0.1	Negligible adverse
R8	66.2	66.1	0.1	Negligible adverse	65.4	65.3	0.1	Negligible adverse
R9	66.5	66.4	0.1	Negligible adverse	65.6	65.6	0.0	Neutral
R11	65.7	65.7	0.0	Neutral	64.9	64.9	0.0	Neutral
R13	66.7	67.1	-0.4	Negligible benefit	65.9	66.2	-0.3	Negligible benefit
R14	65.3	65.3	0.0	Neutral	64.5	64.5	0.0	Neutral
R15	64.7	64.6	0.1	Negligible adverse	63.9	63.8	0.1	Negligible adverse
R16	67.5	67.1	0.4	Negligible adverse	66.7	66.3	0.4	Negligible adverse
R17	67.1	66.7	0.4	Negligible adverse	66.3	65.8	0.5	Negligible adverse
R18	64.4	64.3	0.1	Negligible adverse	63.6	63.5	0.1	Negligible adverse
R20	64.5	64.6	-0.1	Negligible benefit	63.8	63.7	0.1	Negligible adverse
R22	63.7	63.7	0.0	Neutral	62.9	62.9	0.0	Neutral
R24	70.6	70.6	0.0	Neutral	69.8	69.8	0.0	Neutral
R25	68.2	68.2	0.0	Neutral	67.4	67.4	0.0	Neutral
R28	65.7	65.7	0.0	Neutral	64.9	64.9	0.0	Neutral
R30	67.9	67.9	0.0	Neutral	67.1	67.1	0.0	Neutral
R32	77.5	77.5	0.0	Neutral	76.7	76.7	0.0	Neutral
R33	76.9	76.9	0.0	Neutral	76.1	76.1	0.0	Neutral
R34	62.4	61.4	1.0	Minor adverse	61.7	60.6	1.1	Minor adverse
R36	63.1	62.2	0.9	Negligible adverse	62.5	61.4	1.1	Minor adverse
R38	64.6	63.4	1.2	Minor adverse	64.0	62.5	1.5	Minor adverse
R39	62.3	60.9	1.4	Minor adverse	61.8	60.1	1.7	Minor adverse
R40	56.0	54.7	1.3	Minor adverse	55.5	53.9	1.6	Minor adverse
R41	55.6	54.3	1.3	Minor adverse	55.0	53.4	1.6	Minor adverse
R42	57.4	56.1	1.3	Minor adverse	56.8	55.3	1.5	Minor adverse
R43	50.6	48.7	1.9	Minor adverse	50.1	47.9	2.2	Minor adverse

Table 11.7 - Road traffic noise changes with and without the development for year 2016 and 2031 at ground floor height (1.5 metre) for selected existing sensitive receivers.

Receptor	DS2031 (dB) L _{A10,18h}	DM2031 (dB) L _{A10,18h}	Changes	Magnitude of Impact	DS2016 (dB) L _{A10,18h}	DM2016 (dB) L _{A10,18h}	Changes	Magnitude of Impact
R47	47.0	45	2.0	Minor adverse	46.5	44.1	2.4	Minor adverse
R48	53.3	51.8	1.5	Minor Adverse	53.2	51.0	2.2	Minor adverse
R49	63.0	62.5	0.5	Negligible adverse	62.2	61.7	0.5	Negligible adverse
R50	67.1	66.6	0.5	Negligible adverse	66.4	65.8	0.6	Negligible adverse
R51	63.1	62.6	0.5	Negligible adverse	62.3	61.8	0.5	Negligible adverse
R64	54.9	53	1.9	Minor adverse	54.4	52.2	2.2	Minor adverse
R66	57.6	55.4	2.2	Minor adverse	57	54.4	2.6	Minor adverse
R67	55.3	53.6	1.7	Minor adverse	55.1	52.7	2.4	Minor adverse
R69	58.6	56.9	1.7	Minor adverse	58.1	56	2.1	Minor adverse
R70	67.2	67.6	-0.4	Negligible benefit	66.4	66.7	-0.3	Negligible benefit

Table 11.8 - Road traffic noise changes with and without the development for year 2016 and 2031 at first floor height (4.0 metre) for selected existing sensitive receivers.

Receptor	DS2031 (dB) L _{A10,18h}	DM2031 (dB) L _{A10,18h}	Changes	Magnitude of Impact	DS2016 (dB) L _{A10,18h}	DM2016 (dB) L _{A10,18h}	Changes	Magnitude of Impact
R1	68.0	67.9	0.1	Negligible adverse	67.2	67.1	0.1	Negligible adverse
R3	70.2	70.0	0.2	Negligible adverse	69.4	69.1	0.3	Negligible adverse
R5	65.4	65.3	0.1	Negligible adverse	64.7	64.5	0.2	Negligible adverse
R6	64.1	64.0	0.1	Negligible adverse	63.3	63.2	0.1	Negligible adverse
R8	66.2	66.1	0.1	Negligible adverse	65.4	65.3	0.1	Negligible adverse
R9	66.5	66.4	0.1	Negligible adverse	65.6	65.6	0.0	Neutral
R11	65.7	65.7	0.0	Neutral	64.9	64.8	0.1	Negligible adverse
R13	66.6	66.9	-0.3	Negligible benefit	65.8	66.1	-0.3	Negligible benefit
R14	65.2	65.3	-0.1	Negligible benefit	64.4	64.5	-0.1	Negligible benefit
R15	64.7	64.6	0.1	Negligible adverse	63.9	63.7	0.2	Negligible adverse
R16	67.5	67.1	0.4	Negligible adverse	66.7	66.3	0.4	Negligible adverse
R17	67.0	66.5	0.5	Negligible adverse	66.2	65.7	0.5	Negligible adverse

Table 11.8 - Road traffic noise changes with and without the development for year 2016 and 2031 at first floor height (4.0 metre) for selected existing sensitive receivers.

Receptor	DS2031 (dB) L _{A10,18h}	DM2031 (dB) L _{A10,18h}	Changes	Magnitude of Impact	DS2016 (dB) L _{A10,18h}	DM2016 (dB) L _{A10,18h}	Changes	Magnitude of Impact
R18	64.3	64.2	0.1	Negligible adverse	63.5	63.4	0.1	Negligible adverse
R20	64.4	64.4	0.0	Neutral	63.6	63.6	0.0	Neutral
R22	63.6	63.6	0.0	Neutral	62.8	62.7	0.1	Negligible adverse
R24	70.6	70.6	0.0	Neutral	69.8	69.8	0.0	Neutral
R25	68.2	68.2	0.0	Neutral	67.4	67.4	0.0	Neutral
R28	66.2	66.2	0.0	Neutral	65.4	65.3	0.1	Neutral
R30	67.9	67.9	0.0	Neutral	67.1	67.1	0.0	Neutral
R32	77.4	77.4	0.0	Neutral	76.6	76.6	0.0	Neutral
R33	76.8	76.8	0.0	Neutral	76.0	76.0	0.0	Neutral
R34	62.3	61.3	1.0	Neutral	61.6	60.5	1.1	Minor adverse
R36	63.0	62.1	0.9	Negligible adverse	62.4	61.3	1.1	Minor adverse
R38	64.5	63.3	1.2	Minor adverse	63.9	62.5	1.4	Minor adverse
R39	64.2	62.8	1.4	Minor adverse	63.7	62.0	1.7	Minor adverse
R40	58.1	56.9	1.2	Minor adverse	57.6	56.0	1.6	Minor adverse
R41	57.8	56.3	1.5	Minor adverse	57.2	55.5	1.7	Minor adverse
R42	59.4	58.0	1.4	Minor adverse	58.8	57.2	1.6	Minor adverse
R43	52.4	50.4	2.0	Minor adverse	51.9	49.6	2.3	Minor adverse
R47	49.7	47.6	2.1	Minor adverse	49.1	46.7	2.4	Minor Adverse
R48	54.8	52.9	1.9	Minor adverse	54.3	52.1	2.2	Minor Adverse
R49	62.9	62.5	0.4	Negligible adverse	62.2	61.6	0.6	Negligible adverse
R50	66.9	66.5	0.4	Negligible adverse	66.2	65.7	0.5	Negligible adverse
R51	63.1	62.6	0.5	Negligible adverse	62.3	61.8	0.5	Negligible adverse
R64	55.0	53.1	1.9	Minor adverse	54.5	52.3	2.2	Minor Adverse
R66	57.6	55.5	2.1	Minor adverse	57.1	54.6	2.5	Minor Adverse
R67	56.2	54.5	1.7	Minor adverse	55.9	53.6	2.3	Minor Adverse
R69	58.6	56.9	1.7	Minor adverse	58	56	2.0	Minor Adverse
R70	67.0	67.3	-0.3	Negligible benefit	66.2	66.5	-0.3	Negligible benefit

The results indicate that road traffic associated with the development is likely to give rise to a small increase in noise levels at some existing sensitive receivers around the development site.

In general the development will have a neutral to minor adverse impact on traffic noise in the area. The majority of areas will increase in noise by less than 3 dB. PPG 24 refers to an increase of 3 dB as being the minimum perceptible increase and therefore an insignificant increase.

Figure G1.6 presents a noise level difference map showing the impact of road traffic with and without the development for year 2031. The figure shows that the overall impact of road traffic due to the development upon surrounding areas is less than 3 dB, a minor adverse impact.

The impact of road traffic noise upon the proposed residential development has been assessed using the noise model at 12 indicative locations of proposed residential properties near to the development roads. Road traffic noise levels have been calculated for the operation year 2016 and design year 2031 with the development.

Table 11.9 presents the calculated noise levels due to road traffic for year 2016 and 2031 at the ground and first floor residential height respectively. The daytime noise levels are presented in $L_{Aeq,16h}$ converted from $L_{A10,18h}$ and the night time noise levels are converted from $L_{A10,18h}$ using the TRL method 3¹.

Table 11.9 - Road traffic noise calculated at selected locations of proposed residential properties								
Receiver	Ground Floor		First Floor		Ground Floor		First Floor	
	DS 2031 $L_{Aeq,16h}$	DS 2016 $L_{Aeq,16h}$	DS 2031 $L_{Aeq,16h}$	DS 2016 $L_{Aeq,16h}$	DS 2031 $L_{Aeq,8h}$	DS 2016 $L_{Aeq,8h}$	DS 2031 $L_{Aeq,8h}$	DS 2016 $L_{Aeq,8h}$
R52	53.5	53.0	55.6	55.0	46.2	45.7	48.1	47.5
R53	53.3	53.1	56.3	56.1	46.0	45.8	48.7	48.5
R54	53.8	53.6	55.8	55.7	46.5	46.3	48.3	48.2
R55	48.9	48.8	50.8	50.7	42.0	42.0	43.8	43.7
R56	44.6	44.4	46.9	46.7	38.2	38.0	40.2	40.1
R57	50.2	50.2	52.2	52.2	43.2	43.2	45.0	45.0
R58	50.1	50.1	52.1	52.2	43.1	43.1	44.9	45.0
R59	51.1	51.2	53.2	53.2	44.0	44.1	45.9	45.9
R60	47.1	46.7	49.2	48.8	40.4	40.1	42.3	42.0
R61	45.2	44.8	47.3	46.9	38.7	38.4	40.6	40.2
R62	38.3	37.7	39.4	38.8	32.5	32.0	33.5	33.0
R63	50.8	50.7	52.7	52.7	43.8	43.7	45.5	45.5

¹ Method for converting the UK road traffic noise index LA10, 18h to the EU noise indices for road noise mapping, DEFRA 2006.

Figure G1.7 presents a noise contour map showing the impact of road traffic due to the development in $L_{A10,18h}$ for year 2031.

Table 11.9 and Figure G1.7 shows that for the proposed residential dwellings adjacent to roads (i.e. near to Luton Road), the attenuation afforded by a standard double glazing system, providing 25 to 30 dB attenuation will be sufficient to reduce ground floor noise levels to achieve reasonable to good standard within living rooms as stated by BS 8233: 1999.

Where possible, bedrooms should not be located on facades facing the roads. However, where bedrooms do face the road, to achieve suitable night time internal noise levels, acoustic trickle vents fitted in first floor bedroom windows are required. This in combination with a standard double glazed unit will give a reduction of the order of 25-30 dB with windows closed which will achieve the reasonable to good standard specified by BS8233: 1999.

Gardens should be located on quiet building facades facing away from the roads or alternatively a noise barrier can be used to protect the gardens to achieve the good standard specified in BS 8233: 1999. Any such barrier would need to be of a close boarded design (i.e. constructed so that no air gaps exist in the structure) and be constructed of a material with surface density of at least 15 kg/m².

To summarise, noise from road traffic will not cause a significant impact.

11.6.2 Noise from Fixed Plant

Educational and Local Community Facilities

No information is currently available with regard to the fixed electrical and mechanical plant that is to be installed as part of the proposed educational building and local centre. However, it may be assumed that the development may require air extraction units, cooling and ventilation plant, boilers and generators.

The detail design of the fixed plant will require that background noise levels at existing nearby dwellings do not increase. The total combined rating level from all fixed plant should be no greater than the existing $L_{A90,T}$ noise level at nearby dwellings. This would also ensure that an assessment in accordance with BS 4142: 1997 would find that the probability of complaints about noise would be low.

Our long term monitoring at an area near to the proposed location of the local centre and school shows background noise levels between 25 to 40 $L_{A90,5min}$ with an average of 30 dB(A) during the night time. The average measured value has been selected as a representative value of the background noise level for the area.

BS 4142:1997 states that background noise levels below about 30 dB and rating levels below about 35 dB are considered to be very low. Therefore, for this situation where the background noise levels are very low, the fixed plant sources will be designed so as to achieve a rating noise level of no greater than 35 dB at the nearby sensitive receivers.

This would result in the internal noise level through an open window being in the region of 20 dB, which is 10 dB lower than the “good” standard for bedrooms during the night time period as set out in BS 8233:1999.

For the daytime, our long term monitoring at an area near to the local centre and school shows background noise levels between 31 to 40 $L_{A90,1h}$ with an average of 35 dB(A). Any fixed plant sources operating only during the day will be designed so as to achieve a rating level of 40 dB(A) at the nearby sensitive receivers.

All fixed plant should be designed to meet the following rating noise limits as set out in BS 4142: 1997 – see *Table 11.10*.

Table 11.10 - Noise limits for fixed plant and operational noise for daytime and night time		
Potential Noise Source	Noise Rating Limit for Fixed Plant and Operational Noise at receptor $L_{Aeq,T}$ (dB) (free field)	
	Daytime	Night time
Proposed residential properties	40	35

Should there be a character to the noise introduced, it may attract a 5 dB penalty as suggested in BS 4142: 1997 which would in turn affect the rating level. It is very important to understand that designing each individual piece of equipment so as to meet the above criteria will lead to an exceedance of the criteria should more than one item of plant be operating, as there will be a combined effect. It will therefore be necessary to consider all equipment to be installed, so that in full operation the total contribution from all aspects of the units will meet the criteria as set out in *Table 11.10*.

To summarise, providing the above design criteria are met, noise from fixed plant will not cause a significant adverse impact.

11.6.3 Construction Noise

It is possible there may be some disturbance caused to nearby properties during the construction phases. Disruption due to construction is generally a more localised phenomenon than the effects of the development after opening and is temporary in nature.

The nearest residential receptors that may be affected by the construction works are residences around the area to the west and north-west of the site, along Hedley Rise, Luton Road and Chalk Hill.

Techniques available to predict the likely noise and vibration effects from construction can be found in the British Standard BS5228: 2009. However, the methodology is based on quite detailed information on the type and numbers of plant being used, as well as their location and the length of time they are in operation. Such full details are not available at this stage.

Construction Noise

An estimate of the likely effects of noise from the construction phases has been made for those properties nearest to the development. The locations of these sensitive receptors are presented in *Figure G1.8*. The predictions are based on the methodology given in BS5228: 2009 and are in terms of the Equivalent Continuous Sound Level, L_{Aeq} , over the core working day. The predictions are worst case in that it is assumed that there are no particular mitigation measures.

It should be noted that the construction works associated with the site will be carried out in phases. For the purposes of predicting the potential noise impact, the construction works have been divided into the following construction phases, which represent typical activities for this type of development:

- site preparation and ground works (including the formation of haul routes);
- concreting operations;
- erection of the brick buildings and cladding activities; and
- construction of access roads, hard-standings, and landscaping.

It is understood that the only piling anticipated will be for the construction of the school buildings (200 metres from the nearest sensitive receivers) and it will be augered piling to minimise the potential impacts at nearby sensitive receivers.

For the prediction, it is assumed that site preparation would involve the removal of some of the existing vegetation, ground levelling works, establishment of the new access points, earth-moving and site profiling. Building erection would involve, the construction of block built buildings (2 to 3 storey high) or similar with concrete floors cast in situ and cladding or brickwork to the external walls and roof. A reinforced concrete ground slab would be cast in situ. The roads, parking areas and external paving would involve laying either a concrete or bituminous surface. Landscaping works would involve earth moving and site profiling. As there will be no impact piling, it is unlikely an impact on nearby sensitive receptors.

It is also assumed that the intervening ground between the construction noise sources (which as a worst case are assumed to be working near to the edge of the site) and noise-sensitive properties will be acoustically soft, such that there will be a certain amount of attenuation of sound due to ground absorption.

Predictions of the noise levels from construction works have been undertaken for the noise-sensitive receptors identified below.

Properties around Elmtree Avenue are located adjacent to the north-western boundaries of the development site. The buildings will be at 33 metres from the construction of roads, hard-standings and landscaping and 78 metres from the building construction. Properties on Tameton Close are located to the west of the development site and on occasions will also be within 55 metres from the nearest ground works. Properties along the Chalk Hill and the Corkernhoe Primary School on occasions will be within 25 and 170 metres from the ground works associated with the school. Properties on Brick Kiln Lane will be 28 metres from the building construction work and the site levelling and landscaping activities. There is also a day nursery at the junction between Chalk Hill and Brick Kiln Lane which will be on occasions within 56 metres from the building construction work.

For the predictions, the following equipment set out in *Table 11.11* has been assumed.

Table 11.11 - Equipment assumed for the construction noise predictions	
Construction activity	Equipment
Site preparation and ground work	2 excavators, 2 dozers, 2 dump trucks, 2 vibratory roller
Concreting operations	6 mixer trucks, 2 concrete pumps, 5 poker vibrators
Building work	Loading scaffolding, dismantling scaffolding, 2 compressors, cutting timber, hammering, lifting operation, 2 site fork lift trucks, 4 diesel generators, 10 handheld cordless nail guns
Construction of roads, hard-standings and landscaping	1 asphalt paver, 1 dumper, 2 wagons, 1 wheeled excavator, 1 road planner, 1 vibro-roller, 1 dozer

The predicted noise levels due to construction are given in *Table 11.12* below. The predicted noise levels are presented as the worst case situation (when the construction activity is being undertaken at the closest part of the site to the receptors) and the average case, when the construction activity is being undertaken towards the centre of the site. No barrier corrections (i.e. allowance for noise attenuation due to physical obstruction) were assumed for either receptor. The first row of buildings will provide considerable shielding to those buildings behind consequently the levels only apply to the first row of building facades with an unobstructed view of the construction works. *Table 11.13* presents the predicted noise levels due to construction for the average case.

Table 11.12 - Predicted 'Worst Case' construction noise levels – L_{Aeq, working day}.				
Location	Site Construction Activity			
	Ground Works	Concreting activities	Building Fabrication	Road Works
Elmtree Avenue properties	62	61	65	74
Tameton Close properties	66	64	69	64
Chalk Hill properties	74	73	54	54
Cockernhoe Primary School	54	53	47	50
Nursery	65	64	69	55
Brick Kiln properties	73	72	75	60

Table 11.13 - Predicted 'Average Case' construction noise levels – L_{Aeq, working day}.				
Location	Site Construction Activity			
	Ground Works	Concreting activities	Building Fabrication	Road Works
Elmtree Avenue properties	58	60	59	61
Tameton Close properties	60	62	61	56
Chalk Hill properties	60	62	54	53
Cockernhoe Primary School	48	50	47	47
Nursery	60	62	61	53
Brick Kiln properties	68	69	69	56

Tables 11.12 and 11.13 show that noise levels at the nearby sensitive receivers are unlikely to exceed 75 dB L_{Aeq,T} during the construction works even when the works are undertaken at the closest part of the site to the receptor location. Properties at Brick Kiln are predicted to have the greatest impact due to the construction works, and are predicted to be lower than 75dB L_{Aeq,T}.

It is important to note that the average case will be the impact for the majority of the time during the construction phase. The significance of impact due to construction works will be greater, for example when a phase of development is close to an existing dwelling, however it will be for a short period of time. It is therefore considered that the predicted significance of construction for an average case is a more appropriate assessment of impact.

To keep construction noise to a minimum, the contractor will commit to good practice including noise management mitigation measures as an integral part of their Construction Code of Practice (CoCP).

To summarise, noise from construction will not cause a significant adverse impact.

11.7 SUMMARY

The Acoustics and Vibration Group of Bureau Veritas has conducted a noise and vibration impact assessment for a mixed-use urban extension on land to the east of Luton also known as the Brickkiln development.

It is proposed that the development will comprise up to 1000 residential dwellings, an integrated local centre and community / educational facilities.

A survey and a noise modelling study had been conducted to assess the impact on the proposed dwellings and existing nearby sensitive receptors using the principles of:

- Planning Policy Guidance (PPG24);
- BS 4142: 1997 Method for rating industrial noise in mixed residential and industrial areas;
- The Calculation of Road Traffic Noise (CRTN) and The Design Manual for Roads and Bridges (DMRB);
- BS 8233: 1999 Sound insulation and noise reduction for buildings – Code of practice; and
- BS 5228: 2009 Code of practice for noise and vibration control on construction and open site.

The completed assessment has considered the suitability of the site for proposed dwellings, as well as the potential impacts that could arise at existing local noise sensitive receptors during both the construction and operational phases of the proposed development.

For each potential impact area, the significance of noise impacts has been assessed, consideration has been given to noise mitigation measures where warranted, and the residual impacts have been determined. Overall the residual impacts have been identified as no more than minor to negligible impacts.

Road traffic associated with the development will have a neutral to minor adverse impact on the existing sensitive receivers.

It is unlikely that the noise from fixed plant will have an impact on existing nearby sensitive receivers. Providing noise from fixed plant is appropriately designed and controlled it will not cause a significant adverse impact on the proposed residential properties.

Noise from construction will not cause a significant adverse impact. Impacts will be a localised phenomenon and will be temporary in nature. The contractor will commit to good practice including noise management mitigation measures as an integral part of their Construction Code of Practice (CoCP). The CoCP will include measures designed to mitigate the impact of a number of environmental concerns associated with construction including noise and vibration.