Bloor Homes Ltd and Gillian Smith, John Robert Carmichael Smith, Robert Giles Russell Smith and Andrew James Smith

LAND EAST OF STATION ROAD, ELSENHAM

Noise Impact Assessment

SEPTEMBER 2022

PUBLIC

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1 INTRODUCTION

1.1.1. WSP UK Ltd has been commissioned by Bloor Homes Ltd and Gillian Smith, John Robert Carmichael Smith, Robert Giles, Russell Smith and Andrew James Smith (the Client) to undertake a noise survey and assessment for a proposed residential development at Elsenham. This report has been prepared in support of the outline planning application to Uttlesford District Council (UDC).

1.1.2. This report presents the results of the baseline survey undertaken to establish the existing noise levels affecting the site, the results of which have been used to assess the suitability of the site for residential use.

1.1.3. Where necessary, mitigation measures have been identified with the aim of providing a suitable internal and external noise environment for future occupants.

1.1.4. This report is necessarily technical in nature. In order to assist the reader a glossary of terminology used in this report is provided in Appendix A.

2 SITE DESCRIPTION

2.1 LOCATION

2.1.1. The proposed development site is located to the north-east of Elsenham. The land currently comprises agricultural fields with no existing buildings or permanent structures.

2.1.2. The site is bounded by agricultural fields to the north, east and south, and by the West Anglia mainline to the west. There is an existing commercial building immediately to the north-west of the site. This is occupied by Tuplin; a global packaging and logistics company.

2.1.3. The surrounding wider area consists of residential dwellings to the west, Old Mead Road and Station Road also to the west beyond the railway line, the M11 which is approximately 600m to the west of the site and Stansted Airport which is located approximately 2.9km to the south-east of the site. It is also noted that the area immediately to the south of the site has been approved for residential use (UDC planning application reference: UTT/17/3573/OP) and the reserved matters application was granted earlier this year (UTT/21/3269/DFO).

2.1.4. The main noise sources affecting the site include road traffic on the M11 and the local road network, trains on the West Anglia mainline, occasional aircraft traveling to and from Stansted Airport and noise associated with forklifts moving goods around the Tuplin service yard, which is situated to the north of the commercial building.

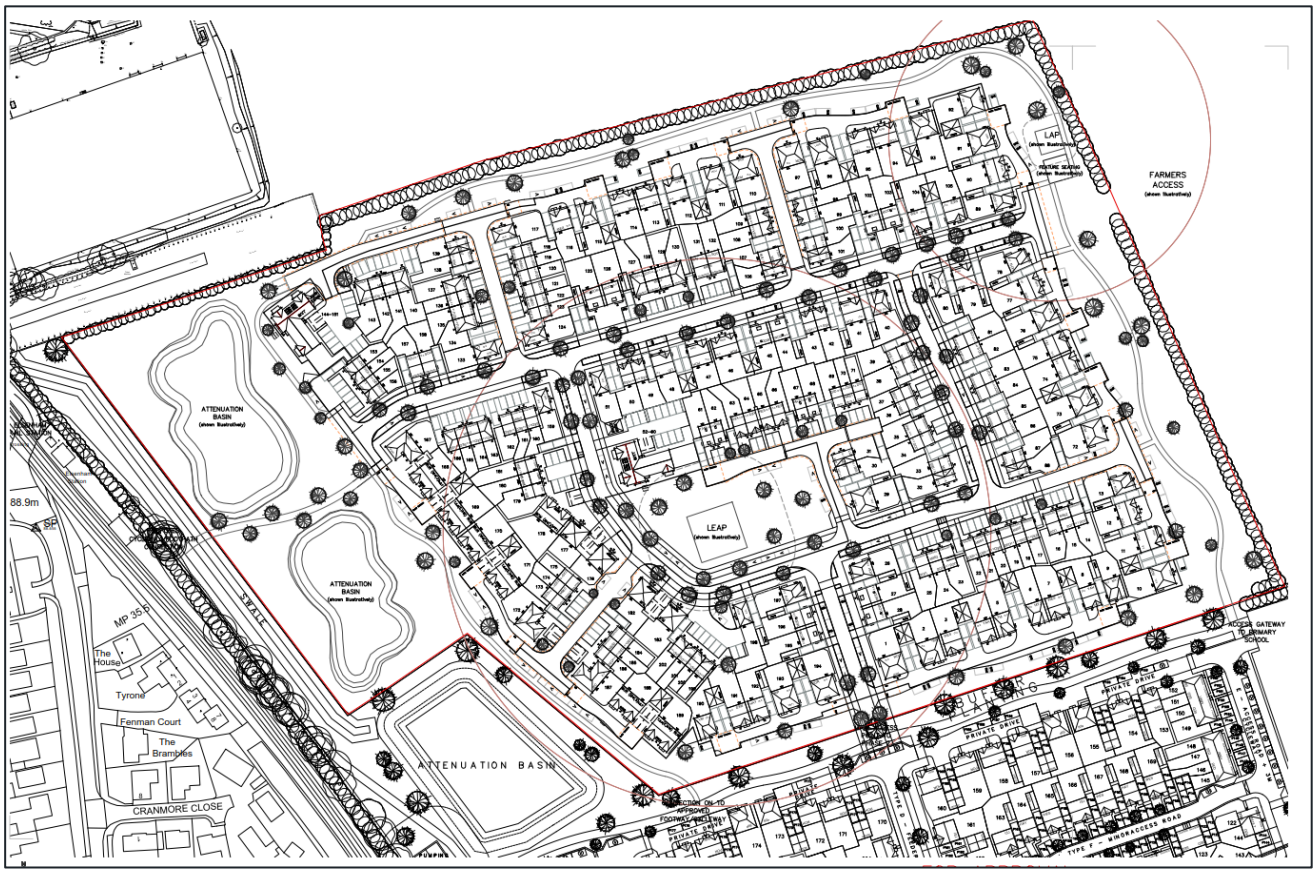
2.2 PROPOSED DEVELOPMENT

2.2.1. The proposed development is for up to 200 residential dwellings along with landscaping, public open space and associated infrastructure works.

2.2.2. The parameter plan is shown in Figure 2-1 and the indicative masterplan shown in Figure 2-2.

Figure 2-1 - Parameter Plan

Figure 2-2 - Indicative Masterplan



3 ACOUSTIC DESIGN STANDARDS AND GUIDANCE

3.1 CONSULTATION WITH THE LOCAL PLANNING AUTHORITY

3.1.1. Consultation was undertaken with the Environmental Health Officer (EHO) at UDC in August 2022. The EHO agreed that internal ambient noise levels should achieve the target values set out in British Standard 8223; details of which are set out in section 3.3 below. Where the internal noise criteria cannot be achieved with windows open, a scheme for alternative means of ventilation and air cooling and heating will be required. Furthermore, the target external noise criterion within gardens is 50 dB $L_{Aeq,16h}$, with any exceedance above this clearly set out.

3.2 UDC'S NOISE ASSESSMENT TECHNICAL GUIDANCE

3.2.1. The EHO also provided UDC's Noise Assessment Technical Guidance document, adopted in June 2017. The Technical Guidance document aims to provide help and advice in relation to noise in a planning context to encourage good acoustics design.

3.2.2. UDC's Technical Guidance note includes reference to BS 8233, the World Health Organisation's Guidelines, and the Professional Practice Guidance on Planning and Noise. It is noted that the Technical Guidance states that the design of the development should ensure that external amenity areas should not be above 50–55 dB $L_{Aeq\ 16hr}$. This upper criterion of 55 dB $L_{Aeq,16h}$, which is in line with the guidance in the aforementioned best practice documents, has been adopted for the development although care has been taken to ensure as much of the site as possible falls below the lower criterion wherever practicable.

3.3 NATIONAL POLICY

NATIONAL PLANNING POLICY FRAMEWORK (NPPF), 2021

3.3.1. First published in 2012 and most recently revised in July 2021, the NPPF sets out the Government's planning policies for England and how these are expected to be applied. It replaces previous noise policy contained in Planning Policy Guidance Note 24. It does not replace the Noise Policy Statement for England 2010 to which it refers.

3.3.2. The NPPF is a concise document that provides its position on noise primarily in paragraph 185 which is reproduced below:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life[65];

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and

c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.

Footnote 65 See Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs, 2010)"

3.3.3. Paragraph 187 of the NPPF provides additional policy information applicable where new development is proposed close to existing commercial noise sources and is reproduced below.

"Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed."

NOISE POLICY STATEMENT FOR ENGLAND (NPSE), 2010

3.3.4. The NPSE provides more detail than the NPPF setting out the long-term vision of the Government noise policy and applying to all forms of noise excluding occupational noise. The NPSE repeatedly refers to the management and control of noise within the context of Government Policy on sustainable development.

3.3.5. The NPSE introduces and describes three categories, or levels, describing the presence or absence of noise effects but does not quantify those categories, stating that the corresponding objective levels are likely to be different for different noise sources, receptors and times of the day or night. These categories 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
- **SOAEL** – Significant Observed Adverse Effect Level – This is the level above which significant adverse effects on health and quality of life occur.

3.3.6. The NPSE recognised that, at the time of publication, further research was needed into how these categories might be quantified for different scenarios. There is still no robust, universally accepted method of deriving suitable values and a variety of approaches are adopted in different circumstances.

3.4 TECHNICAL GUIDANCE

BS 8233:2014 GUIDANCE ON SOUND INSULATION AND NOISE REDUCTION FOR BUILDINGS (BS 8233), 2014

3.4.1. The scope of BS 8233 is the provision of guidance for the control of noise in and around buildings. It suggests appropriate criteria for different situations, which primarily are intended to guide the design of new buildings, or refurbished buildings undergoing a change of use. The noise level criteria recommended in BS 8233 for residential spaces are based on the World Health Organisation Guidelines for Community Noise and are summarised in the table below.

Table 3-1 - Indoor ambient noise levels for dwellings (BS 8233 Table 4)

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

3.4.2. Note 7 to the above table states:

"Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved."

3.4.3. On design criteria for external noise, BS 8233 states that:

"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognised that these guideline values are not achievable in all circumstances where development might also be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited".

WORLD HEALTH ORGANISATION (WHO) GUIDELINES FOR COMMUNITY NOISE, 1999

3.4.4. The WHO guidelines consolidate scientific knowledge on the health effects of community noise and provide guidance to environmental health authorities and professionals trying to protect people from the harmful effects of noise in non-industrial environments. The main sources of community noise are identified as road, rail and air traffic, industries, construction and public work and neighbours.

3.4.5. A wide range of specific effects and environments are considered in the guidelines but a few that relate to this study are described below.

With regard to community noise, the guidelines state (in section 4.2.7) that annoyance "*varies with the type of activity producing the noise…..During the daytime, few people are seriously annoyed by activities with L_{Aeq} levels below 55 dB; or moderately annoyed with L_{Aeq} levels below 50 dB.*" The time base for these values, which relate to the daytime period, is 16 hours.

3.4.6. In dwellings, the critical effects of noise are on sleep, annoyance and speech interference. To avoid sleep disturbance "indoor guideline values for bedrooms are 30 dB L_{Aeq} for continuous noise and 45 dB L_{Amax} for single sound events".

PROFESSIONAL PRACTICE GUIDANCE ON PLANNING & NOISE: NEW RESIDENTIAL DEVELOPMENT (PROPG), 2017

3.4.7. The ProPG was produced by a Working Group consisting of representatives of the Association of Noise Consultants (ANC), Institute of Acoustics (IOA) and Chartered Institute of Environmental Health (CIEH), together with practitioners from a planning and local authority background, to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England.

3.4.8. The scope of the ProPG is limited to the consideration of new residential development that will be exposed predominantly to airborne noise from transport sources.

3.4.9. The ProPG aims to complement Government planning and noise policy and guidance, and in particular it strives to:

- *"advocate full consideration of the acoustic environment from the earliest possible stage of the development control process;*
- *encourage the process of good acoustic design in and around new residential developments;*
- *outline what should be taken into account in deciding planning applications for new noise-sensitive developments;*
- *improve understanding of how to determine the extent of potential noise impact and effect; and assist the delivery of sustainable development."*

Internal Spaces (habitable rooms)

3.4.10. In terms of noise criteria, the document references, and builds upon, those contained in BS 8233. The ProPG presents the internal noise level guidelines as set-out in Section 7.7.2 of BS 8233, but with elaborated guidance in the accompanying notes. The additional guidance from Note 4, Note 5 and Note 7 is provided below.

3.4.11. Note 4 proposes the WHO-based limit of 45 dB L_{AFmax}, with the following accompanying text:

"In most circumstances in noise-sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{Amax,F}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events (see Appendix A)."

3.4.12. Note 5 from BS 8233 has been rewritten in the ProPG as follows:

"Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded, subject to the further advice in Note 7."

3.4.13. The following is added to Note 7:

"The more often internal L_{Aeq} levels start to exceed the internal L_{Aeq} target levels by more than 5 dB, the more that most people are likely to regard them as "unreasonable". Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has

been kept to a minimum. Once internal L_{Aeq} levels exceed the target levels by more than 10 dB, they are highly likely to be regarded as "unacceptable" by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing "unacceptable" noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form (see Section 3.D)."

3.4.14. Key to note from the above, therefore, is that:

- the use of a limit of 45 dB L_{AFmax} (not to be exceeded by more than 10 individual events per night) is further supported;
- where there is a need to assess with windows closed, any façade openings used to provide whole dwelling ventilation should be assumed open; and
- where levels exceed the targets by more than 5 dB, they are likely to be regarded as "unreasonable", and "unacceptable" when more than 10 dB above.

ACOUSTICS, VENTILATION AND OVERHEATING: RESIDENTIAL DESIGN GUIDE (AVOG), 2020

3.4.15. The Acoustics, Ventilation and Overheating Guide (AVOG) (2020) recommends an approach to acoustic assessments for new residential development that takes due regard of the interdependence of provisions for acoustics, ventilation and overheating.

3.4.16. The AVOG provides a two-level noise assessment procedure to estimate the potential impact on occupants in the case of the overheating condition. The overheating condition, is where excessive or prolonged high-temperatures in homes, resulting from internal or external heat gains, may have adverse effects on the comfort, health or productivity of the occupants.

3.4.17. The AVOG includes a number of useful design principles, such as the following:

- 'good acoustic design' must include consideration of appropriate solutions to overheating conditions for new-build residential property;
- increasing levels of noise outside a proposed residential building will generally demand a greater level of assessment for noise effects during overheating conditions;
- consideration of noise inside a building during overheating conditions should include consideration for both noise generated outside the building, and by the ventilation solution itself (e.g. mechanical noise); and
- it is appropriate to apply higher noise criteria to habitable rooms during overheating conditions than for normal/typical conditions.

BS 4142:2014+A1:2019 METHODS FOR RATING AND ASSESSING INDUSTRIAL AND COMMERCIAL SOUND (BS 4142), 2019

3.4.18. BS 4142 describes methods for rating and assessing the following:

- sound from industrial and manufacturing processes;
- sound from fixed installations which comprise mechanical and electrical plant and equipment;
- sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and
- sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train movements on or around an industrial and/or commercial site.

3.4.19. The methods use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes and upon which sound is incident.

3.4.20. The Standard effectively compares and rates the difference between the specific sound level of the source ($L_{Aeq,T}$) and the typical background sound level ($L_{A90,T}$) in the absence of the specific sound. If appropriate, the specific sound level is corrected, by the application of one or more corrections for acoustic features such as tonal qualities and/or distinct impulses, to give a 'rating' level ($L_{Ar,Tr}$).

3.4.21. The Standard allows the following additive corrections for character: 0 dB to +6 dB for tonality and 0 dB to +9 dB for impulsivity. Where the specific sound features characteristics that are neither tonal nor impulsive, but otherwise are readily distinctive, a penalty of +3 dB can be applied. Finally, should the specific sound contain identifiable on/off conditions and so be readily distinctive, a penalty of +3 dB can be applied.

3.4.22. The Standard advises that the time interval of the background sound measurement should be sufficient to obtain a representative or typical value of the background sound level at the time(s) the source in question operates or is proposed to operate in the future. The specific sound level should be evaluated over a one hour period during the day and over a 15 minute period during the night.

3.4.23. Comparing the rating level with the background sound level, the Standard states:

"Typically, the greater this difference, the greater the magnitude of impact.

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

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

The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."

3.4.24. All pertinent contextual considerations should be taken into account including the following:

- The absolute level of the sound;
- The character and level of the residual sound compared to the character and level of the specific sound; and
- The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions.

4 BASELINE NOISE SURVEY

4.1 NOISE MEASUREMENT POSITIONS

4.1.1. A baseline noise survey has been undertaken at three locations on the proposed development site. The monitoring positions are identified in Figure 4-1 and are described in Table 4-1 below.

Table 4-1 - Noise Measurement Positions

Measurement Position	Date and time	Description
1 (LT1)	13:20 Thursday 14th July 2022 to 12:45 Thursday 21st July 2022	Located approximately 16m to the east of the West Anglia mainline at a height of 1.5m above local ground level.
2 (LT2)	12:30 Thursday 14th July 2022 to 12:30 Thursday 21st July 2022	Located in the north-west of the development site approximately 10m to the east of the boundary with the Tuplin site.
3 (LT3)	12:00 Thursday 14th July 2022 to 19:00 Thursday 14th July 2022[1]	Located on the northern boundary of the development site approximately 425m to the east of Old Mead Road.

4.1.2. The noise monitoring equipment used at LT3 was vandalised on site and, therefore, the intended monitoring period was not captured. Given it is not known when the meter itself was vandalised, data from this measurement position have not been used further in this assessment.

Figure 4-1 - Noise Measurement Location Plan

4.2 EQUIPMENT DETAILS

4.2.1. The details of the sound level meters and calibrators used to undertake the survey are presented in Appendix B.

4.2.2. The sound level meters were subject to field calibration tests prior to and on completion of each set of measurements using its field calibrator, with the exception of the meter at LT3 which was vandalised and could therefore not be calibrated upon completion. No significant drift occurred at either LT1 or LT2.

4.3 WEATHER

4.3.1. At the start of the survey, the weather was sunny with clear skies, no rain and little perceptible breeze. At the end of the survey, the weather was also dry and still. Historical data obtained from www.wunderground.com indicates that conditions were similar to these throughout the majority of the survey period. Wind conditions were generally no higher than 5 m/s. Consequently, data from the monitoring period are considered to be suitable for obtaining representative sound level measurements at the development site.

4.4 ENVIRONMENTAL NOISE CLIMATE

4.4.1. Subjectively the noise climate was dominated by distant road traffic noise from the M11, trains passing along the railway line and occasional aircraft taking off from Stansted Airport. Vehicles on smaller local roads affected the positions closer to the western boundary more significantly.

4.4.2. For LT2 which was located close to the Tuplin site to the north-west of the site, noise from vans and forklifts was also audible. It was noted that the Tuplin site was operational during weekdays only (Monday to Friday) between 08:00 and 16:30.

4.5 NOISE MEASUREMENT RESULTS

4.5.1. A summary of the time-averaged ambient and typical background noise levels for each daytime (07:00 – 23:00 hours) and night-time (23:00 – 07:00 hours) period, along with the typical maximum noise levels during the night-time, are presented in Table 4-3 to Table 4-5 for LT1, LT2 and LT3 respectively. The 'typical' L_{AFmax} values have been derived by determining the 90th percentile of the $L_{AFmax,\ 15min}$ values measured during each relevant night-time period. The typical background sound levels have been derived from the lowest most commonly occurring $L_{A90,15min}$ value during the daytime and night-time periods.

Table 4-2 - Summary of measured noise levels, LT1, dB

Date	Daytime		Night-time		
	$L_{Aeq,16h}$	$L_{A90,T}$	$L_{Aeq,8h}$	Typical L_{AFmax}	$L_{A90,T}$
Thursday 14/07/2022	58*	45*	53	79	37
Friday 15/07/2022	58	45	53	80	43
Saturday 16/07/2022	57	38	47	66	39
Sunday 17/07/2022	55	39	52	72	37
Monday 18/07/2022	56	42	51	72	34
Tuesday 19/07/2022	54	43	52	75	34
Wednesday 20/07/2022	57	47	54	80	36
Thursday 21/07/2022	58*	49*	-	-	
Average $L_{Aeq,T}$ (from full periods only)	56	-	52	-	-

* Part measurement period: see Table 4-1

Table 4-3 - Summary of measured noise levels, LT2, dB

Date	Daytime		Night-time		
	$L_{Aeq,16h}$	$L_{A90,T}$	$L_{Aeq,8h}$	Typical L_{AFmax}	$L_{A90,T}$
Thursday 14/07/2022	52*	50*	50	64	40
Friday 15/07/2022	51	50	48	63	42
Saturday 16/07/2022	46	38	40	59	35
Sunday 17/07/2022	45	39	44	60	37
Monday 18/07/2022	47	43	43	59	32
Tuesday 19/07/2022	48	44	45	57	36
Wednesday 20/07/2022	52	49	49	60	39
Thursday 21/07/2022	52*	49*	-	-	-
Average $L_{Aeq,T}$ (from full periods only)	48	-	46	-	-
* Part measurement period: see Table 4-1					

5 ASSESSMENT OF COMMERCIAL OPERATIONS

5.1.1. To determine whether the existing commercial operations associated with the Tuplin site will have an adverse impact on the residential development, in particular the units along the northern boundary, an assessment has been undertaken in line with BS 4142:2014+A1:2019.

5.1.2. The specific sound level for the Tuplin site, along with the distance between the site and the measurement position, are presented in Table 5-1 below. Two scenarios for the specific sound level have been identified. The typical scenario identifies a period of 15 minutes of high activity, within a one hour period (and in line with the day reference period in BS 4142). The worst case scenario assumes that the 15-minute period of high activity continues for the full duration of the one hour assessment period.

5.1.3. The distance to the closest residential unit is also presented as well as the corrected noise level for the site in operation, as predicted at the closest property.

5.1.4. An appropriate acoustic feature correction has been applied and added to the specific noise level to derive the rating level. This is based on the subjective method identified in Section 9 of BS 4142:2014+A1:2019.

5.1.5. The lowest typical background sound level has been adopted from Table 4-4 from weekday daytime periods only.

5.1.6. The difference between the rating level and background level has been calculated to determine whether the Tuplin site is likely to have a significant adverse impact on the development.

Table 5-1 - BS 4142 assessment of Tuplin site

Assessment	Typical Scenario	Worst case Scenario
Specific noise level ($L_{Aeq,15mins}$)	55 dB	55 dB
On-time correction to 1 hour reference period	-6 dB	0 dB
Specific noise level ($L_{Aeq,1h}$)	49 dB	55 dB
Acoustic feature correction - Tonality	+ 2 dB	+ 2 dB
Rating level ($L_{Ar,Tr}$)	51 dB	57 dB
Distance between source and measurement position	10 m	10 m
Distance to closest residential unit	150 m	150 m
Distance correction	- 12 dB	- 12 dB

Predicted rating level at closest residential unit ($L_{Aeq,T}$)	39 dB	45 dB
Background noise level ($L_{A90,T}$)	43 dB	43 dB
Excess of rating level over background noise level	-4 dB	+2 dB

5.1.7. Based on the values presented in Table 5-1, it can be seen that the rating level of the Tuplin site is below the background noise level for the typical scenario and 2 dB above background for the worst case scenario. Both of these scenarios indicate a low impact.

5.1.8. The contextual assessment should consider all pertinent factors before modifying the initial impact estimation accordingly. In this case the key contextual considerations are thought to be:

- **The absolute level of sound**. In this assessment the absolute level of the sound predicted is significantly below any of the design criteria set out in BS 8233 or any other relevant guidance or standards. This factor, therefore, detracts from the likelihood that a noise impact will result.

- **The character of the residual sound compared to the character of the specific sound.** The characteristics of the reversing alarms from forklifts, are not particularly similar to that of the prevailing noise environment which is dominated by road traffic noise. However, future residents will be aware of the existing use of the Tuplin site and, as such, any noise associated will form part of the existing noise climate.

- **Hours of operation.** The noisy activities only take place at the Tuplin site between 08:00 and 16:30 hours. Confirmation of the operational hours can be identified across the week in which the noise data were captured. It can be identified that there are no noisy activities prior to 0800 hours, after 1600 hours or during the weekends. This would support a downward modification to any estimated impact magnitude on the basis that it does not extend into the evening or night-time periods when residents will be more noise sensitive.

- **The established use of the site**. The Tuplin site is well established, and the noisy uses of the site will pre-date any occupancy of the development site. As such, future residents will come to the site with knowledge of Tuplin's existence and their expectations will be tempered accordingly. To ensure this, it is recommended that the first occupiers of the development are informed, during the purchase or tenancy initiation, of the potential for these noisy activities to take place at the Tuplin site. In terms of any potential nuisance complaints in the future, this will be particularly relevant and will confer the Tuplin site with a measure of protection against complaints.

- **Determination of the specific noise level.** The specific noise level has been determined from measurements made at LT2. A 15 minute period of activity has been determined from the measurements and corrected to the one hour reference period. Activity times on any given day are likely to vary depending on how busy the Tuplin site is. As the activity levels on the site could increase or decrease in comparison to those measured this factor would be neutral to the likelihood that a noise impact will result.

5.1.9. When the contextual considerations have been taken into account, the potential noise impacts inferred from the worst-case activities at the Tuplin site provide further confirmation that they are indicative of a '*low impact*'.

5.1.10. Uncertainties in all aspects of this assessment have been minimised as far as possible and their consideration is set out in more detail in Appendix C.

5.1.1. It should be noted that BS 4142 states that it is not intended to be used to assess the extent of the impact at indoor locations, nor the assessment of indoor sound levels. Therefore, an assessment of the indoor sound levels and the suitability of the site for residential development is presented in Section 6 taking into account the façade insulation treatment and acoustic screening.

6 SITE SUITABILITY ASSESSMENT

6.1 INTERNAL AND EXTERNAL NOISE CRITERIA

6.1.1. This section provides an assessment of the suitability of the site for residential use with respect to noise. The internal and external noise criteria, in line with the guidance set out in BS 8233 and UDC's Noise Assessment Technical Guidance note, are outlined in Table 6-1 below.

6.1.2. As the criteria in BS 8233 are for anonymous noise sources, which do not include industrial sources, the daytime internal and external criterion for those dwellings closest to Tuplin has been corrected by -2dB in line with the acoustic feature correction identified in the BS 4142 assessment to ensure that suitable internal noise levels are achieved.

Table 6-1 - Internal and external noise criteria for residential development

	Daytime	Night-time	
	$L_{Aeq,16h}$	$L_{Aeq,8h}$	Typical L_{AFmax}
Internal noise levels (in habitable rooms)	35 dB	30 dB	45 dB
Internal noise levels (in habitable rooms) – north-west boundary of the site	33 dB	30 dB	45 dB
External noise levels (in gardens)	55 dB	-	
External noise levels (in gardens) – north-west boundary of the site	53 dB		

6.2 EXTERNAL NOISE LEVELS AT THE BUILDING FAÇADE

3D NOISE MODEL

6.2.1. A 3D noise model was created using the software CadnaA (Datakustik, 2021 MR2) to evaluate the predicted environmental noise levels across the proposed development.

6.2.2. Existing topographical information was imported from open source 1 m LIDAR Digital Terrain Model data made available by the Department for Environment, Food & Rural Affairs (DEFRA). Existing building, road and rail information was sourced from open data (OS OpenMap - Local) made available by Ordnance Survey. Traffic data for the M11 and the local road network have been included in the noise model. These data have been provided by the transport consultant for the proposed development and are based on survey data collected in February 2022.

6.2.3. Noise associated with Stansted Airport has not been included in the noise model, as the overhead flights are considered not to affect the ambient $L_{Aeq,T}$ noise levels. This conclusion is supported as the site falls outside of the lowest daytime (51 dB $L_{Aeq,16h}$) and night-time (45 dB $L_{Aeq,8h}$) noise exposure contours, as presented in the Noise Exposure Contours for Stansted Airport 2021 report.

6.2.4. Standard buildings were set at a height of 8 m, reflectivity was set to 3 orders of reflection and default ground absorption set to 1.0, with localised hard surfaces added separately.

6.2.5. Where assessment locations within the model are placed at buildings, they are positioned 0.5m from the façade and do not account for the noise sensitive receptor building reflection within the results. The noise model predictions are, therefore, free-field specific sound levels, consistent with the survey measured sound levels.

6.2.6. The basic noise level ($L_{A10,18hour}$) for roads has been calculated based on the 18 hour AAWT in accordance with *'Calculation of Road traffic Noise'* (CRTN, 1988). Daytime ($L_{Aeq,16hour}$) and night-time ($L_{Aeq,8hour}$) noise levels have then been calculated at receptors based on the methodology provided for Method 3 in the Transport Research laboratory (TRL) document *'Converting the UK Traffic Noise Index $L_{A10,18h}$ to EU Noise Indices for Noise Mapping'*.

6.2.7. The noise model has been verified against the measured noise levels on site at the same locations. The predicted noise levels fall within the range of measured noise levels at each position, and within 1 dB of the average noise levels, and therefore is considered to accurately represent the existing noise levels across the site.

PREDICTED INCIDENT NOISE LEVELS

6.2.8. The daytime and night-time noise levels have been predicted across the site using the 3D noise model. The noise contour maps for the daytime (predicted at a height of 1.5m above ground level) and night (predicted at a height of 4m above ground level) are shown in Figure 5-1 and 5-2 respectively.

Figure 6-1 – Daytime Noise Contours

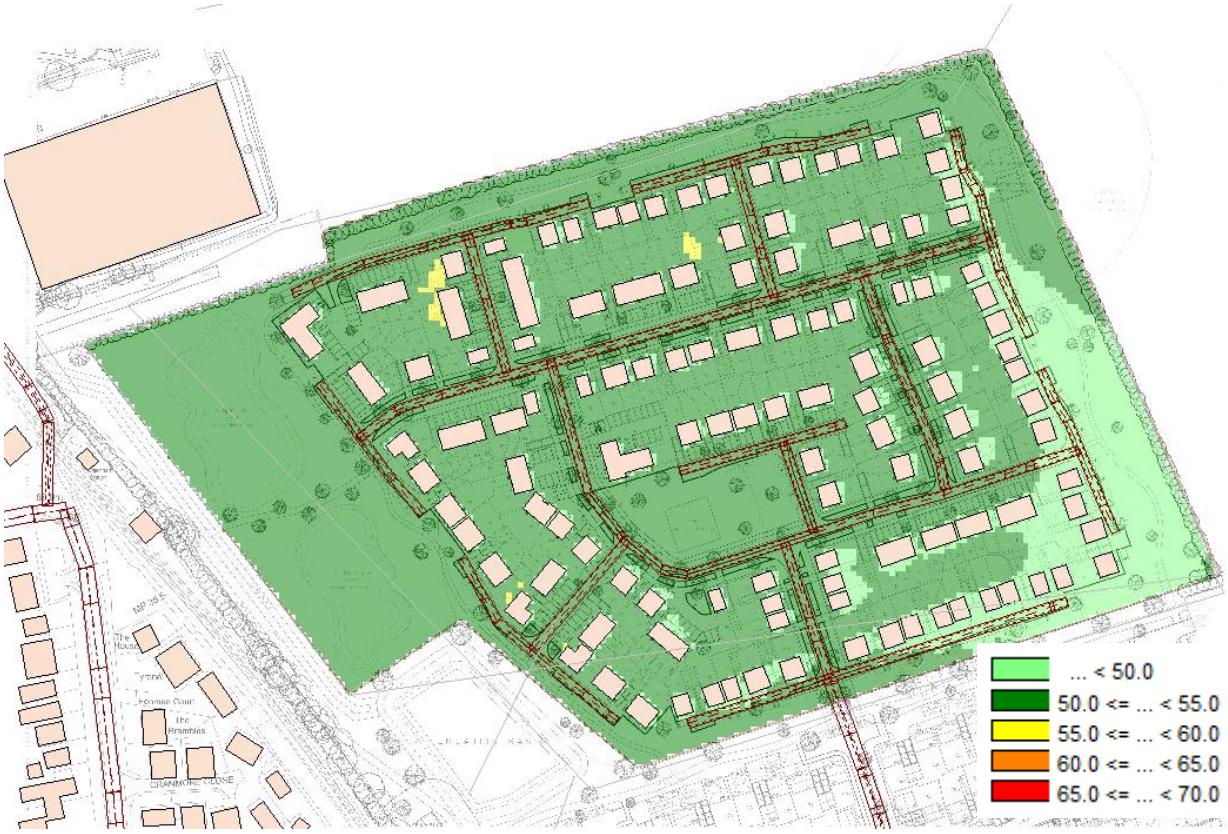
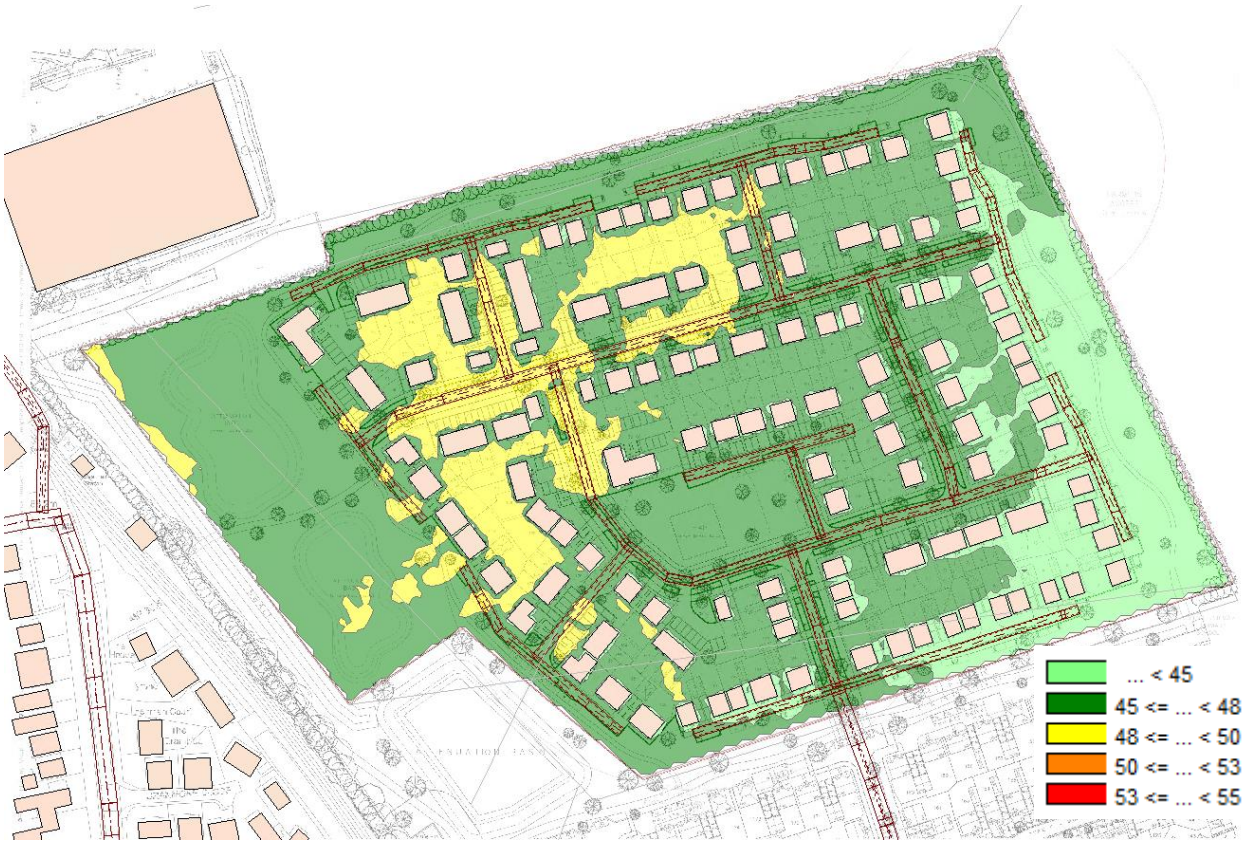


Figure 6-2 – Night-time Noise Contours



6.2.9. The typical maximum noise level along the western boundary of the site closest to the railway line has been adopted from LT1, and corrected for increased distance to the development build-line. A correction of -15 dB has been applied, as the measurement was undertaken at 16m from the railway line and the build-line is approximately 90m from the railway line.

6.2.10. For clarity, the free-field external noise levels used to determine the sound insulation performance of the façade are outlined in Table 5-2.

Table 6-2 - Noise levels for external building fabric assessment, dB

Facade	Daytime	Night-time	
	$L_{Aeq,16h}$	$L_{Aeq,8h}$	Typical L_{AFmax}
West facing (overlooking the railway)	55	48	65
North facing (overlooking Tuplin site)	53	48	65

6.3 EXTERNAL BUILDING FABRIC ASSESSMENT

6.3.1. This section presents specifications for the sound insulation of the building façade and recommendations for the ventilation requirements necessary to achieve the internal noise criteria as outlined in Table 6-1.

EXTERNAL FACADE

6.3.2. The detailed calculation methodology within BS 8233 sets out a procedure for determining the sound insulation performance of the façade based on the external noise levels and the internal noise criteria. The calculations have been based on the following assumptions:

- A typical room side of 3.5m x 3.5m x 2.8m;
- The glazed elements occupy 50% of the façade;
- The non-glazed elements of the façade achieve a sound insulation performance of 49 dB R_W+C_{tr};
- One vent per habitable room; and
- The reverberation time in habitable rooms has been assumed to be 0.5 seconds.

6.3.3. Based on the above assumptions, the minimum sound insulation performance for the glazing and ventilation units, as well as an indicative glazed unit and vent type, is set out in Table 6-3 below.

Table 6-3 – Sound insulation performance of glazing and vents, dB

Facade	Glazing	Vent
All of the site	29 dB R_W+C_{tr} (e.g. 4mm / 12mm airspace / 6mm glass)	29 dB $D_{new}+C_{tr}$ (e.g. Greenwood 8000HD trickle through-window vent)

PREVENTION OF OVERHEATING

6.3.4. While the exchange of air provided by the vents unit may assist in preventing dwellings from becoming stuffy and reduce the need to open windows, the air they provide is not cooled.

6.3.5. Approved Document Part F notes that *"Purge ventilation provisions may also be used to improve thermal comfort, although this not controlled under the Building Regulations."* It is expected that, if dwellings are to rely on open windows for cooling, the windows would need to be open for longer periods than would perhaps be typical for purge ventilation.

6.3.6. The UDC noise assessment technical guidance identifies a sound level difference for a partially open window of up to 15 dB from outside the window to inside.

6.3.7. BS 8233 and the ProPG states that a relaxation in the internal ambient noise level criteria of up to 5 dB would still result in 'reasonable' conditions being achieved.

6.3.8. Based on the predicted external noise levels as presented in Table 6-2, with a 15 dB reduction for a partially openable window, the internal criteria would be exceeded by up to 5 dB. Consequently, reasonable internal conditions can still be achieved with windows open, and no further assessment is considered necessary.

6.3.9. Whilst it is acknowledged that BS 8233 and the ProPG are not relevant for the assessment of industrial noise, given the lack of any suitable alternative guidance and that the industrial noise has been determined to be of low impact, the conclusion that reasonable internal conditions can be achieved is considered to remain.

6.4 EXTERNAL AMENITY SPACE ASSESSMENT

6.4.1. Based on the proposed site layout in Figure 1-2, all of the residential units will have a garden to provide private amenity space.

6.4.2. To prevent serious annoyance in outdoor living areas during the day and evening, it is desirable that the noise level should not exceed a free-field level of 55 dB $L_{Aeq,16h}$. However, it is noted in BS 8233 that this criterion is not always achievable in all circumstances and a development should be designed to achieve the lowest practicable levels in these external amenity spaces.

6.4.3. Based on the daytime noise contours as presented in Figure 6-1, it is anticipated the 55 dB $L_{Aeq,16h}$ external noise criterion would be achieved for all of the gardens across the site except for five in the north-west of the site. Those gardens that exceed the criterion do so by no more than 1 dB for a portion of the garden area, which is not considered to be significant in terms of noise impact. Several gardens in the south-east of the site will achieve the external noise level criterion of 50 dB $L_{Aeq,16hr}$.

7 CONCLUSIONS

7.1.1. WSP has been commissioned by Bloor Homes Ltd and Gillian Smith, John Robert Carmichael Smith, Robert Giles Russell Smith and Andrew James Smith (the Client) to undertake a noise survey and assessment for a proposed residential development at Elsenham.

7.1.2. A baseline noise survey has been conducted to establish the existing noise levels on the site. The results of the noise survey have been used in the assessment of ambient noise affecting the proposed development once built and occupied.

7.1.3. An assessment of commercial noise from Tuplin, to the north-west of the site, has been carried out in line with BS 4142:2014+A1:2019. The result of the assessment provided an indication of a low impact for the worst affected dwellings in the north-west corner of the proposed development.

7.1.4. Appropriate acoustic performance requirements for glazing and ventilation have been identified, to achieve the adopted internal noise criteria for the proposed residential dwellings. The minimum sound insultation performance requirements of the glazing and vents are:

- 29 dB R_W+C_{tr} for the glazed elements of the façade and 29 dB $D_{new}+C_{tr}$ for the vents

7.1.5. Further to the above, reasonable internal conditions can still be achieved in habitable rooms with windows open to manage overheating and the majority of gardens are expected to achieve the external noise criterion of 55 dB $L_{Aeq,16hr}$. A small number of gardens are expected to exceed the criterion by no more than 1 dB in a portion of the garden area which is not considered a significant in terms of noise impact. Several gardens in the south-east of the proposed development will achieve the 50 dB criterion $L_{Aeq,16hr}$. On this basis the site is considered suitable for residential development and will meet the objectives set out in UDC's Development Plan.

Appendix A

GLOSSARY OF ACOUSTIC TERMINOLOGY

ACOUSTIC TERMINOLOGY

Table A1: Acoustic Glossary

Terminology	Description
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 s_1 and s_2 is given by 20 $\log_{10}$ (s_1 / s_2). 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.
Façade	At a distance of 1m in front of a large sound reflecting object such as a building façade.

Fast/Slow Time Weighting	Averaging times used in sound level meters.
Fast/Slow Time Weighting	Averaging times used in sound level meters.

Appendix B

APPENDIX B - EQUIPMENT DETAILS

Table A2: Equipment Details

Equipment name Position	Equipment description	Manufacturer and type number	Serial number	Calibration due date
LT1	Sound level meter	01dB-Stell Duo 'Datalogging Integrating Sound Level Meter'	10594	13/04/2023
	Pre-amplifier	01dB-Stell PRE 21 S Preamplifier	1507076	
	Microphone	G.R.A.S Type 40CD Condenser Microphone	224313	
	Calibrator	01dB Cal 21	34924020	21/10/2022
LT2	Sound level meter	01dB-Stell Duo 'Datalogging Integrating Sound Level Meter'	10328	21/10/2023
	Pre-amplifier	01dB-Stell PRE 21 S Preamplifier	10233	
	Microphone	G.R.A.S Type 40CD Condenser Microphone	154531	
	Calibrator	01dB Cal 21	34134166	07/02/2023
LT3	Sound level meter	01 dB CUBE 'Integrating-Averaging Sound Level Meter'	10630	21/10/2023
	Pre-amplifier	Acoem PRE 22 Preamplifier	10184	
	Microphone	GRAS Type 40CD Condenser Microphone	288065	
	Calibrator	01dB-Metravib Cal 21	34344461	01/09/2022

Appendix C

APPENDIX B - UNCERTAINTY MATRIX

WSP UNCERTAINTY ASSESSMENT MATRIX

Uncertainty Control Measures	Applicable?	Adopted?/Comments
Measurement		
Only use in calibration Type/Class 1 equipment and check (and record) calibration level before and after measurements	✓	Yes
Take measurements using the time and frequency weighting specified by the relevant standard	✓	Yes
Make detailed notes, including details of the equipment, weather, survey positions (including approximate distances), contributing noise sources, presence of screening etc.	✓	Yes
Take photographs, and record survey locations	✓	Yes
Avoid standing waves/interference – listen for effects, take spatial average from several locations or conduct a sweep	✓	External Measurements only
Take measurements at different distances to establish propagation	✓	Yes, range of distances
Take measurements at different heights where relevant	×	N/A
Don't just measure at the "noisiest" parts of site, but establish how "quiet" it is, too, where relevant to the assessment	✓	Yes, range of locations
Measure under different operating conditions relevant to your assessment / adopt worst case if known	×	N/A
Measure more than one cycle/ event (ideally at least three)	×	N/A
Determine state of repair of any associated source, where relevant	×	N/A
Use a windshield and avoid windy conditions (i.e. gusts regularly exceeding 5 m/s)	✓	Yes
Avoid wet conditions (particularly in terms of rain on the windshield/mic and on neighbouring surfaces)	✓	Yes
Avoid electrical and electromagnetic interference (such as from power cables and radio transmitters)	✓	Yes
Avoid extreme temperatures – traffic conditions can be different in freezing conditions, whilst meters can overheat and fail in a case when in direct sunlight during the summer.	✓	Yes
Make measurements during different weather conditions (particularly relevant in terms of wind direction for sites affected by aircraft movements, but also for sites affected by other distant, but significant, sources of noise, in different directions	✓	Yes
Where only one source is dominant (such as a main road), as a minimum, measure during conditions favourable to propagation (i.e. when wind direction is within +/-45^{o} of the line between the source and receiver or during temperature inversion, such as on clear calm nights)	✓	Yes, development is upwind of dominant noise sources
Avoid tree/leaf (movement) sound where possible – ideally take measurements at comparable distance to receptor locations	✓	Some foliage close by, but not significant
Avoid dawn chorus sound where possible – ideally take measurements the same distance from trees and bushes as any receptors of interest	✓	No significant dawn chorus – monitoring locations representative of future residential receptors

Uncertainty Control Measures	Applicable?	Adopted?/Comments
Measurement continued/…		
Measure outside the receptor in question where possible; however, it is worst case typically to measure under free-field conditions and apply +3 dB correction to convert to "façade" where applicable – for most planning (new residential development) assessments, free-field is preferable	×	NA - new residential development
Where it is not possible to install a meter outside the receptor in question, install a meter elsewhere and undertake additional attended measurements, either outside the receptor or at a representative location (when not adequately covered by the installed meter)	×	NA - new residential development
Avoid atypical traffic conditions (such as during school holidays and road works – road traffic incidents can significantly affect flows, but which can't be predicted, and their occurrence can't always be established after the survey – check the data for anomalies)	✓	Yes
Avoid presence of you and/or the microphone resulting in atypical conditions.	✓	Yes
Data handling		
Download data immediately after survey and process promptly whilst details are fresh in your head	✓	Yes
Use digital transfer methods and double check data read-off manually	✓	Yes
Look at the time-history (in as fine a resolution as possible) for any unexpected events – preferably with active spectral data (i.e. in dBTRAIT)	✓	Yes
If removing any data (due to an atypical event, for example), 'save as' a new file and provide a note to the data.	✓	Yes
Prediction		
Use measurement data at different distances to verify propagation	✓	Yes
Different height measurements to verify screening effects, if relevant	✓	Not relevant
Use propagation calculation procedure relevant to source and distance	✓	Yes
Use detailed traffic flow data applicable to the methodology	✓	Yes – and verified against monitoring data
Use detailed sound source data (including octave-bands levels), accounting for size, height and directivity, where known	✓	Yes
Use detailed topographical data and base mapping	✓	Yes

Uncertainty Control Measures	Applicable?	Adopted?/Comments
Identify different ground types	✓	Yes, differing ground conditions used
Apply an order of reflections of at least one	✓	Yes
Use 3D view feature to check model accuracy of the model	✓	Yes
Produce contour plots as a further means of identifying any abnormalities or errors in the model	✓	Yes

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