



**Proposed Residential Development,  
Stonegate/Moulton Chapel Road, Cowbit**

**Noise Assessment Report**

**Doc Ref: 03091-110100**

**04/05/2017**

**On behalf of**  
Mr Paul Smith

**Prepared by**  
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## 1.0 INTRODUCTION

- 1.1 Blue Tree Acoustics has been appointed by Mr Paul Smith to carry out a noise assessment for a proposed residential development on Stonegate/Moulton Chapel Road, Cowbit, near Spalding.
- 1.2 The development site is situated west of the A16, near the roundabout junction with B1357 Stonegate on the eastern periphery of Cowbit, and currently comprises open agricultural land. The A16 is a busy traffic route during daytime, with regular passing vehicles at night. Stonegate is more sparsely trafficked, providing local access to Cowbit.
- 1.3 The development proposal is to construct new residential properties on the site, with new access road from Stonegate.
- 1.4 The surrounding area is a mixture of residential and agricultural farmland.
- 1.5 This noise impact assessment includes:
  - i) Inspection of the site and surroundings.
  - ii) Evaluation of the site in accordance with relevant planning policy guidance.
  - iii) Consideration of noise control measures required to maintain acceptable noise levels within the proposed bedrooms and living rooms in accordance with *British Standard 8233: 2014, 'Guidance on sound insulation and noise reduction for buildings'* (BS8233) and relevant Local Authority guidance.

## 2.0 NOISE SURVEY

- 2.1 Noise monitoring was undertaken by Blue Tree Acoustics in order to determine the existing ambient noise climate at the site. Measurements were taken during representative daytime and nighttime survey periods on Tuesday 18<sup>th</sup> and Wednesday 19<sup>th</sup> April 2017.
- 2.2 During the measurement periods, local and distant road traffic from the A16 was the dominant noise source at the development site.
- 2.3 Noise measurements were carried out using 1no Rion NA28 Type 1/Class 1 Integrating Sound Level Meter. The sound level meter was mounted on a tripod at approximately 1.5m height from local ground level, and a proprietary windshield was fitted to the microphone. Calibration checks were carried out both before and after the measurements, with no variance observed. The sound level meter was within a period of laboratory calibration. Weather conditions during the noise surveys were dry and calm with wind speeds <5m/s. Data from a nearby weather station is shown in Appendix III.
- 2.4 The measurement results are detailed in Appendix II and summarised in the following tables to show the range of noise levels recorded at the measurement locations on the development site.

**Table 1: Measured Free-field External Noise Levels at Location 1**

| Period               | dB L <sub>Aeq,15min</sub> | dB L <sub>Amax,15min</sub> | dB L <sub>A10,15min</sub> | dB L <sub>A90,15min</sub> |
|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|
| Day Range            | 57 - 61                   | 67 - 80                    | 60 - 64                   | 50 - 54                   |
| <i>Day Average</i>   | 59                        | 72                         | 61                        | 52                        |
| Night Range          | 54 - 55                   | 65 - 67                    | 57 - 58                   | 45 - 48                   |
| <i>Night Average</i> | 55                        | 66                         | 58                        | 46                        |

**Table 2: Measured Free-field External Noise Levels at Location 2**

| Period               | dB L <sub>Aeq,15min</sub> | dB L <sub>Amax,15min</sub> | dB L <sub>A10,15min</sub> | dB L <sub>A90,15min</sub> |
|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|
| Day Range            | 57 - 59                   | 68 - 77                    | 60 - 62                   | 50 - 53                   |
| <i>Day Average</i>   | 58                        | 73                         | 61                        | 52                        |
| Night Range          | 51 - 52                   | 62 - 67                    | 55 - 56                   | 41 - 44                   |
| <i>Night Average</i> | 52                        | 64                         | 55                        | 43                        |

**Table 3: Measured Free-field External Noise Levels at Location 3**

| <b>Period</b>        | <b>dB L<sub>Aeq,15min</sub></b> | <b>dB L<sub>Amax,15min</sub></b> | <b>dB L<sub>A10,15min</sub></b> | <b>dB L<sub>A90,15min</sub></b> |
|----------------------|---------------------------------|----------------------------------|---------------------------------|---------------------------------|
| Day Range            | 57 - 58                         | 66 - 78                          | 59 - 60                         | 54 - 55                         |
| <i>Day Average</i>   | 58                              | 72                               | 59                              | 55                              |
| Night Range          | 52 - 54                         | 62 - 66                          | 55 - 57                         | 39 - 48                         |
| <i>Night Average</i> | 53                              | 63                               | 56                              | 43                              |

**Table 4: Measured Free-field External Noise Levels at Location 4**

| <b>Period</b>        | <b>dB L<sub>Aeq,15min</sub></b> | <b>dB L<sub>Amax,15min</sub></b> | <b>dB L<sub>A10,15min</sub></b> | <b>dB L<sub>A90,15min</sub></b> |
|----------------------|---------------------------------|----------------------------------|---------------------------------|---------------------------------|
| Day Range            | 59 - 60                         | 71 - 75                          | 61 - 62                         | 54 - 57                         |
| <i>Day Average</i>   | 60                              | 73                               | 62                              | 56                              |
| Night Range          | 54 - 55                         | 63                               | 58 - 59                         | 42 - 45                         |
| <i>Night Average</i> | 55                              | 63                               | 58                              | 43                              |

### 3.0 NOISE ASSESSMENT

- 3.1 The National Planning Policy Framework came into force in 2012. This document replaced a great many planning guidance documents that previously informed the planning system in England. The new framework states that:

*The planning system should contribute to and enhance the natural and local environment by:*

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

*Planning policies and decisions should aim to:*

- *avoid noise from giving rise to significant adverse impacts<sup>27</sup> on health and quality of life as a result of new development;*
  - *mitigate and reduce to a minimum other adverse impacts<sup>27</sup> on health and quality of life arising from noise from new development, including through the use of conditions;*
  - *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established;<sup>28</sup>*
- and*
- *identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.*

<sup>27</sup> See Explanatory Note to the Noise Policy Statement for England (Department for the Environment, Food and Rural Affairs).

<sup>28</sup> Subject to the provisions of the Environmental Protection Act 1990 and other relevant law.

3.2 In addition, the Noise Policy Statement for England (NPSE) states:

#### **Noise Policy Vision**

**Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.**

#### **Noise Policy Aims**

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

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

#### **Guiding principles of sustainable development**

**Ensuring a Strong Healthy and Just Society** – Meeting the diverse needs of all people in existing and future communities, promoting personal wellbeing, social cohesion and inclusion, and creating equal opportunity for all.

**Using Sound Science Responsibly** – Ensuring policy is developed and implemented on the basis of strong scientific evidence, whilst taking into account scientific uncertainty (through the precautionary principle) as well as public attitudes and values.

**Living Within Environmental Limits** – Respecting the limits of the planet's environment, resources and biodiversity – to improve our environment and ensure that the natural resources needed for life are unimpaired and remain so for future generations.

**Achieving a Sustainable Economy** – Building a strong, stable and sustainable economy which provides prosperity and opportunities for all, and in which environmental and social costs fall on those who impose them (polluter pays), and efficient resource use is incentivised.

**Promoting Good Governance** – Actively promoting effective, participative systems of governance in all levels of society – engaging people's creativity, energy and diversity.

Source: Securing the future – delivering UK sustainable development strategy, HM Government, March 2005.

### 3.3 The Noise Policy Statement for England Explanatory note states that:

*Noise is an inevitable consequence of a mature and vibrant society. For some the noise of city life provides a desirable sense of excitement and exhilaration, but for others noise is an unwanted intrusion that adversely impacts on their quality of life, affecting their health and well being.*

*The management of noise has developed over many years as the types and character of noise sources have altered and as people's attitude to noise has changed. The Noise Abatement Act came into law in 1960 and the Report from the Committee on the Problem of Noise was published in 1963 (the Wilson report). Since then, examples of noise management can be found in many areas including reducing noise at source; the use of the land use and transport planning systems, compensation measures, the statutory nuisance and licensing regimes and other related legislation.*

*Furthermore, the broad aim of noise management has been to separate noise sources from sensitive noise receivers and to 'minimise' noise. Of course, taken in isolation and to a literal extreme, noise minimisation would mean no noise at all. In reality, although it has not always been stated, the aim has tended to be to minimise noise as far as reasonably practical. This concept can be found in the Environmental Protection Act 1990, where, in some circumstances, there is a defence of 'best practicable means' in summary statutory nuisance proceedings.*

*By describing clear policy vision and aims the NPSE provides the necessary clarity and direction to enable decisions to be made regarding what is an acceptable noise burden to place on society.*

*The intention is that the NPSE should apply to all types of noise apart from noise in the workplace (occupational noise). For the purposes of the NPSE, "noise" includes:*

- *"environmental noise" which includes noise from transportation sources;*
- *"neighbour noise" which includes noise from inside and outside people's homes;*

*And*

- *"neighbourhood noise" which includes noise arising from within the community such as industrial and entertainment premises, trade and business premises, construction sites and noise in the street.*

*The application of the NPSE should mean that noise is properly taken into account at the appropriate time. In the past, the opportunity for the cost effective management of noise has often been missed because the noise implications of a particular policy, development or other activity have not been considered at an early enough stage.*

*In addition, the application of the NPSE should enable noise to be considered alongside other relevant issues and not to be considered in isolation. In the past, the wider benefits of a particular policy, development or other activity may not have been given adequate weight when assessing the noise implications.*

*In the longer term, the Government hopes that existing policies could be reviewed (on a prioritised basis), and revised if necessary, so that the policies and any noise management measures being adopted accord with the vision, aims and principles of the NPSE.*

*Noise management is a complex issue and at times requires complex solutions. Unlike air quality, there are currently no European or national noise limits which have to be met, although there can be specific local limits for specific developments. Furthermore, sound only becomes noise (often defined as 'unwanted sound') when it exists in the wrong place or at the wrong time such that it causes or contributes to some harmful or otherwise unwanted effect, like annoyance or sleep disturbance. Unlike many other pollutants, noise pollution depends not just on the physical aspects of the sound itself, but also the human reaction to it. Consequently, the NPSE provides a clear description of desired outcome from the noise management of a particular situation.*

*The guiding principles of Government policy on sustainable development should be used to assist in its implementation. The development of further principles specifically to underpin implementation of noise management policy will be kept under review as experience is gained from the application of the NPSE.*

*There are several key phrases within the NPSE vision and these are discussed below.*

**Health and quality of life**

*The World Health Organisation defines health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity, and recognises the enjoyment of the highest attainable standard of health as one of the fundamental rights of every human being.*

*It can be argued that quality of life contributes to our standard of health. However, in the NPSE it has been decided to make a distinction between 'quality of life' which is a subjective measure that refers to people's emotional, social and physical well being and 'health' which refers to physical and mental well being.*

*It is recognised that noise exposure can cause annoyance and sleep disturbance both of which impact on quality of life. It is also agreed by many experts that annoyance and sleep disturbance can give rise to adverse health effects. The distinction that has been made between 'quality of life' effects and 'health' effects recognises that there is emerging evidence that long term exposure to some types of transport noise can additionally cause an increased risk of direct health effects. The Government intends to keep research on the health effects of long term exposure to noise under review in accordance with the principles of the NPSE.*

**Promote good health and good quality of life**

*This statement expresses the long term desired policy outcome, but in the use of 'promote' and 'good' recognises that it is not possible to have a single objective noise-based measure that is mandatory and applicable to all sources of noise in all situations.*

**Effective management of noise**

*This concept confirms that the policy applies to all types of 'noise' (environmental, neighbour and neighbourhood) and that the solution could be more than simply minimising the noise.*

**Within the context of Government policy on sustainable development**

*Sustainable development is a core principle underpinning all government policy. For the UK Government the goal of sustainable development is being pursued in an integrated way through a sustainable, innovative and productive economy that delivers high levels of employment and a*

*just society that promotes social inclusion, sustainable communities and personal wellbeing. The goal is pursued in ways that protect and enhance the physical and natural environment, and that use resources and energy as efficiently as possible.*

*There is a need to integrate consideration of the economic and social benefit of the activity or policy under examination with proper consideration of the adverse environmental effects, including the impact of noise on health and quality of life. This should avoid noise being treated in isolation in any particular situation, i.e. not focussing solely on the noise impact without taking into account other related factors.*

*There are several key phrases within the NPSE aims and these are discussed below.*

#### ***“Significant adverse” and “adverse”***

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

#### ***NOEL . No Observed Effect Level***

*This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.*

#### ***LOAEL . Lowest Observed Adverse Effect Level***

*This is the level above which adverse effects on health and quality of life can be detected.*

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

#### ***SOAEL . Significant Observed Adverse Effect Level***

*This is the level above which significant adverse effects on health and quality of life occur.*

*It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different*

*for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available.*

### ***The first aim of the Noise Policy Statement for England***

*Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.*

*The first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided while also taking into account the guiding principles of sustainable development.*

### ***The second aim of the Noise Policy Statement for England***

*Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.*

*The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur.*

### ***The third aim of the Noise Policy Statement for England***

*Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.*

*This aim seeks, where possible, positively to improve health and quality of life through the proactive management of noise while also taking into account the guiding principles of sustainable development, recognising that there will be opportunities for such measures to be taken and that*

*they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim.*

- 3.4 Unfortunately, the above guidance gives no objective, tangible standards or criteria that enable planning decisions to be made. In the absence of such guidance, quantification of noise impact in terms of guidance such as BS8233, which presents noise limits and criteria based on World Health Organisation recommendations, can be considered as appropriately assessing the potential noise impact with regard to toxicology concepts and hence in line with the principles of the NPPF and NPSE. Therefore, if a site meets the recommendations of BS8233 and any associated Local Authority noise requirements, it can be considered as being below the level where there is no detectable adverse effect on health and quality of life due to noise, and this meets the NOEL (No Observed Effect Level) set out in the NPSE.
- 3.5 *British Standard 8233: 2014, 'Guidance on sound insulation and noise reduction for buildings'* (BS8233:2014) provides information on the design of internal acoustics in buildings. It deals with control of noise from outside the building, noise from plant and services within it, and room acoustics for non-critical situations.
- 3.6 BS8233:2014 provides guidance regarding indoor ambient noise criteria for residential accommodation, as presented below.

**Table 5: BS8233:2014 Guidance Criteria for Indoor Ambient Noise Levels**

| Activity                   | Location         | 0700-2300 hours                  | 2300-0700 hours                  |
|----------------------------|------------------|----------------------------------|----------------------------------|
| Resting                    | Living rooms     | 35 dB L <sub>Aeq</sub> (16 hour) | -                                |
| Dining                     | Dining room/area | 40 dB L <sub>Aeq</sub> (16 hour) | -                                |
| Sleeping (daytime resting) | Bedroom          | 35 dB L <sub>Aeq</sub> (16 hour) | 30 dB L <sub>Aeq</sub> (8 hour), |

- 3.7 BS8233:2014 does not stipulate any criteria for maximum noise levels within rooms in terms of dB L<sub>Amax</sub>, but does state that, "*Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or L<sub>Amax,F</sub>, depending on the character and number of events per night. Sporadic noise events could require separate values.*"

- 3.8 It is noted that BS8233:2014 also states that, where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5dB and reasonable internal conditions still achieved.
- 3.9 In addition, the BS8233:2014 guidance relating to gardens makes reference to external noise levels in gardens and balconies, etc., as follows:

*For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 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 recognized that these guideline values are not achievable in all circumstances where development might 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.*

*Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB  $L_{Aeq,T}$  or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space.*

- 3.10 The following noise mitigation section is based on achieving the BS8233:2014 noise level criteria set out above. Noise ingress calculations have been carried out in accordance with BS8233:2014. It should be noted that calculations to limit noise ingress are based on the typical noise events occurring at the site during the survey periods. However, it must be acknowledged that there will always remain potential for atypical events, such as emergency sirens,

police/ambulance helicopter, temporary works, etc., that could result in elevated noise levels within habitable rooms.

## 4.0 NOISE MITIGATION MEASURES

- 4.1 There are a variety of proportionate and reasonable techniques that could be introduced to mitigate the effects of noise, such as:
- **Engineering:** reduction of noise at source (e.g. use of quiet machinery and working methods), containment of generated noise, and protection of noise-sensitive buildings (e.g. by sound insulation and/or screening them by purpose-built barriers);
  - **Layout:** adequate distance between source and noise-sensitive building; screening by natural barriers, other buildings or non-critical rooms in a building;
  - **Administrative:** limiting operating time of source, restricting activities on site, specifying an acceptable noise limit.
- 4.2 An indicative layout for the proposed development is presented in Figure 2. The potential dwelling locations most exposed to traffic noise will be those along the eastern site boundary, toward the A16. The site layout helps reduce traffic noise impact by providing areas of open space along the eastern boundary that increase separation distance from the A16 traffic. The plots situated more toward the western boundary of the development site will benefit from acoustic screening and scattering of the A16 traffic noise provided by the intervening plots situated nearer to the eastern site boundary.
- 4.3 The existing daytime noise levels are around 58-59dB  $L_{Aeq}$  at the proposed new house locations, which is around 3-4dB above the BS8233:2014 desirable upper guideline value of 55dB  $L_{Aeq}$ . As referenced in Paragraph 3.9 above, BS8233:2014 acknowledges that the guideline values may not be achievable in all circumstances and a compromise can be warranted. For this site, the margin of excess above the 55dB  $L_{Aeq}$  guideline would not be considered particularly large, given that an increase in road traffic noise of 3dB(A) is generally regarded as being just noticeable. It is also feasible that standard close-boarded (as opposed to 'hit-and-miss') fencing could be provided to private garden areas, which could provide some useful reduction in traffic noise, e.g. potentially up to 3dB(A). Notwithstanding the above, if it is desired to reduce noise levels in gardens to meet the 55dB  $L_{Aeq}$  upper guideline value of BS8233:2014, then provision of acoustic fencing of minimum 2m height to protect gardens along the eastern and southern site boundaries will be necessary. The precise position of acoustic fencing shall be reviewed in the developing design, but outline barrier locations are indicated in Figure 2, based on the currently proposed layout.

- 4.4 Acoustic fencing should be constructed of solid, weather-treated timber (or ply) of minimum 18mm thickness. All joints should be tight-buttet with timber cover strips or tongue and groove boards to ensure that there are no air gaps in the structure or between the base of the fence and the ground beneath. Alternatively, if desired, acoustic barriers can be created from almost any solid material that can be made impermeable to air; for example, the barrier could be constructed from masonry, concrete, plastic, timber panels, etc.

### **Dwelling Protection**

- 4.5 The design of the building envelope of the new dwellings can incorporate suitable sound insulation to satisfy the internal noise criteria set out above. Noise ingress calculations have been carried out in accordance with BS8233:2014 in order to determine appropriate sound insulation measures to satisfy the acoustic criteria set out above. Based on the noise ingress calculations, the following sound insulation measures are recommended. As there are no detailed plans available at this stage, calculations are based on standard room and window sizes.
- 4.6 All new housing should be of masonry construction, e.g. external walls comprising insulated cavity with blockwork inner leaf and external brick leaf.
- 4.7 Roof constructions should be tiled, with ceilings to rooms below comprising a minimum of 1no layer of solid gypsum-based board (total minimum mass per unit area 10kg/m<sup>2</sup>), overlaid with minimum 200mm insulation wool. Any proposed rooms in the roofspace should be designed to have suitable internal linings to achieve the required sound insulation, e.g. equivalent to the external masonry wall.
- 4.8 All windows to noise-sensitive habitable rooms should have a minimum double glazing of 4mm glass/min 12mm airgap/6mm glass (typically minimum sound insulation 33dB  $R_w$ ). For such acoustically rated windows, the required acoustic performance should be attained by the glazing system as a whole, including frames, opening lights, etc.
- 4.9 Ground floor living rooms and dining rooms may be provided with ventilators with minimum sound insulation performance of 33dB  $D_{n,e,w}$ , which is achievable by various window slot vents. Bedrooms, or other habitable rooms, at 1<sup>st</sup> floor level and above should be provided with acoustic ventilators with minimum sound insulation performance of 37dB  $D_{n,e,w}$ , such as Greenwood

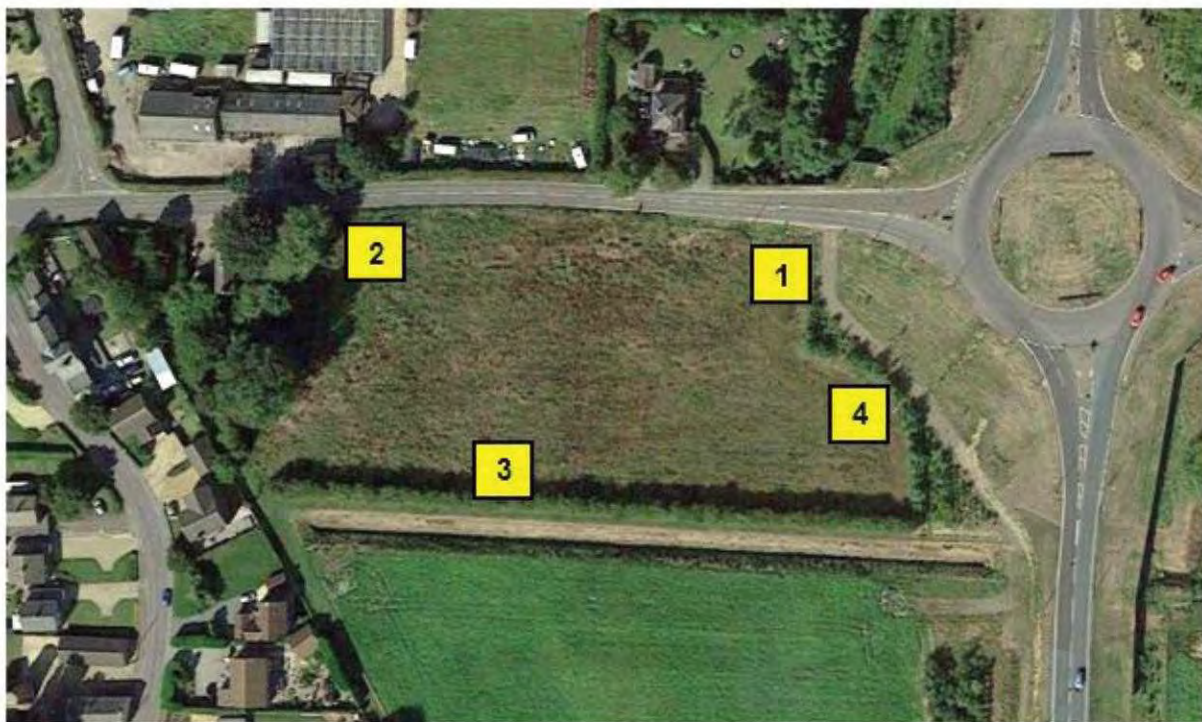
1600DN or Titon C50. Alternatively, a ducted ventilation system (e.g. whole house type) could be implemented, or it may be possible to design a continuous running MEV/MVHR fan system with no requirement for ventilation openings in window frames or external walls into habitable rooms on building elevations directly exposed to noise sources. It should also be ensured that internally generated noise from new mechanical services are designed to be suitably quiet within the new dwellings. CIBSE guidance suggests Noise Rating (NR) of NR25 is appropriate for bedrooms, and NR30 for living rooms. These criteria can be considered appropriate for the proposed development and separate to the BS8233 targets stipulated above for external noise sources.

- 4.10 Glazing and ventilators to non-habitable rooms or spaces do not require special acoustic measures, and these spaces may have standard trickle ventilation. For the purposes of noise assessment, separate kitchens, bathrooms, WCs, etc., are considered as non-habitable spaces.
- 4.11 The specifications given above are suitable recommendations and should be verified during the detailed building design. Equivalent acoustic performance may be achieved by other materials or products, but acoustic performance data for all proposed systems should be checked by a competent acoustic consultant in order to ensure adequate acoustic performance will be achieved.
- 4.12 It should be acknowledged that careful design and close attention to detail, along with high standards of site supervision and workmanship, are essential in achieving the required acoustic performance, particularly in relation to controlling flanking sound transmission paths, air gaps, and use of suitable materials. Therefore, effective work management plans will be needed to ensure all contractors and tradesmen are aware of the acoustic performance requirements and details to ensure works are implemented to the necessary standard.
- 4.13 All recommendations given above are for acoustic purposes only. Any other requirements, such as structural, thermal, fire safety, etc., should be checked by suitably qualified specialists.

## **5.0 SUMMARY AND CONCLUSIONS**

- 5.1 A noise assessment has been carried out on behalf of Mr Paul Smith for a proposed residential development on land off Stonegate/Moulton Chapel Road, Cowbit.
- 5.2 The assessment has included measurements of the prevailing ambient noise levels at the site during daytime and nighttime.
- 5.3 The A16 road traffic was found to be the dominant noise source impacting upon the site during the day and night.
- 5.4 The suitability of the noise climate at the site for residential development has been assessed. The assessment has been undertaken in accordance with the National Planning Policy Framework (NPPF) and the Noise Policy Statement for England (NPSE). Noise assessment and design targets for internal and external noise levels recommended in BS8233:2014 have been used to quantify noise impact and determine suitability for residential development with due regard to effects on health and quality of life as set out in the NPSE.
- 5.5 Outline noise control measures have been recommended in order to meet suitable noise level criteria for the proposed residential development.
- 5.6 We conclude that the site can be considered suitable for residential development in planning and noise terms, as acceptable noise levels can be achieved following the design and implementation of suitably specified noise mitigation measures. On this basis, we consider that the noise assessment methodology and conclusions meet the principles set out in the NPPF and NPSE.

**FIGURE 1 – SITE AERIAL VIEW & APPROXIMATE MEASUREMENT LOCATIONS**



**FIGURE 2 – INDICATIVE SITE LAYOUT**



## APPENDIX I – NOISE UNITS AND INDICES

### a) Sound Pressure Level and the decibel (dB)

A sound wave is a small fluctuation of pressure in air. The human ear responds to these variations in pressure, producing the sensation of hearing. The ear can detect a very wide range of pressure variations. Due to the wide range of pressure variations detectable by the ear, a logarithmic scale is used to convert the values into manageable numbers. The dB (decibel) is the logarithmic unit used to describe sound (or noise) levels. The usual range of sound pressure levels is from 0 dB (threshold of hearing) to 120 dB (threshold of pain).

### b) Frequency and Hertz (Hz)

Frequency is a measure of the rate of fluctuation of a sound wave. The unit used is cycles per second, or Hertz (Hz). Sometimes large frequencies are often written as kilohertz (kHz), where 1kHz = 1000Hz.

Young people with normal hearing can hear frequencies in the range 20Hz to 20kHz. However, the upper frequency limit gradually reduces as a person gets older.

As the ear hears some frequencies better than others, the A-weighting scale is used to mimic human hearing. A-weighting applies a correction to the sound level at a given frequency depending on how well the ear hears that frequency.

### c) Glossary of Terms

In order to describe noise where the level is continuously varying, a number of other indices, including statistical parameters, are used. The indices used in this report are described below.

**L<sub>Aeq</sub>** This is the A-weighted equivalent continuous sound level which is an average of the total sound energy measured over a specified time period. In other words, L<sub>Aeq</sub> is the level of a continuous noise which has the same total (A-weighted) energy as the real fluctuating noise, measured over the same time period.

**L<sub>Amax</sub>** This is the maximum A-weighted sound level that was recorded during the monitoring period.

- $L_{A90}$  This is the A-weighted sound level exceeded for 90% of the time period.  $L_{A90}$  is used as a measure of background noise.
- $L_{A10}$  This is the A-weighted sound level exceeded for 10% of the time period and is often used in the assessment of road traffic noise.
- NR Measured noise levels in each octave band are compared to the NR curve reference values. The overall NR value is the lowest NR curve that has not been exceeded.
- $D_{nT,w}$  Weighted standardised level difference, a single figure generated by comparing the  $D_{nT}$  with a reference curve. The reference curve is shifted in 1dB steps until the sum of adverse deviation of the test curve, compared to the reference curve, is as large as possible, but no more than 32.0 dB. The value of the shifted reference curve at 500Hz is taken as the  $D_{nT,w}$ . N.B. As  $D_{nT,w}$  for airborne transmission represents a level difference, an improvement generates a larger figure – used in airborne tests.
- $R_w$  Similar to the  $D_{nT,w}$  term, but a measure of the airborne sound insulation performance of a separating element, when tested in laboratory conditions. As such the build is essentially perfect, and has no flanking noise routes.  $D_{nT,w}$  values measured on site will always be of a significantly lower value than the  $R_w$  value for a structure.

## APPENDIX II – NOISE SURVEY DATA

Measurement locations described as 'free-field' were suitably distant from acoustically reflecting surfaces and structures, other than the ground, to minimise the influence of reflections.

### Location 1 – Northeast Site Boundary Stonegate/A16 Roundabout

Rion NA-28 sound level meter, all values dB(A), 15-minute duration, free-field

| Date       | Time  | L <sub>Aeq</sub> | L <sub>Amax</sub> | L <sub>A10</sub> | L <sub>A90</sub> |
|------------|-------|------------------|-------------------|------------------|------------------|
| 18/04/2017 | 14:33 | 61.3             | 80.4              | 64.2             | 49.8             |
| 18/04/2017 | 15:27 | 56.9             | 68.0              | 59.6             | 52.6             |
| 18/04/2017 | 16:19 | 57.6             | 67.2              | 60.4             | 53.5             |
| 18/04/2017 | 17:41 | 59.0             | 73.5              | 62.2             | 53.6             |
| 18/04/2017 | 18:51 | 57.5             | 70.5              | 60.7             | 51.1             |
| 18/04/2017 | 23:00 | 55.4             | 65.1              | 58.1             | 47.9             |
| 19/04/2017 | 00:09 | 54.6             | 66.5              | 57.9             | 45.1             |
| 19/04/2017 | 01:16 | 54.0             | 65.1              | 57.1             | 46.3             |

### Location 2 – Northwest Site Boundary Stonegate

Rion NA-28 sound level meter, all values dB(A), 15-minute duration, free-field

| Date       | Time  | L <sub>Aeq</sub> | L <sub>Amax</sub> | L <sub>A10</sub> | L <sub>A90</sub> |
|------------|-------|------------------|-------------------|------------------|------------------|
| 18/04/2017 | 14:51 | 57.8             | 76.7              | 60.3             | 50.4             |
| 18/04/2017 | 15:46 | 57.1             | 70.1              | 59.8             | 52.1             |
| 18/04/2017 | 16:52 | 57.0             | 68.1              | 59.8             | 52.8             |
| 18/04/2017 | 17:59 | 58.5             | 75.0              | 61.9             | 52.7             |
| 18/04/2017 | 23:21 | 52.3             | 61.6              | 55.7             | 43.4             |
| 19/04/2017 | 00:27 | 51.8             | 62.9              | 55.5             | 41.1             |
| 19/04/2017 | 01:34 | 51.3             | 67.4              | 54.5             | 43.9             |

**Location 3 – Southern Site Boundary**

Rion NA-28 sound level meter, all values dB(A), 15-minute duration, free-field

| Date       | Time  | L <sub>Aeq</sub> | L <sub>Amax</sub> | L <sub>A10</sub> | L <sub>A90</sub> |
|------------|-------|------------------|-------------------|------------------|------------------|
| 18/04/2017 | 15:09 | 58.0             | 75.1              | 59.8             | 54.8             |
| 18/04/2017 | 16:02 | 57.1             | 66.0              | 59.2             | 54.0             |
| 18/04/2017 | 17:08 | 57.6             | 77.8              | 59.2             | 55.0             |
| 18/04/2017 | 18:16 | 57.2             | 68.0              | 59.3             | 54.2             |
| 18/04/2017 | 23:37 | 51.7             | 61.6              | 55.2             | 43.5             |
| 19/04/2017 | 00:43 | 54.2             | 65.8              | 57.4             | 47.5             |
| 19/04/2017 | 01:50 | 51.9             | 62.3              | 56.1             | 39.2             |

**Location 4 – Eastern Site Boundary A16 Roundabout**

Rion NA-28 sound level meter, all values dB(A), 15-minute duration, free-field

| Date       | Time  | L <sub>Aeq</sub> | L <sub>Amax</sub> | L <sub>A10</sub> | L <sub>A90</sub> |
|------------|-------|------------------|-------------------|------------------|------------------|
| 18/04/2017 | 16:35 | 59.9             | 71.0              | 62.1             | 56.5             |
| 18/04/2017 | 17:25 | 59.8             | 74.8              | 61.9             | 56.2             |
| 18/04/2017 | 18:34 | 58.7             | 71.6              | 61.3             | 54.2             |
| 18/04/2017 | 23:53 | 55.2             | 63.0              | 59.3             | 42.0             |
| 19/04/2017 | 01:00 | 54.1             | 62.9              | 57.5             | 44.6             |
| 19/04/2017 | 02:07 | 54.2             | 62.7              | 58.1             | 42.7             |

**APPENDIX III – WEATHER DATA**

April 18, 2017 - April 19, 2017

