

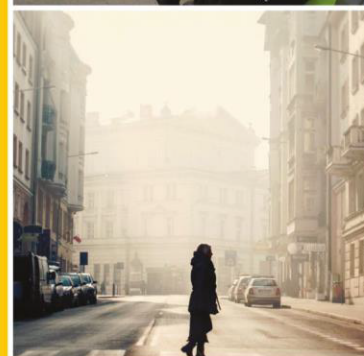


**PROPOSED HOLIDAY LODGE SITE
BARROW HILL QUARRY, MILL LANE,
EARL SHILTON**

NOISE ASSESSMENT

OCTOBER 2021

REPORT REF: 26726-04-NA-01



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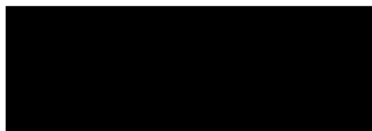
REPORT REF: 26726-04-NA-01

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CONTENTS

- 1.0 INTRODUCTION
- 2.0 SITE DESCRIPTION
- 3.0 NOISE CRITERIA
- 4.0 NOISE SURVEY
- 5.0 NOISE IMPACT ASSESSMENT
- 6.0 CONCLUSIONS

APPENDICES

- A. SITE LOCATION PLAN
- B. ESTC PLAN
- C. SITE LAYOUT PLAN
- D. DESCRIPTION OF NOISE UNITS
- E. NOISE MONITORING POSITIONS & MEASUREMENT
- F. MODELLED NOISE CONTOUR MAPS
- G. SOUND REDUCTION OF INDICATIVE PERMBERTON WINDOW
- H. SOUND REDUCTION OF POLYCARBONATE SHEET

1.0 INTRODUCTION

- 1.1 Mewies Engineering Consultants Ltd (M-EC Acoustic Air) has been commissioned by AT Contracting & Plant Hire Ltd to prepare a Noise Assessment for a proposed Holiday Lodge Site at Barrow Hill Quarry, Mill Lane, Earl Shilton. A site location plan is included in Appendix A.

Assessment Scope

- 1.2 The noise assessment has been undertaken with regard to Professional Practice Guidance on Planning & Noise (ProPG), prepared jointly by the Association of Noise Consultants, the Institute of Acoustics and the Chartered Institute of Environmental Health, which seeks to secure good acoustic design for new residential development within England's planning system, British Standard BS8233:2014 'Guidance on sound insulation and noise reduction for buildings', British Standard BS3632:2015 'Specification for Residential park homes and Residential Lodges', and the Department for Communities and Local Governments Planning Policy for Travellers Sites, August 2015.
- 1.3 A site description is provided in Section 2.0 of this report. Relevant national guidance on noise is presented in Section 3.0. Section 4.0 contains the results of the noise survey, and the assessment of noise impacts upon the Traveller Site is presented in Section 5.0 together with proposed mitigation measures. Our conclusions are presented in Section 6.0.
- 1.4 M-EC has completed this report for the benefit of the individuals referred to in paragraph 1.1 and any relevant statutory authority which may require reference in relation to approvals for the proposed development. Other third parties should not use or rely upon the contents of this report unless explicit written approval has been gained from M-EC.
- 1.5 M-EC accepts no responsibility or liability for:
- a) The consequence of this documentation being used for any purpose or project other than that for which it was commissioned;
 - b) The issue of this document to any third party with whom approval for use has not been agreed.

2.0 SITE DESCRIPTION

Existing Site

2.1 The application site is located at Barrow Hill Quarry, Mill Lane, Earl Shilton. The site is bound to all sides by open green field and agricultural land, with Mill Lane adjacent to the north eastern site boundary, and a pond located to the south, with the Earl Shilton Trials Club (ESTC) and the M69 motorway located beyond. The principal source of noise affecting the site will be from the M69 Motorway, coupled with any contributions from the ESTC.

2.2 A site location plan is provided in Appendix A.

2.3 The ESTC have been contacted regarding their typical operations and have responded as follows:

- There are no specific courses, and trials involve a few short sets of obstacles called sections.
- Operations occur considerably within 0700 to 2300 hours.
- Members are able to practice at any time, as all are provided with an access key.
- Wednesday is the busiest practice day, with potentially up to 30 bikes in attendance.
- Generally, there are not many people practicing at any one time, with 3 to 4 people considered typical.
- The majority of operations occur on the southern side of the motorway.
- Events occur less than 15 times a year.
- During an event there are no more than 100 bikes on site.
- Event times would run between 0900 to 1530 hours.
- Bikes are unloaded and started up within the site boundary.

2.4 The ESTC site boundary is identified in Appendix B.

Development Proposals

2.5 The development proposals comprise Holiday Lodge rentals, consisting of approximately 21 hard standing caravan pitches, along with associated infrastructure and access via Mill Lane.

2.6 A proposed layout plan is provided in Appendix C.

3.0 NOISE CRITERIA

Noise Terms and Units

- 3.1 Noise levels are measured and assessed using the decibel scale (dB), which provides a measure of the air pressure changes due to vibrating sources such as vehicle engines or machinery. Due to the vast range of air pressures that the human ear is capable of detecting, the decibel measurement uses a logarithmic scale that compresses the data into a more manageable scale for assessment purposes. A detailed explanation of the derivation of the decibel scale is presented in Appendix D.
- 3.2 Due to the logarithmic nature of the dB scale, the addition of two or more noise levels has to be done logarithmically rather than arithmetically. For example, two equal sound sources each producing 50 dB, when operated simultaneously, do not result in a noise level of 100 dB but instead produce a combined level of 53 dB, i.e. a rise of 3 dB for each doubling of sound energy. Subjectively, a 3 dB change does not represent a doubling or halving of loudness; to make a sound appear twice or half as loud requires a change of 10 dB.
- 3.3 The subjective loudness of noise can be measured by applying a filter or weighting that equates to the frequency response of the human ear. This is referred to as an A-weighting and when applied results in noise levels expressed as dB(A). dB(A) noise levels reflect the human perception of loudness.

National Planning Policy Framework

- 3.4 The latest National Planning Policy Framework (NPPF) 2021 sets out the Government's planning policies for England and how these are to be expected to be applied. The NPPF must be taken into account in the preparation of local and neighbourhood plans, and is to be a material consideration in planning decisions.
- 3.5 Paragraph 174 of the NPPF advises that, with respect to noise, planning policies and decisions should contribute to and enhance the natural and local environment by “...*preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution ...*”
- 3.6 Further, paragraph 185 advises that “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; and*

- 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.*

3.7 The NPPF's footnote to point a) above explicitly refers to the Explanatory Note to the *Noise Policy Statement for England* (Department for Environment, Food & Rural Affairs, 2010).

Noise Policy Statement for England

- 3.8 The guidance of the Noise Policy Statement for England (NPSE) applies to all forms of noise including environmental noise, neighbour noise and neighbourhood noise, but does not apply to noise in the workplace (occupational noise). It introduces the concepts of 'No Observed Effect Level' (NOEL), which is the level below which there is no detectable effect on health and quality of life due to the noise; the 'Lowest Observed Adverse Effect Level' (LOAEL), which is the level above which adverse effects on health and quality of life can be detected; and the 'Significant Observed Adverse Effect Level' (SOAEL), which is the level above which significant adverse effects on health and quality of life occur.
- 3.9 In March 2014 the Department for Communities & Local Government updated its on-line planning guidance to assist with interpretation of the original NPPF and the NPSE. The guidance covers general matters such as relevance of noise issues, noise concerns and factors, how to determine impacts, and mitigation. To assist with recognising when noise could be a concern, the guidance summarises the noise exposure hierarchy as follows, based on the likely average response

Table 1: Noise Exposure Hierarchy Based on Likely Average Response

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid

Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent
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BS8233:2014 ‘Guidance on sound insulation and noise reduction for buildings’

- 3.10 For steady external noise sources, BS8233:2014 states that it is generally desirable that the internal ambient noise level does not exceed the guideline values in Table 2.

Table 2: Indoor ambient noise levels for dwellings

Activity	Location	Daytime 07:00 to 23:00	Night-time 23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room	40 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

NOTE 1 Table 2 provides recommended levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Groundborne noise is assessed separately and is not included as part of these targets, as human response to groundborne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.

NOTE 2 The levels shown in Table 2 are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the levels recommended in Table 2.

NOTE 3 These levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Years Eve.

NOTE 4 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 $L_{Amax,P}$ depending on the character and number of events per night. Sporadic noise events could require separate values.

NOTE 5 If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level.

NOTE 6 Attention is drawn to the building regulations (30, 31, 32).

NOTE 7 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.

- 3.11 For traditional external areas that are used for amenity space, such as gardens and patios, the BS says it is desirable that “the external noise does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$.”
- 3.12 However, due to the nationwide difficulty in satisfying an external noise criterion of 55 dB $L_{Aeq,T}$ in urban areas where transportation noise is prevalent, BS8233:2014 provides an over-arching consideration of how to treat outdoor garden areas in the following way:

“... 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.

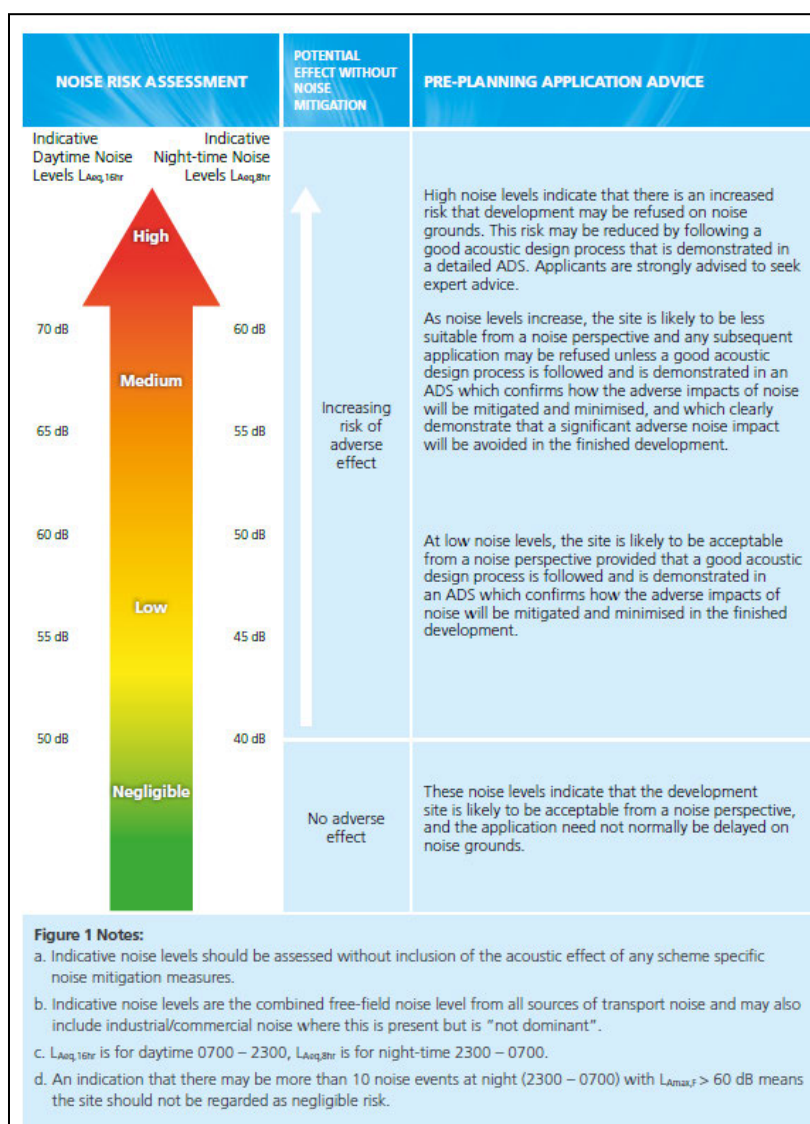
Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses.”

Professional Practice Guidance on Planning & Noise, New Residential Development, May 2017

- 3.13 The Professional Practice Guidance on Planning & Noise (ProPG), prepared jointly by the Association of Noise Consultants (ANC), the Institute of Acoustics (IOA) and the Chartered Institute of Environmental Health (CIEH), seeks to secure good acoustic design for new residential development within England’s planning system.
- 3.14 The guidance includes a framework to enable situations where noise is not an issue to be clearly determined, and to help identify the extent of risk at noisier sites. However, the guidance does not constitute an official government code of practice and neither replaces nor provides an authoritative interpretation of the law or government policy.
- 3.15 The scope of the guidance is also restricted to sites that are exposed predominantly to noise from transportation sources. Where industrial or commercial noise is present on the site but is “not dominant”, its contribution may be included in the noise level used to establish the degree of risk. Where industrial or commercial noise is present on the site and is considered to be “dominant”, then the risk assessment should not be applied to the industrial or commercial noise component and regard should be had to the guidance in BS4142:2014.
- 3.16 The ProPG advocates a 2-stage approach covering:
- Stage 1 – an initial noise risk assessment of the proposed development site;
 - Stage 2 – a systematic consideration of four key elements.
- 3.17 The four key elements to be undertaken in parallel during Stage 2 of the assessment are:
1. demonstrating a “Good Acoustic Design Process”;
 2. observing internal “Noise Level Guidelines”;

3. undertaking an “External Amenity Area Noise Assessment”; and
 4. consideration of “Other Relevant Issues”.
- 3.18 The overall approach is underpinned by the preparation of an “Acoustic Design Statement” (ADS), for which guidance is contained in ProPG Supplementary Document 2, Good Acoustic Design. An ADS for a site assessed as high risk should be more detailed than for a site assessed as low risk, and an ADS should not be necessary for a site assessed as negligible risk. The ProPG’s Supplementary Document 1, Planning & Noise Policy Guidance provides additional information regarding other planning guidance.
- 3.19 The process for the Initial Site Noise Risk Assessment is summarised in Figure 1. The site’s day and night-time noise exposures are used to define whether the site falls into a negligible, low, medium or high risk noise category. A site considered as negligible risk is likely to be acceptable from a noise perspective and need not normally be delayed on noise grounds.

Figure 1: Initial Site Noise Risk Assessment



- 3.20 Elements 1 and 2 of the Stage 2 assessments utilise the noise levels at new dwellings to determine the good acoustic design to avoid ‘unreasonable’ acoustic conditions and prevent ‘unacceptable’ acoustic conditions. The internal noise level guidelines used by ProPG are largely those previously set out under BS8233:2014 (Table 2) but with some additional guidance intended to assist with the determination of ‘unreasonable’ and ‘unacceptable’ acoustic conditions, which, for clarity, are highlighted by the use of blue italic font in the notes to Table 3.

Table 3: ProPG Internal Noise Level Guidelines

ACTIVITY	LOCATION	07:00 – 23:00 HRS	23:00 – 07:00 HRS
Resting	Living room	35 dB $L_{Aeq,16\text{ hr}}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16\text{ hr}}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16\text{ hr}}$	30 dB $L_{Aeq,8\text{ hr}}$ 45 dB $L_{Amax,F}$ (Note 4)

NOTE 1 The Table provides recommended internal L_{Aeq} target levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Ground-borne noise is assessed separately and is not included as part of these targets, as human response to ground-borne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.

NOTE 2 The internal L_{Aeq} target levels shown in the Table are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the internal L_{Aeq} target levels recommended in the Table.

NOTE 3 These internal L_{Aeq} target levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Year's Eve.

NOTE 4 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 $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values. 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).

NOTE 5 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.

NOTE 6 Attention is drawn to the requirements of the Building Regulations.

NOTE 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal L_{Aeq} target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved. 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).

- 3.21 Element 3 of the ProPG's Stage 2 assessment applicable to External Amenity Area Noise Assessment similarly extends the current guidance applicable to outdoor areas in the following manner:

-
- 3(i) *“If external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces should be considered so that they can be enjoyed as intended.*
- 3(ii) *The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB LAeq,16hr.*
- 3(iii) *These guideline values may not be achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels in these external amenity spaces.*
- 3(iv) *Whether or not external amenity spaces are an intrinsic part of the overall design, consideration of the need to provide access to a quiet or relatively quiet external amenity space forms part of a good acoustic design process.*
- 3(v) *Where, despite following a good acoustic design process, significant adverse noise impacts remain on any private external amenity space (e.g. garden or balcony) then that impact may be partially off-set if the residents are provided, through the design of the development or the planning process, with access to:*
- a relatively quiet facade (containing openable windows to habitable rooms) or a relatively quiet externally ventilated space (i.e. an enclosed balcony) as part of their dwelling; and/or*
 - a relatively quiet alternative or additional external amenity space for sole use by a household, (e.g. a garden, roof garden or large open balcony in a different, protected, location); and/or*
 - a relatively quiet, protected, nearby, external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings; and/or*
 - a relatively quiet, protected, publicly accessible, external amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance). The local planning authority could link such provision to the definition and management of Quiet Areas under the Environmental Noise Regulations.”*
- 3.22 The final element of Stage 2 is an assessment of other relevant issues, which may include the following matters:
- 4(i) *“compliance with relevant national and local policy;*
- 4(ii) *magnitude and extent of compliance with ProPG;*
-

- 4(iii) *likely occupants of the development;*
- 4(iv) *acoustic design v unintended adverse consequences;*
- 4(v) *acoustic design v wider planning objectives.”*

- 3.23 Upon completion of the ProPG’s Stage 1 and 2 assessments, the findings should enable one of four possible recommendations to be presented to the decision maker, namely to grant permission without conditions, grant with conditions, ‘avoid’ or ‘prevent’.

BS3632:2015 ‘Specification for Residential Park Homes and Residential Lodges’

- 3.24 Residential park homes are traditionally thin-walled, single-glazed units with poor insulation where the cost to maintain a comfortable level of heating can be very high. Therefore, BS 3632:2015 aims to improve this in new homes and lodges. It gives the minimum specification for residential park homes in terms of ventilation, thermal insulation, stability once sited and room sizes etc.
- 3.25 With regard to noise, the build standard specified by BS3632 is that caravan walls should achieve a sound reduction rating (R_w) no less than 35 dB.

Department for Communities and Local Governments Planning Policy for Travellers Sites, August 2015

- 3.26 This document sets out the Government’s planning policy for traveller sites, and should be read in conjunction with the National Planning Policy Framework.
- 3.27 The document’s overarching aim is to ensure fair and equal treatment for travellers, in a way that facilitates the traditional and nomadic way of life of travellers while respecting the interests of the settled community. Whilst the document contains no specific criteria in relation to noise, Policies B and H reference the following:

Policy B/13

- e) *“provide for proper consideration of the effect of local environmental quality (such as noise and air quality) on the health and well-being of any travellers that may locate there or on others as a result of new development.”*

Policy H/28

- a) *“limiting which parts of a site may be used for any business operations, in order to minimise the visual impact and limit the effect of noise.”*

Road Traffic

- 3.28 Road traffic noise levels, which have been determined to be the dominant source of noise for the site, are typically measured and predicted in units of LA_{10} (18 hour) dB in accordance with the Department of Transport’s ‘Calculation of Road Traffic Noise, 1988’ (CRTN). The LA_{10} is the A-weighted sound level in decibels exceeded for 10% of the measurement period, which in this case

is the 18 hour period between 0600 and 2400 hours. This noise index has been shown to correlate best with people's subjective annoyance due to road traffic noise. L_{A10} noise levels measured over any three hours between 1000-1700 hours are typically 1 dB(A) higher than the L_{A10} over the 18-hour period (CRTN paragraph 43). A fuller description of noise units used in this evidence is presented in Appendix D.

- 3.29 With respect to the planning of new residential development in the vicinity of existing road traffic, previous guidance was provided by Planning Policy Guidance PPG24:Planning and Noise. This document provided guidance in terms of Noise Exposure Categories (NEC) for residential development. For comparison with the L_{A10} (18 hour) traffic noise index, it is important to note that the noise index used by the previous planning guidance and also by design guidance such as BS8233 and the WHO guidelines use the $L_{Aeq,T}$ dB noise index, which is a measure of the total sound energy present in a time period, T, expressed as an equivalent continuous noise level.
- 3.30 For environmental noise sources such as road traffic, the $L_{Aeq,T}$ noise level over the daytime assessment period of 16 hours used by planning guidance is typically, 2 dB lower than L_{A10} (18 hour) noise level. In addition, planning criteria are often expressed as free-field noise levels, i.e. away from the reflecting effects of building facades, whereas noise levels predicted at specific buildings by CRTN normally include a facade reflection factor. L_{A10} (18 hour) noise levels will be higher than equivalent free-field values by a further 3 dB(A) due to these reflection effects. Therefore, for any direct comparison between predicted noise levels and $L_{Aeq,T}$ criteria, L_{A10} (18 hour) noise levels will need to be corrected by -2 dB(A) in the case of free-field noise measurements or predictions and by -5 dB(A) in the case of facade noise levels.

4.0 NOISE SURVEY

- 4.1 Ambient noise levels at the site during the day and night-time were monitored from Wednesday 15th to Thursday 16th September 2021. Noise levels were monitored continuously over a 24-hour period along the southern site boundary (Position 1). Further sample measurements were undertaken at various reference distances from bikes during the Wednesday practice session at the ESTC, including a further 1-hour sample measurement along the southern boundary of the site, whilst the practice session was underway (Position 2). The noise monitoring positions are identified in Appendix E.
- 4.2 Noise levels were recorded using the following equipment, which was calibrated to a reference signal immediately prior to and after the survey and exhibited zero drift.
- Norsonic 140 Type 1 Sound Level Meter; and
 - Norsonic 1255 Acoustic Calibrator.
- 4.3 The microphone was positioned at a height of 1.5m in free-field locations, i.e. excluding the effect of reflections from buildings or structures. During the survey period, the weather conditions were sunny and warm, with north westerly winds of up to 1.5 m/s during the Wednesday, and sunny and warm, with south westerly winds of 0.5 m/s during Thursday.
- 4.4 During the survey periods, the predominant noise source affecting the site was at all times road traffic using the M69 Motorway. The attended site survey notes indicate that whilst bikes using the ESTC were faintly audible during the practice session, the assessor found it difficult to distinguish the bikes from road traffic using the M69 Motorway.
- 4.5 The measured noise levels are also presented in Appendix E, and are summarised below in Tables 4 and 5.

Table 4: Measured Noise Levels, Free-field dB(A)

Situation	Time	L _{Aeq}	L _{Amax}	L _{A01}	L _{A10}	L _{A90}
Position 1 Day	1259-2300	55.6	77.1	58.3	56	51.3
Position 1 Night	2300-0700	56.0	70.5	58.8	57.2	52.2
Position 1 Day	0700-1505	57.2	78.1	59.5	57.5	53.7
Position 2	1139-1240	48.4	69.4	52.1	49.3	45.9

- 4.6 The daytime L_{Aeq,16hour} and night-time L_{Aeq,8hour} measured along the southern site boundary was 56 dB during both the day and night (rounding to the nearest whole number for assessment purposes).
- 4.7 Analysis of the L_{Amax} noise levels shows that the individual road traffic noise events during the night-time typically fall below 63 dB, but with 10 events due to a loud vehicle causing peaks of between 63-71 dB. Therefore, for night-time assessment purposes it has been assumed that L_{Amax} noise events due to passing vehicles will typically be 63 dB or less along the southern site boundary.

- 4.8 The daytime $L_{Aeq T}$ undertaken along the southern boundary during the Wednesday practice session was 48 dB.

Table 5: ESTC Practice Session, Free-field dB(A)

Situation	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
Multiple bikes congregated around obstacle @ Approx 5m	77.5	92.1	80.5	68.2
Bike rev/passby @ Approx 0.5m	85.1	104.2	84.2	70.6
Bikes consecutively going up verticle obstacle @ Approx 1.5m	80.1	101.8	80.9	69.4
One bike going over rock obstacle @ Approx 2m	77.8	95	81.2	69.5
One bike going up pipe obstacle @ Approx 2m	76.0	88.1	79.3	64.7
3x Startup of bike @ Approx 1m	81.2	90.7	86.2	58.1

- 4.9 Table 5 shows the noise levels from various scenarios at the ESTC practice session. The data shows an $L_{Aeq T}$ ranging from 76 dB to 85 dB, with L_{Amax} levels of up to 104 dB.

5.0 NOISE ASSESSMENT

- 5.1 Future sound levels across the proposed development site have been established by creating a 3D noise model of the area using Cadna-A noise modelling software, which is used for the prediction and assessment of environmental noise.
- 5.2 Cadna-A is an internationally accepted suite of software that is used for the prediction and assessment of environmental noise. The software takes account of various inputs, including topography, buildings and road noise sources, and calculates sound levels in accordance with national and international standards; in this case, the relevant UK standards are the procedures set out within the Calculation of Road Traffic Noise (CRTN) 1988, and ISO 9613 'Acoustics – Attenuation of sound during propagation outdoors'. Modelled results are outputted as colour noise contour maps.
- 5.3 Ground level data has been informed by OS Terrain 5 Contours, which were obtained from Promap (<https://www.promap.co.uk/>).
- 5.4 With reference to the noise criteria outlined in Section 3.0, Cadna-A has been used to create noise models for the following scenarios, to predict and assess sound levels across site:
- Daytime $L_{Aeq,16 \text{ hour}}$ external sound levels at ground floor (1.5m) height;
 - Night-time $L_{Aeq,8 \text{ hour}}$ external sound levels at ground floor (1.5m) height; and
 - Night-time L_{Amax} external sound level at ground floor (1.5m) height.

Assessment

- 5.5 An Initial Site Noise Risk Assessment as required by the ProPG is presented in Table 6. Based on the maximum noise exposure levels recorded on site, the site during the day falls within the category of Low risk, for which the guidance indicates that *“At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development”*.
- 5.6 The noise exposure increases to a Medium risk during the night-time, for which the guidance states *“The site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrates that a significant adverse noise impact will be avoided in the finished development”*.

Table 6: Initial Site Noise Risk Assessment

Risk Category	Negligible		Low		Medium		High	
	Day	Night	Day	Night	Day	Night	Day	Night
ProPG L_{Aeq} threshold dB	<50	<40	50-60	40-50	60-70	50-60	>70	>60
Site Noise Level L_{Aeq} dB			56			56		
Risk Assessment			Low			Medium		

- 5.7 The following sections deal with the mitigation measures required by an ADS, namely the acoustic design needed to achieve internal noise level guidelines and the consideration of any other relevant matters.
- 5.8 However, there is no set guidance relating to noise on Holiday Lodge sites. The closest relevant guidance is that contained within BS8233, which provides recommended guideline values for sound levels within living rooms, bedrooms and private amenity spaces such as gardens, for residential dwellings. A summary of the BS8233 sound level criteria is provided below:

- Living rooms (daytime) $L_{Aeq,T}$ 35dB(A);
- Bedrooms (daytime) $L_{Aeq,T}$ 35dB(A);
- Bedrooms (night-time) $L_{Aeq,T}$ 30dB(A);
- Bedrooms (night-time) L_{AFmax} 45dB(A); and
- Outdoor living areas $L_{Aeq,1hr}$ 55 dB(A).

Trials Club

- 5.9 The ESTC have confirmed that up to 100 bikes could be in attendance on an event weekend. However, only a small number of bikes would be utilising various sections at any one time. As a worst case assessment, the following noise models include multiple sections in use together, with 40 bikes operating in unison, which will represent a robust scenario for determining noise impacts from the ESTC, as the number of bikes operating at any one time would be far less than this.

Mitigation

External Sound Levels

- 5.10 The noise criterion often the most difficult to meet adjacent to busy transportation routes is the BS8233 outdoor noise criterion of 55 dB L_{Aeq} applicable to private amenity spaces such as gardens. The daytime $L_{Aeq, 16hour}$ site noise contour shown on drawing 26726_04_120_01 in Appendix F, indicates unscreened external noise levels of up to 57 dB will be experienced across the southern section of the site, which would exceed the outdoor criterion of 55 dB, although, only marginally.
- 5.11 Drawing 26726_04_120_07 in Appendix F indicates that even with the use of screening in the form of a bund, acoustic fence, or combination bund/fence along the southern boundary, due to the

topography of the site and surrounding area, 6m high screening would only provide an attenuation of approximately 1 dB, and the outdoor noise level would still be in excess of the criterion.

- 5.12 However, it should be noted that the BS8233 criterion is aimed at private amenity spaces such as private residential gardens, and is not intended for short-term holiday lets, where visitors will not be present for extended periods of time, or for public amenity areas that may be present on the site. In addition, when considering the noise levels against the BS8233 criterion, only marginal exceedances of 2 dB are experienced across the southern half of the site, with the northern section satisfying the criterion. Therefore, if any public amenity area is proposed, it would be advisable to have this located within the northern half of the site, where noise levels satisfy the criterion.
- 5.13 Furthermore, any exceedance of the criterion needs to be considered against the caveats expressed in paragraphs 3.12, namely that *“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.”*
- 5.14 If fencing is to be used for acoustic screening, the following specification is recommended as a minimum:
- Good quality timber with no warping, knots etc;
 - At least 25mm thick in all places;
 - Close-boarder and continued across the front of posts to minimise gaps;
 - Boards should overlap 25mm as a minimum;
 - No gaps should be present between gravel board and the ground; and
 - Minimum mass of 10 to 15km/m³.

Internal Sound Levels

- 5.15 With regard to internal L_{Aeq} and L_{Amax} noise levels, the relevant BS8233 criterion to be met and the maximum exceedance of the criterion is shown in Table 7.

Table 7: Unscreened Day and Night-time $L_{Aeq,T}$ and L_{Amax} Sound Levels, dB

Situation	Noise Level	Criterion	Exceedance
Daytime $L_{Aeq, 16hour}$	57	35	22
Night-time $L_{Aeq, 8hour}$	56	30	26
Night-time L_{Amax}	63	45	18

- 5.16 BS3632 requires caravans used for residential purposes to have external walls achieving a sound reduction rating (R_w) no less than 35 dB, which would enable all internal criteria to be met.

-
- 5.17 However, windows are the ‘weakest’ point in any façade. Therefore, the outside to inside sound reduction to be provided by the glazed elements needs to be considered.
- 5.18 The information in Table 7 indicates that the sound reduction of the glazing system will need to provide at least 26 dB R_w for the most exposed caravan pitch.
- 5.19 There is no available information regarding sound reduction requirements for caravan windows. However, Pemberton Park and Leisure Homes have advised that the specification utilised within their park home windows is a configuration of 3/22argon/3, where the information is presented in terms of the thickness of one pane of polycarbonate in mm, followed by the size of the argon filled air gap, followed by the thickness of the second pane of polycarbonate. Pemberton have confirmed that this configuration is capable of providing a sound reduction 34 dB R_w , which would be more than sufficient to enable all internal BS8233 criteria to be met. and the relevant correspondence with Pemberton is provided in Appendix G.
- 5.20 In any event, the information in Appendix H indicates that the sound reduction for a single sheet of 4.5mm thick general purpose polycarbonate is capable of providing a sound reduction of 27 dB R_w . Therefore, any polycarbonate window of 4.5mm or greater should similarly enable all BS8233 internal noise criteria to be met.
- 5.21 Opening windows for ventilation purposes would reduce the insulation provided by the caravan façade and internal noise levels would then exceed the BS8233 standards, although this situation is not unusual for residential areas within the urban environment where transportation noise is prevalent. If the Local Planning Authority considers it necessary to satisfy internal noise standards with a degree of ventilation, mitigation measures will be required to enable occupiers to obtain ventilation with windows closed. If available, passive acoustic ventilators such as acoustic trickle vents could be installed within the caravan walls to enable occupiers to obtain natural ventilation with windows closed, without any loss of amenity due to noise intrusion.

Summary

- 5.22 There is no set guidance relating to noise on Holiday Lodge Sites, with the closest relevant guidance being BS8233, which provides recommended guideline values for sound levels within living rooms, bedrooms and private amenity spaces such as gardens, for residential dwellings.
- 5.23 The above assessment demonstrates that relevant recommended external and internal noise standards contained within BS8233 can be met within the proposed development, and there are no other outstanding noise issues. Therefore, the overall conclusion of the noise assessment is that the decision maker may grant planning permission with conditions where appropriate.

6.0 CONCLUSIONS

- 6.1 Mewies Engineering Consultants Ltd (M-EC Acoustic Air) has been commissioned by AT Contracting & Plant Hire Ltd to prepare a Noise Assessment for a proposed Holiday Lodge Site at Barrow Hill Quarry, Mill Lane, Earl Shilton.
- 6.2 An Initial Site Noise Risk Assessment required by the ProPG, shows that based on the maximum noise exposure levels recorded on site, the site during the day falls within the category of Low risk, for which the guidance indicates that *“At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development”*.
- 6.3 The noise exposure increases to a Medium risk during the night-time, for which the guidance states *“The site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrates that a significant adverse noise impact will be avoided in the finished development”*.
- 6.4 There is no set guidance relating to noise on Holiday Lodge Sites, with the closest relevant guidance being BS8233, which provides recommended guideline values for sound levels within living rooms, bedrooms and private amenity spaces such as gardens, for residential dwellings.
- 6.5 The noise criterion often the most difficult to meet adjacent to busy transportation routes is the BS8233 outdoor noise criterion of 55 dB L_{Aeq} applicable to private amenity spaces such as gardens. The daytime $L_{Aeq\ 16hour}$ site noise contour indicates unscreened external noise levels of up to 57 dB will be experienced across the southern section of the site, which will exceed the outdoor criterion of 55 dB, although, only marginally.
- 6.6 Even with the use of screening in the form of a bund, acoustic fence, or combination bund/fence along the southern boundary, due to the topography of the site and surrounding area, 6m high screening would only provide an attenuation of approximately 1 dB, and the outdoor noise level would still be in excess of the criterion.
- 6.7 However, it should be noted that the BS8233 criterion is aimed at private amenity spaces such as private residential gardens, and is not intended for short-term holiday lets, where visitors will not be present for extended periods of time, or for public amenity areas that may be present on the site. In addition, when considering the noise levels against the BS8233 criterion, only marginal exceedances of 2 dB are experienced across the southern half of the site, with the northern section satisfying the criterion. Therefore, if any public amenity area is proposed, it would be advisable to have this located within the northern half of the site, where noise levels satisfy the criterion.

-
- 6.8 Furthermore, any exceedance of the criterion needs to be considered against the expressed caveats, namely that *“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.”*
- 6.9 BS3632 requires caravans used for residential purposes to have external walls achieving a sound reduction rating (R_w) no less than 35 dB, which would enable all internal criteria to be met.
- 6.10 There is no available information regarding sound reduction requirements for caravan windows. However, Pemberton Park and Leisure Homes have advised that the specification utilised within their park home windows is a configuration of 3/22argon/3, where the information is presented in terms of the thickness of one pane of polycarbonate in mm, followed by the size of the argon filled air gap, followed by the thickness of the second pane of polycarbonate. Pemberton have confirmed that this configuration is capable of providing a sound reduction 34 dB R_w , which would be more than sufficient to enable all internal BS8233 criteria to be met.
- 6.11 In any event, the sound reduction for a single sheet of 4.5mm general purpose polycarbonate is capable of providing a sound reduction of 27 dB R_w and therefore, any polycarbonate window of 4.5mm or greater should similarly enable all internal noise criteria of BS8233 to be met.
- 6.12 Opening windows for ventilation purposes would reduce the insulation provided by the caravan façade and internal noise levels would then exceed the BS8233 standards, although this situation is not unusual for residential areas within the urban environment where transportation noise is prevalent. If the Local Planning Authority considers it necessary to satisfy internal noise standards with a degree of ventilation, mitigation measures will be required to enable occupiers to obtain ventilation with windows closed. If available, passive acoustic ventilators such as acoustic trickle vents could be installed within the caravan walls to enable occupiers to obtain natural ventilation with windows closed, without any loss of amenity due to noise intrusion.
- 6.13 The above assessment demonstrates that relevant recommended external and internal noise standards contained within BS8233 can be met within the proposed development, and there are no other outstanding noise issues. Therefore, the overall conclusion of the noise assessment is that the decision maker may grant planning permission with conditions where appropriate.
-

APPENDIX A

M-EC
The Old Chapel
Station Road
Hugglescote
Leicestershire
LE67 2GB

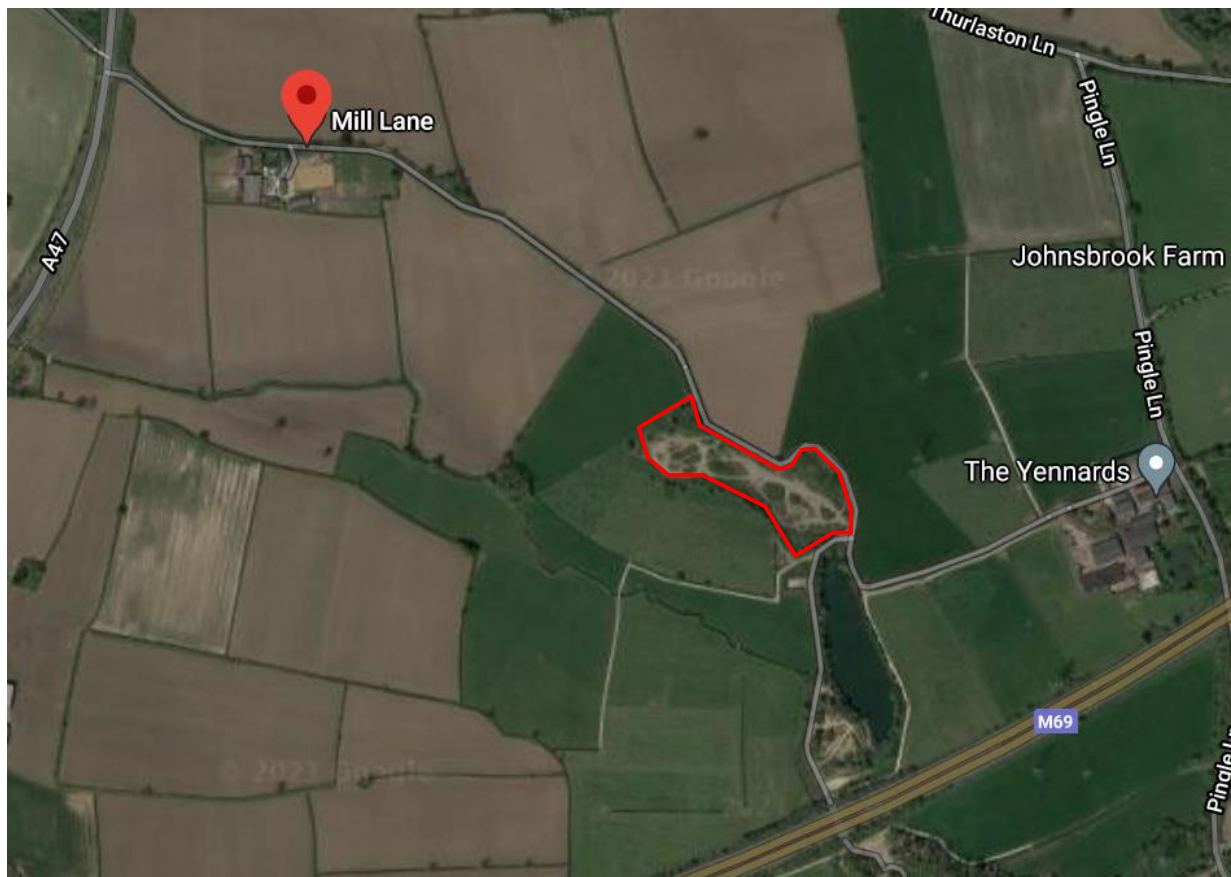


SITE LOCATION PLAN

Project: Barrow Hill Quarry, Mill Lane, Earl Shilton

File Ref: 26726

O.S. Grid Ref: 448769,297158



APPENDIX B



[Home](#)

[About](#)

[Practice](#)

[Trials ▾](#)

[National](#)

[Training](#)

[Forms](#)

[Contact](#)

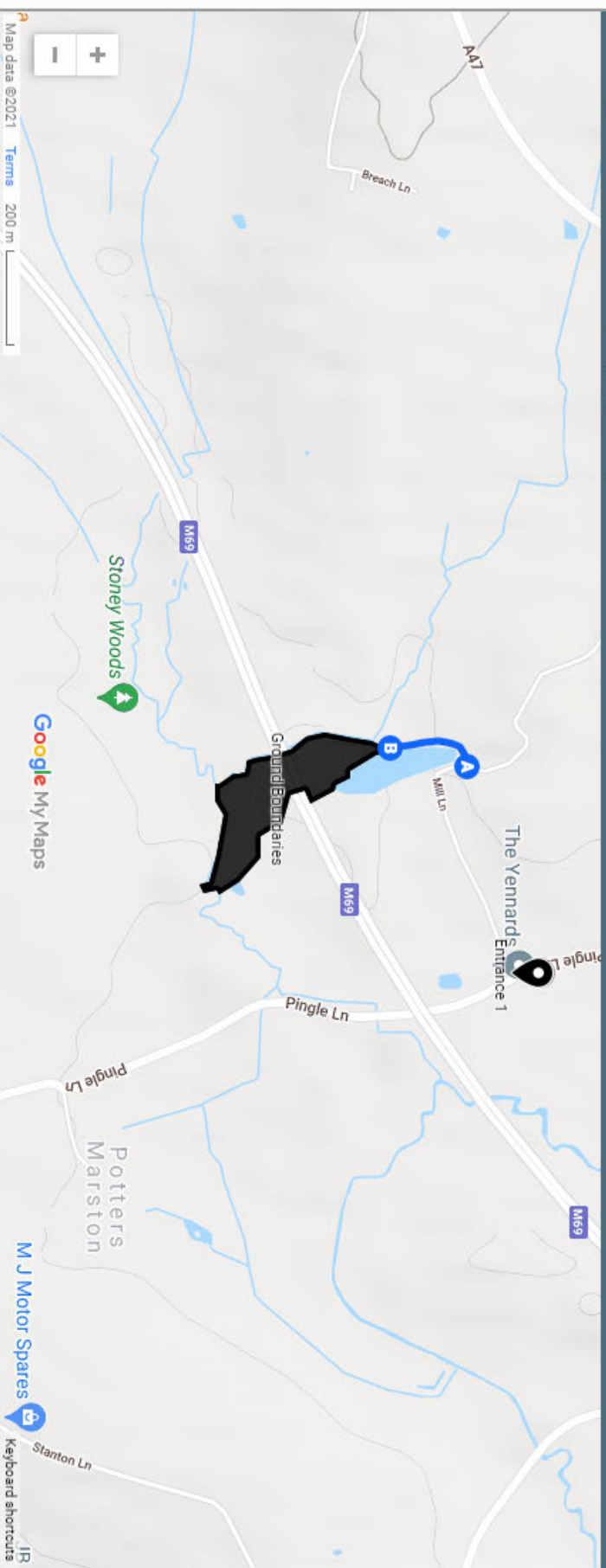
[News](#)



Earl Shilton Trials Club

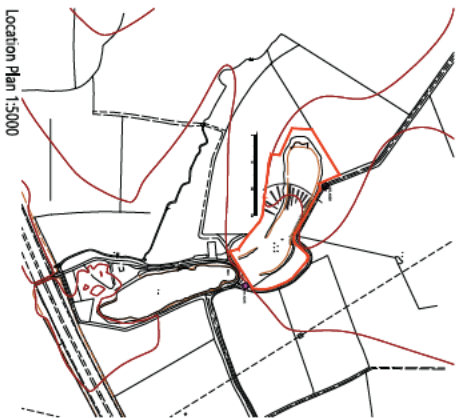
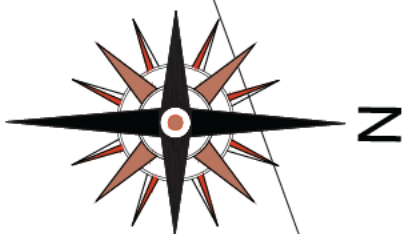


This map was made with Google My Maps. Create your own.



APPENDIX C

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Location Plan 1:5000



0

50

100

150

DRAFT

Schedule

21 x lodges,
Site area 28500sqm, 7 acres

Barrow Hill Quarry
Earl Shilton

Site Graphic Pending
Survey

Scale: 1:1000@ A1 Date: July 2021

Dwg No. 1001 Revision: -

Brook House Consulting

BHC

72 Boston Road
Leicester
LE4 1TB

Pending survey and formal brief.

Tel: 0116 2716665 Email: mail@brookhouseconsulting.com

Plan 1:1000

APPENDIX D

DESCRIPTION OF NOISE UNITS

- The sounds that we hear are a result of successive air pressure changes. These air pressure changes are generated by vibrating sources, such as motor vehicle engines, and they travel to a receiver, i.e. the human ear, as air pressure waves.
- The human ear is capable of detecting a vast range of air pressures, from the lowest sound intensity that the normal ear can detect (about 10^{-12} watts/m²) to the highest that can be withstood without physical pain (about 10 watts/m²). If we were to use a linear scale to represent this range of human sensitivity it would encompass a billion units. Clearly this would be an unmanageable scale yielding unwieldy numbers.
- The scale can be compressed by converting it to a logarithmic or Bel scale, the number of Bels being the logarithm to the base 10 of one value to another (as applied by Alexander Graham Bell to measure the intensity of electric currents). The Bel scale gives a compressed range of 0 to 12 units which in practice is a little too compressed. A change of 1 Bel represents a doubling or halving of loudness to the average listener. A more practical operating range of 0 to 120 is obtained by multiplying by 10, i.e. 10 x Bel, which produces the scale units known as decibels or dB.
- Examples of typical sound intensity levels within the decibel range of 0 to 120 dB are listed below:

Four engine jet aircraft at 100m	120 dB
Riveting of steel plate at 10m	105 dB
Pneumatic drill at 10m	90 dB
Circular wood saw at 10m	80 dB
Heavy road traffic at 10m	75 dB
Telephone bell at 10m	65 dB
Male speech, average at 10m	50 dB
Whisper at 10m	25 dB
Threshold of hearing, 1000 Hz	0 dB

- Due to this logarithmic scale noise levels have to be combined logarithmically rather than arithmetically. For example, two equal sound sources of 70 dB each, when operated simultaneously, do not produce a combined level of 140 dB but instead result in a level of 73 dB, i.e. a rise of 3 dB for each doubling of sound intensity. Subjectively, a 3 dB change does not represent a doubling or halving of loudness; to make a sound appear twice as loud requires an increase in sound pressure level of about 10 dB.
- The sensitivity of the human ear to different acoustic frequencies of sound can be taken into account when measuring or calculating noise by applying a filter or weighting which equates to the frequency response of the human ear. This is referred to as an A-weighting and when applied results in noise levels expressed as dB(A). dB(A) noise levels reflect the human perception of loudness.
- Due to the often broadband and variable nature of environmental noises such as traffic, people exposed to different levels of noise do not make consistently different judgements about the noise climate until the difference in average noise level is about 3 dB(A). This is equivalent to a doubling of sound energy or, for example, a doubling of traffic flow. However, individuals are able to detect much lesser changes in noise exposure in any given situation and under ideal conditions can detect differences of as little as 1dB.
- Noise levels that fluctuate over time can be measured using a variety of noise indices. One index that correlates fairly well with community annoyance due to road traffic noise is the L_{A10} (18-hour) noise index. The L_{A10} is the A-weighted sound level exceeded for 10% of the time, and the L_{A10} (18-hour) is the arithmetic mean of the 18 hourly L_{A10} values during the period 6am to midnight (0600 to 2400 hours).

- An alternative index used in the UK to characterise intermittent sources of noise such as railways or construction sites is the equivalent continuous noise level, L_{Aeq} . It is a measure of the total sound energy generated by a fluctuating sound signal within a given time period and can be derived by 'spreading' the total sound energy evenly over the same time period as the fluctuating signal, hence the term 'equivalent continuous noise level'.
- Other useful noise units include the L_{Amax} , which is the maximum A-weighted sound level often used to characterise single events, and the L_{A90} which is the level of noise exceeded for 90% of the time and is an indicator of the background noise levels in the absence of specific sources such as traffic.

APPENDIX E

M-EC
The Old Chapel
Station Road
Hugglescote
Leicestershire
LE67 2GB



NOISE MONITORING POSITIONS

Project: Barrow Hill Quarry, Mill Lane, Earl Shilton

File Ref: 26726

O.S. Grid Ref: 448769,297158



Noise Measurements

24-hr on-site measurement

Date Daytime	L _{Aeq}	L _{Amax}	L _{A01}	L _{A10}	L _{A90}
(2021/09/15 12:59:51.00)	55.1	58.8	-	56.3	53.9
(2021/09/15 13:00:01.00)	55.4	77.1	58.7	56.9	52.4
(2021/09/15 13:05:02.00)	53.1	58	56.8	54.7	50.8
(2021/09/15 13:10:02.00)	52.3	63.3	55.1	53.7	50.3
(2021/09/15 13:15:02.00)	53.8	64.2	56.2	55.1	52.1
(2021/09/15 13:20:02.00)	54.6	62	57.7	56.3	52
(2021/09/15 13:25:02.00)	55.5	59.1	58	57	53.6
(2021/09/15 13:30:02.00)	54.2	60.1	57.1	55.9	51.8
(2021/09/15 13:35:02.00)	54.3	57.9	56.9	55.8	52.5
(2021/09/15 13:40:02.00)	53.2	59.8	56.3	55.1	49.9
(2021/09/15 13:45:02.00)	55	59.9	58.5	57	52.6
(2021/09/15 13:50:02.00)	56.2	68	62	58.1	52.1
(2021/09/15 13:55:02.00)	54.8	62.6	57.6	56.5	52.2
(2021/09/15 14:00:01.00)	54.5	64	58.2	57	50.7
(2021/09/15 14:05:02.00)	52	58.3	56.5	54.1	49.6
(2021/09/15 14:10:01.00)	52.6	57.9	56.8	54.9	49.7
(2021/09/15 14:15:02.00)	52.9	57.2	55.8	54.5	51.1
(2021/09/15 14:20:02.00)	51.9	57.2	55.7	53.3	50.1
(2021/09/15 14:25:02.00)	53	63.8	56.9	55.5	50.5
(2021/09/15 14:30:02.00)	51.7	59.8	55.1	53.7	48.7
(2021/09/15 14:35:02.00)	51.8	57.5	55.8	54.2	48.3
(2021/09/15 14:40:02.00)	52.3	65.8	56.6	54.3	49.4
(2021/09/15 14:45:02.00)	50	62.4	53.4	51.7	47.6
(2021/09/15 14:50:02.00)	51	73.1	55.1	52.7	48.1
(2021/09/15 14:55:02.00)	53.5	59.3	56.3	55.1	51.6
(2021/09/15 15:00:02.00)	51.6	57.6	55.4	54	48.4
(2021/09/15 15:05:02.00)	47.8	57	52.3	50.3	44.9
(2021/09/15 15:10:01.00)	50.1	55.5	54.5	52.6	46.2
(2021/09/15 15:15:02.00)	51	57	55.8	53.5	47
(2021/09/15 15:20:02.00)	48.8	56.1	52.5	50.8	46.5
(2021/09/15 15:25:02.00)	49.1	53	51.9	50.7	47.3
(2021/09/15 15:30:02.00)	47.4	54.9	50.8	48.7	45.4
(2021/09/15 15:35:02.00)	48.7	63	52.7	50.9	45.7
(2021/09/15 15:40:03.00)	48.5	58.8	52.2	50.1	45.1
(2021/09/15 15:45:02.00)	49.8	53.2	52.4	51.2	48.1
(2021/09/15 15:50:02.00)	46.6	52.9	49.7	48.1	44.2
(2021/09/15 15:55:02.00)	50.3	56	54.6	52.4	48
(2021/09/15 16:00:02.00)	50.3	56.7	53.4	51.6	48.7
(2021/09/15 16:05:02.00)	49.5	56.1	52.9	50.9	47.6
(2021/09/15 16:10:02.00)	48.9	62.9	53.6	50.4	47
(2021/09/15 16:15:02.00)	47.2	53.5	50.1	48.8	45.3
(2021/09/15 16:20:02.00)	47.2	51.7	50.6	49.1	44.6
(2021/09/15 16:25:02.00)	62.3	76.1	73.5	66.6	48.8
(2021/09/15 16:30:01.00)	55.3	74.5	68.4	53.3	45.3
(2021/09/15 16:35:02.00)	58	71.2	68.2	62.1	47.3
(2021/09/15 16:40:02.00)	59.7	76.7	72.8	61.4	46.2
(2021/09/15 16:45:02.00)	57	70.5	68.1	61	46.9
(2021/09/15 16:50:02.00)	54.5	71.1	65.9	58.4	44.1
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(2021/09/15 17:05:02.00)	44.3	50.5	47.3	45.8	42.7
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(2021/09/15 17:15:02.00)	52.1	66.9	59.9	54.3	47.6
(2021/09/15 17:20:02.00)	50.6	55	54	52.3	48.3
(2021/09/15 17:25:02.00)	49.8	55.2	53.1	51.6	47.9
(2021/09/15 17:30:02.00)	49.6	66	52.7	51.3	46.6
(2021/09/15 17:35:02.00)	52.2	56.5	55.2	53.6	50.8
(2021/09/15 17:40:02.00)	50.7	54.6	53.5	52	49.2
(2021/09/15 17:45:02.00)	49.7	55.8	53.1	51.4	47.5
(2021/09/15 17:50:02.00)	51.4	54.7	53.7	52.7	49.9
(2021/09/15 17:55:02.00)	52.6	66	57.5	53.7	50.5
(2021/09/15 18:00:02.00)	51.2	56.7	53.7	52.6	49.5
(2021/09/15 18:05:02.00)	51.3	58.4	54.2	52.9	49.3
(2021/09/15 18:10:02.00)	51.2	59.8	54.9	52.5	49.5
(2021/09/15 18:15:02.00)	50.6	59.7	54.8	51.8	48.8
(2021/09/15 18:20:02.00)	52.2	56.1	54.6	53.6	50.5
(2021/09/15 18:25:02.00)	53.2	57.3	55.6	54.5	51.3
(2021/09/15 18:30:02.00)	53.1	57.6	56	54.3	51.4
(2021/09/15 18:35:02.00)	52.8	56.1	55	54.1	51.2
(2021/09/15 18:40:02.00)	54.7	62.6	59.8	57.2	51.9
(2021/09/15 18:45:02.00)	59	69.6	66.8	62.2	52.7
(2021/09/15 18:50:02.00)	58.2	64.9	63.9	60.9	54.5
(2021/09/15 18:55:02.00)	59.3	70.4	67	61.7	55.2
(2021/09/15 19:00:03.00)	59	71.8	66.3	61.7	54.1
(2021/09/15 19:05:02.00)	59.9	71.7	67.6	62	55.7
(2021/09/15 19:10:02.00)	55.6	61.7	58.3	56.7	54.2
(2021/09/15 19:15:02.00)	55.5	68.7	61.8	56.5	53.2
(2021/09/15 19:20:02.00)	55.4	59.1	57.4	56.5	54
(2021/09/15 19:25:02.00)	57.3	68.1	66.7	58.2	54.3
(2021/09/15 19:30:02.00)	56.8	61.1	59.1	58.1	54.9
(2021/09/15 19:35:02.00)	57.7	61.4	60.3	59	56.1
(2021/09/15 19:40:02.00)	58	61.8	60.8	59.7	55.6
(2021/09/15 19:45:02.00)	57.9	61.3	60.4	59.3	56.5
(2021/09/15 19:50:02.00)	56.9	60.4	59.3	58.4	55
(2021/09/15 19:55:02.00)	55.7	60.1	57.9	57.1	54.1
(2021/09/15 20:00:02.00)	56.7	59.3	58.5	57.7	55.5
(2021/09/15 20:05:02.00)	56.2	59.5	58.7	57.6	54.3
(2021/09/15 20:10:02.00)	55.5	59.6	58.2	57	53.5
(2021/09/15 20:15:02.00)	56.6	61	59.9	57.8	54.9
(2021/09/15 20:20:02.00)	57.7	63	61.1	59.4	55.3
(2021/09/15 20:25:02.00)	59.6	67	64	61.2	57
(2021/09/15 20:30:02.00)	57	60.5	59.3	58.2	55.1
(2021/09/15 20:35:02.00)	56.9	59.5	59	58.1	55.1
(2021/09/15 20:40:02.00)	58.4	61.8	60.8	59.6	57
(2021/09/15 20:45:02.00)	57.7	61.8	60.2	59.2	55.6
(2021/09/15 20:50:02.00)	56.6	60.9	60.2	58.6	54
(2021/09/15 20:55:02.00)	56.5	61.5	60.2	58.5	53.8
(2021/09/15 21:00:02.00)	58.5	62.6	61.6	60.3	56.1
(2021/09/15 21:05:02.00)	57.5	62.9	61.1	59.5	54.6
(2021/09/15 21:10:03.00)	57.5	65.8	63.1	59.7	54.8
(2021/09/15 21:15:02.00)	56.8	60.8	59.8	58.5	54.4
(2021/09/15 21:20:02.00)	58	61.9	60.1	59.3	56.3
(2021/09/15 21:25:02.00)	58.4	62.9	62	60.3	55.4
(2021/09/15 21:30:02.00)	57.5	62.7	61.7	60.1	54.4

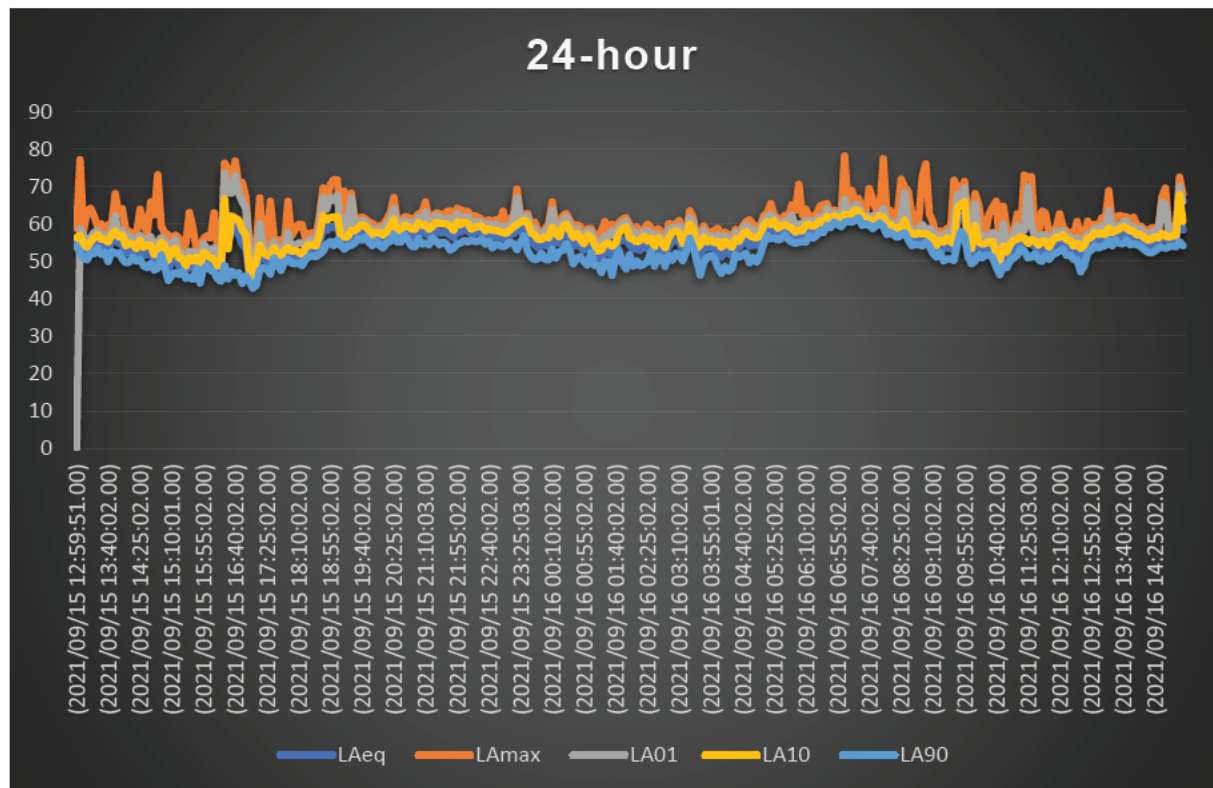
(2021/09/15 21:35:02.00)	57.8	61.7	60.8	59.9	55.1
(2021/09/15 21:40:02.00)	57.7	63.2	61.3	59.9	54.5
(2021/09/15 21:45:02.00)	56.9	63.4	61.3	59.4	53
(2021/09/15 21:50:02.00)	56.2	60.5	59.7	58.2	53.5
(2021/09/15 21:55:02.00)	58.1	64.2	62.6	60.6	54.6
(2021/09/15 22:00:02.00)	57.7	63.7	61.5	59.8	54.9
(2021/09/15 22:05:02.00)	58.4	63.3	61.7	60.4	55.5
(2021/09/15 22:10:02.00)	58.2	63.3	61.8	60.2	55.1
(2021/09/15 22:15:02.00)	57.2	62	60.6	58.6	55.5
(2021/09/15 22:20:02.00)	57.5	62.1	60.6	59	55.3
(2021/09/15 22:25:01.00)	57.7	61.7	60.4	59.3	55.3
(2021/09/15 22:30:02.00)	58	61.1	60.4	59.4	56
(2021/09/15 22:35:02.00)	56.6	60.1	59	58.1	54.5
(2021/09/15 22:40:02.00)	57.2	61	60	58.7	55.4
(2021/09/15 22:45:02.00)	56.5	60.5	59.4	58.3	53.5
(2021/09/15 22:50:02.00)	56.4	61.1	59.9	58.2	54.5
(2021/09/15 22:55:02.00)	56.5	59.7	58.9	57.9	54.3
Average	55.6	61.4	58.3	56	51.3
Maximum	62.3	77.1	73.5	66.6	57
Night-time					
(2021/09/15 23:00:02.00)	56.1	63.3	59.3	57.7	53.8
(2021/09/15 23:05:02.00)	56.1	59.4	58.3	57.4	54.3
(2021/09/15 23:10:02.00)	57.1	61.1	59.7	58.4	55.1
(2021/09/15 23:15:02.00)	57.4	62.1	60.9	59.1	54.7
(2021/09/15 23:20:02.00)	58.1	69.2	66.9	59.8	53.1
(2021/09/15 23:25:03.00)	57.9	62	61.4	60.4	55
(2021/09/15 23:30:02.00)	59.3	62.3	61.6	60.8	56.7
(2021/09/15 23:35:02.00)	57.6	62.8	62	60.5	52.6
(2021/09/15 23:40:02.00)	55.3	59.6	58.7	57.6	51.2
(2021/09/15 23:45:02.00)	54.5	60.5	58.7	57.1	50.3
(2021/09/15 23:50:02.00)	53.6	58	57	55.8	50.7
(2021/09/15 23:55:02.00)	54.4	57.4	56.7	55.8	52.1
(2021/09/16 00:00:02.00)	54.3	58.6	57.9	56.6	50.4
(2021/09/16 00:05:02.00)	53.9	60	58.5	56.2	50.3
(2021/09/16 00:10:02.00)	57.2	65.8	63.7	59	53.3
(2021/09/16 00:15:02.00)	55.1	60	59.1	57.4	50.8
(2021/09/16 00:20:01.00)	54.8	59	57.6	56.5	52.5
(2021/09/16 00:25:02.00)	57	62	60.6	59.3	52.9
(2021/09/16 00:30:01.00)	57.8	62.7	61.7	59.8	54.6
(2021/09/16 00:35:02.00)	55.9	60.8	59.7	58.2	52.7
(2021/09/16 00:40:02.00)	53.9	59.5	57.8	56.3	49.3
(2021/09/16 00:45:02.00)	54.8	59.7	58.7	57.5	50.7
(2021/09/16 00:50:01.00)	53.8	59.2	57.3	55.9	51.2
(2021/09/16 00:55:02.00)	53	57.5	56.1	54.6	50
(2021/09/16 01:00:02.00)	54	58.6	57.9	57	48.9
(2021/09/16 01:05:02.00)	54.7	58.7	57.9	56.6	52.2
(2021/09/16 01:10:02.00)	52.3	56.9	55.9	54.5	48.9
(2021/09/16 01:15:02.00)	51.2	56.6	54.4	52.7	49
(2021/09/16 01:20:02.00)	50.9	58.1	55.2	53	47
(2021/09/16 01:25:02.00)	52.7	60.6	56.7	54.7	49.9
(2021/09/16 01:30:02.00)	52.7	57.7	56.5	54.9	49.7
(2021/09/16 01:35:02.00)	51.3	59.8	58.2	54	46.2
(2021/09/16 01:40:02.00)	52.8	57.7	56.6	54.7	50.5
(2021/09/16 01:45:02.00)	55.6	60.3	59.2	57.5	52.8

(2021/09/16 01:50:02.00)	55.5	61.2	60.1	58.6	49.4
(2021/09/16 01:55:02.00)	56	61.5	60.7	59.2	47.9
(2021/09/16 02:00:02.00)	54.4	59.7	58.4	56.1	51.7
(2021/09/16 02:05:02.00)	53.3	58.6	57.9	55.9	48.7
(2021/09/16 02:10:02.00)	53.2	59.2	57.3	55.1	50.1
(2021/09/16 02:15:02.00)	52.9	57.3	56.7	55.5	48.8
(2021/09/16 02:20:02.00)	54.7	58.6	57.9	56.7	49.2
(2021/09/16 02:25:02.00)	53.2	59.9	58	55.4	49.8
(2021/09/16 02:30:02.00)	54.6	58.9	57.7	56.1	52.5
(2021/09/16 02:35:02.00)	51.8	56.1	55.2	53.9	48.7
(2021/09/16 02:40:03.00)	54.5	58.7	57.1	56.3	51.3
(2021/09/16 02:45:02.00)	53.3	57.6	56.2	55	50.8
(2021/09/16 02:50:02.00)	51.3	55.5	54.8	53.6	48.6
(2021/09/16 02:55:02.00)	53.9	60.1	58.4	56.1	51.4
(2021/09/16 03:00:02.00)	55.1	59.7	58.9	57.6	50.2
(2021/09/16 03:05:02.00)	55.5	59.7	59	58.1	52.1
(2021/09/16 03:10:02.00)	55.4	60.8	59.4	57.6	51.6
(2021/09/16 03:15:02.00)	52.9	57	56	54.8	50.2
(2021/09/16 03:20:02.00)	54.8	58.3	57.5	56.5	52.5
(2021/09/16 03:25:02.00)	58.2	63.4	61.5	59.8	56.1
(2021/09/16 03:30:02.00)	56.6	61.5	60.3	58.6	53.7
(2021/09/16 03:35:02.00)	52.1	56.5	55	53.5	50
(2021/09/16 03:40:02.00)	51.5	56.7	55.7	54.4	46.3
(2021/09/16 03:45:02.00)	53.7	59.4	58.2	56.5	49.8
(2021/09/16 03:50:02.00)	53.5	57.6	56.3	55.2	51
(2021/09/16 03:55:01.00)	54	57.8	56.8	55.7	51.5
(2021/09/16 04:00:02.00)	53.1	58.2	56.4	54.9	50.8
(2021/09/16 04:05:02.00)	52.5	58.8	56.8	55.2	48.4
(2021/09/16 04:10:02.00)	51.1	56.3	55	53.7	46.7
(2021/09/16 04:15:02.00)	53	57.8	56.8	55.4	48.6
(2021/09/16 04:20:02.00)	52	57	55.8	54.6	47.3
(2021/09/16 04:25:02.00)	51.6	56.3	55	53.7	48.1
(2021/09/16 04:30:02.00)	54.2	58.5	57.6	56	51.8
(2021/09/16 04:35:02.00)	53.5	57.2	56.3	55.3	51.1
(2021/09/16 04:40:02.00)	55.2	59.2	58.3	57.1	51.5
(2021/09/16 04:45:02.00)	55.8	60.5	59.5	57.9	52.1
(2021/09/16 04:50:02.00)	54	61	58.8	56.8	49.6
(2021/09/16 04:55:02.00)	54.4	59.8	58.4	56.4	51
(2021/09/16 05:00:02.00)	54.3	58.7	57.3	56.2	49.7
(2021/09/16 05:05:02.00)	54.5	59.2	58.3	56.7	51.6
(2021/09/16 05:10:02.00)	57.2	62.1	60.7	59.5	54.6
(2021/09/16 05:15:01.00)	58.9	62.8	61.5	60.5	56.9
(2021/09/16 05:20:02.00)	58.2	65.4	62.4	59.8	56
(2021/09/16 05:25:02.00)	58.9	62.5	61.6	60.8	56.3
(2021/09/16 05:30:02.00)	57.4	61.2	59.8	58.8	55.6
(2021/09/16 05:35:02.00)	57.8	61.1	60.3	59.4	56
(2021/09/16 05:40:02.00)	58.5	62.2	60.5	59.7	57.2
(2021/09/16 05:45:02.00)	57.8	61.5	60.8	59.3	55.8
(2021/09/16 05:50:02.00)	57.5	65	62.2	58.8	55.1
(2021/09/16 05:55:02.00)	56.4	63.6	59.6	57.8	54.8
(2021/09/16 06:00:02.00)	56.9	70.5	59.8	58.1	55
(2021/09/16 06:05:02.00)	56.9	62.3	60.2	58.1	55.2
(2021/09/16 06:10:02.00)	57.7	63.8	60.8	59.7	55.1
(2021/09/16 06:15:02.00)	58.4	61.8	60.8	59.8	57

(2021/09/16 06:20:02.00)	57.7	61.9	60.5	59.2	56.1
(2021/09/16 06:25:02.00)	58.4	62.5	61.1	59.8	56.8
(2021/09/16 06:30:02.00)	59.5	64.7	61.8	60.8	57.9
(2021/09/16 06:35:02.00)	58.9	65.1	61.9	60	57.7
(2021/09/16 06:40:02.00)	60.9	65.4	64	62	59.6
(2021/09/16 06:45:02.00)	60	62.1	61.5	60.9	59
(2021/09/16 06:50:02.00)	61.3	63.7	62.9	62.1	60.4
(2021/09/16 06:55:02.00)	60.9	63.2	62.4	61.8	59.8
Average	56.0	60.3	58.8	57.2	52.2
Maximum	61.3	70.5	66.9	62.1	60.4
Daytime					
(2021/09/16 07:00:02.00)	60.2	62.3	61.7	61	59.2
(2021/09/16 07:05:03.00)	61.9	78.1	66.4	62.5	60.3
(2021/09/16 07:10:02.00)	61.6	64.7	63.2	62.4	60.7
(2021/09/16 07:15:02.00)	61.6	68.9	63.3	62.6	60.4
(2021/09/16 07:20:02.00)	62.5	66.2	65.2	63.7	60.8
(2021/09/16 07:25:02.00)	62.6	66.7	64.5	63.5	61.6
(2021/09/16 07:30:02.00)	60.7	63	62.3	61.7	59.6
(2021/09/16 07:35:02.00)	60.9	62.9	62.2	61.7	60
(2021/09/16 07:40:02.00)	60.4	69.4	61.8	61	59.6
(2021/09/16 07:45:02.00)	59.8	66.6	62.1	60.7	58.7
(2021/09/16 07:50:02.00)	60.3	63.6	62.3	61.1	59.5
(2021/09/16 07:55:02.00)	61.2	63.3	62.7	62.1	60.2
(2021/09/16 08:00:02.00)	60.7	77.3	64	61.7	59.3
(2021/09/16 08:05:02.00)	58.7	62.7	60.8	60	57.1
(2021/09/16 08:10:02.00)	58.8	63.6	60.7	59.7	57.7
(2021/09/16 08:15:02.00)	57.9	60.7	59.7	58.9	56.8
(2021/09/16 08:20:02.00)	57.7	63.3	59.5	58.8	56.3
(2021/09/16 08:25:02.00)	58.5	71.9	61.6	59.3	57.1
(2021/09/16 08:30:02.00)	60.2	69.7	68.3	60.9	57.6
(2021/09/16 08:35:02.00)	57.1	68.6	59.8	58.2	55.7
(2021/09/16 08:40:02.00)	56	62.7	58.3	57.3	54.2
(2021/09/16 08:45:01.00)	56	59	58.2	57.2	54.4
(2021/09/16 08:50:02.00)	56.3	61.2	58.6	57.5	54.4
(2021/09/16 08:55:01.00)	56.2	72.6	59.8	57.3	54.1
(2021/09/16 09:00:02.00)	56.6	76	58.5	57.3	55
(2021/09/16 09:05:02.00)	55.6	62.6	58.8	56.7	54.1
(2021/09/16 09:10:02.00)	54.6	60.5	58.1	56.3	52.1
(2021/09/16 09:15:02.00)	52.8	56.3	55.3	54.2	51.1
(2021/09/16 09:20:02.00)	54.3	58.1	56.9	55.7	52.3
(2021/09/16 09:25:02.00)	53.2	57.5	56.3	55.1	50.2
(2021/09/16 09:30:02.00)	53.8	58.8	57.7	56.3	50.5
(2021/09/16 09:35:02.00)	53.3	57.8	56.6	55.3	50.6
(2021/09/16 09:40:02.00)	53.3	71.6	59.8	54.6	50.2
(2021/09/16 09:45:02.00)	61.4	69.3	67.8	64.4	54.8
(2021/09/16 09:50:02.00)	62.2	69.5	67.5	65.1	57.9
(2021/09/16 09:55:02.00)	62.4	71.3	69.6	66	56.8
(2021/09/16 10:00:02.00)	53.3	60.5	56.8	54.9	51.2
(2021/09/16 10:05:02.00)	51.6	62.3	55.8	53.5	49.4
(2021/09/16 10:10:01.00)	55.7	68	65.4	59.5	50.1
(2021/09/16 10:15:02.00)	53.9	65.2	57.6	55.3	51.8
(2021/09/16 10:20:02.00)	53	59.3	56.9	54.5	50.9
(2021/09/16 10:25:02.00)	53.3	57.9	56.5	54.8	51.6
(2021/09/16 10:30:02.00)	53.7	62.6	56.6	55.1	51.7

(2021/09/16 10:35:02.00)	53.5	64.4	57.6	55.2	50.9
(2021/09/16 10:40:02.00)	50.8	66	56.7	51.9	48.5
(2021/09/16 10:45:02.00)	48.6	53.3	51.5	50.1	46.4
(2021/09/16 10:50:02.00)	52.1	64.7	59.8	54	48.6
(2021/09/16 10:55:02.00)	50.5	58.8	54.4	52.5	48.3
(2021/09/16 11:00:02.00)	52.6	56.9	55.6	54.5	50.2
(2021/09/16 11:05:02.00)	53.5	58	57	55.7	50.9
(2021/09/16 11:10:02.00)	54	62.6	59.5	55.8	51.5
(2021/09/16 11:15:02.00)	55.1	59.2	57.9	56.6	53.5
(2021/09/16 11:20:02.00)	55.8	73.1	58.3	56.2	52.7
(2021/09/16 11:25:03.00)	55.8	72.3	69.7	54.7	50.9
(2021/09/16 11:30:02.00)	54.4	72.6	59.4	55.8	51.1
(2021/09/16 11:35:02.00)	54	57.7	56.6	55.4	52
(2021/09/16 11:40:02.00)	52.5	56.9	55.5	54.3	50.4
(2021/09/16 11:45:02.00)	53	63.4	56.9	55.3	50
(2021/09/16 11:50:02.00)	53.8	62.8	57	55.4	51.7
(2021/09/16 11:55:02.00)	52.2	57.5	55.4	53.7	50.4
(2021/09/16 12:00:02.00)	53.8	57.9	56.5	55.4	51.7
(2021/09/16 12:05:02.00)	54.6	58.8	57.9	56.4	52.1
(2021/09/16 12:10:02.00)	54.7	62.6	57.6	56.3	52.7
(2021/09/16 12:15:02.00)	55.4	59.1	58.1	57.1	53.3
(2021/09/16 12:20:02.00)	53.8	58	56.8	55.6	51.5
(2021/09/16 12:25:02.00)	53.8	57.6	56.4	55.5	51.6
(2021/09/16 12:30:02.00)	52.3	57.2	55.3	54	50.4
(2021/09/16 12:35:02.00)	53.1	60.6	56.2	54.8	50.4
(2021/09/16 12:40:02.00)	51	56.5	55.1	53.4	47.2
(2021/09/16 12:45:02.00)	52.1	56.8	55.4	54.2	48.8
(2021/09/16 12:50:02.00)	54.4	60.7	57.3	56.2	52.2
(2021/09/16 12:55:02.00)	54.9	58.8	57.3	56.3	52.9
(2021/09/16 13:00:02.00)	55.9	59.8	58.9	57.7	54.1
(2021/09/16 13:05:02.00)	55.4	59	58.1	57.1	53.5
(2021/09/16 13:10:02.00)	55.9	61.5	59.4	57.6	53.9
(2021/09/16 13:15:02.00)	55.7	61.3	58.1	57	54.2
(2021/09/16 13:20:02.00)	57.7	68.8	63.4	58.9	55.6
(2021/09/16 13:25:02.00)	56	59.9	58.8	57.7	54
(2021/09/16 13:30:02.00)	57	61.7	59.3	58.1	55.7
(2021/09/16 13:35:02.00)	57.2	62.3	59.6	58.6	54.8
(2021/09/16 13:40:02.00)	56.9	61.9	60.4	59.2	54.6
(2021/09/16 13:45:02.00)	57.3	61.9	60.7	58.9	55.6
(2021/09/16 13:50:02.00)	56.3	60.8	59.4	58.1	54.4
(2021/09/16 13:55:02.00)	56.5	61.8	59.2	58	54.6
(2021/09/16 14:00:02.00)	55.7	59.5	58.4	57	54.4
(2021/09/16 14:05:02.00)	55.7	59.4	58.6	57.2	53.9
(2021/09/16 14:10:02.00)	54.7	58.5	57.4	56.2	53.1
(2021/09/16 14:15:02.00)	54.2	57.7	56.6	55.6	52.4
(2021/09/16 14:20:02.00)	54.3	58.9	57.6	55.8	52.2
(2021/09/16 14:25:02.00)	54.8	59	58.1	56.5	52.7
(2021/09/16 14:30:02.00)	55	58.6	57.3	56.2	53.4
(2021/09/16 14:35:02.00)	56.7	67.2	65.6	57.4	53.8
(2021/09/16 14:40:02.00)	56	69.5	65.1	56.7	53.4
(2021/09/16 14:45:03.00)	55.3	58.2	57.2	56.4	53.8
(2021/09/16 14:50:02.00)	55.6	59.5	58.3	56.8	54
(2021/09/16 14:55:02.00)	55.5	58.2	57.5	56.7	53.8
(2021/09/16 15:00:02.00)	62.6	72.4	69.9	67.7	55.2

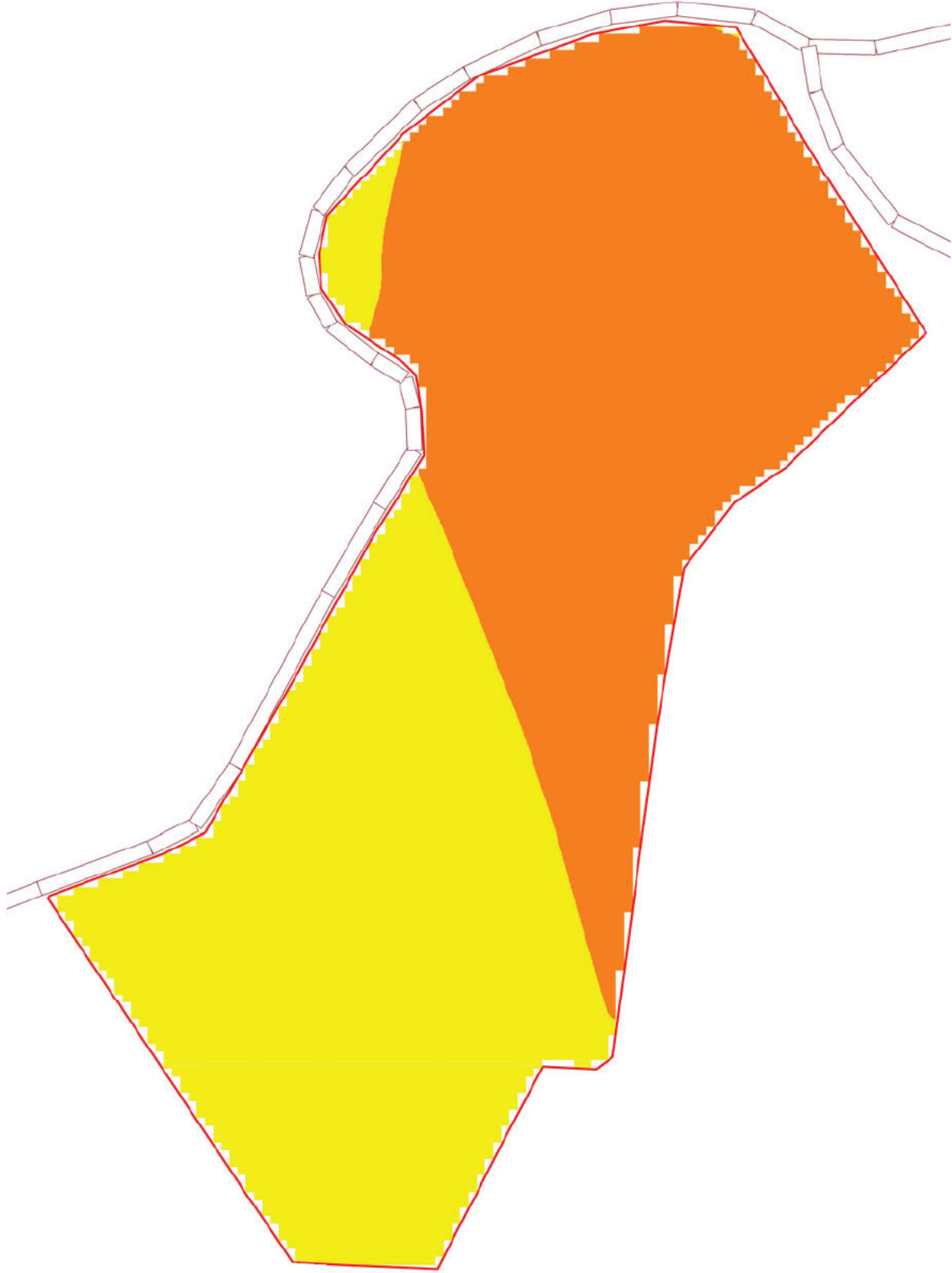
(2021/09/16 15:05:02.00)	58.4	67.9	66	60.7	54.2
Average	57.2	62.9	59.5	57.5	53.7
Maximum	62.6	78.1	69.9	67.7	61.6



Date	L _{Aeq}	L _{Amax}	L _{A01}	L _{A10}	L _{A90}
Multiple bikes congregated around obstacle @ Approx 5m					
(2021/09/15 10:56:53.00)	78.7	92.1	88.4	81.7	69.5
(2021/09/15 11:00:02.00)	75.8	87.2	86	79.3	66.8
Average	77.5	89.7	87.2	80.5	68.2
Maximum	78.7	92.1	88.4	81.7	69.5
Bike rev/pass by @ Approx 0.5m					
(2021/09/15 11:02:14.00)	85.1	104.2	99.7	84.2	70.6
Bikes consecutively going up verticle obstacle @ Approx 1.5m					
(2021/09/15 11:05:01.00)	84.3	101.8	100.4	82.8	71.8
(2021/09/15 11:05:52.00)	78.5	87.3	86.4	82	71.5
(2021/09/15 11:06:13.00)	80.1	89.1	87.5	83.3	73.4
(2021/09/15 11:06:59.00)	75.2	86.5	85.2	77.7	67.1
(2021/09/15 11:09:10.00)	75.6	89.7	86.7	78.8	63.4
Average	80.1	90.9	89.2	80.9	69.4
Maximum	84.3	101.8	100.4	83.3	73.4
One bike going over rock obstacle @ Approx 2m					
(2021/09/15 11:13:44.00)	76.7	86.5	85.6	80.5	68.8
(2021/09/15 11:14:42.00)	77.4	86.2	85.7	80.9	68.2
(2021/09/15 11:15:02.00)	78.1	87.6	85.5	81.3	72.4
(2021/09/15 11:17:59.00)	78.6	95	87.5	82	68.6
Average	77.8	88.8	86.1	81.2	69.5
Maximum	78.6	95	87.5	82	72.4
One bike going up pipe obstacle @ Approx 2m					
(2021/09/15 11:22:42.00)	73.7	86.7	85.8	74	62.6
(2021/09/15 11:23:31.00)	76.9	88.1	87.1	81.8	63.3

(2021/09/15 11:24:44.00)	76.8	86.3	85.1	82	68.1
Average	76.0	87	86	79.3	64.7
Maximum	76.9	88.1	87.1	82	68.1
3x Startup of bike @ Approx 1m					
(2021/09/15 11:28:10.00)	82.1	89.9	-	86.8	60.4
(2021/09/15 11:28:44.00)	80.7	90.7	-	85.8	54.8
(2021/09/15 11:29:20.00)	80.5	88.5	-	86	59
Average	81.2	89.7	-	86.2	58.1
Maximum	82.1	90.7	-	86.8	60.4
1-hr sample on site					
(2021/09/15 11:39:42.00)	45.6	48.6	48.2	47.1	44
(2021/09/15 11:40:02.00)	47.9	59.1	50.7	49.4	45.6
(2021/09/15 11:45:02.00)	47	55.3	50.5	48.3	45.2
(2021/09/15 11:50:02.00)	46.3	55.5	49.5	47.6	44.6
(2021/09/15 11:55:02.00)	48.8	56.5	53.2	50.9	46.2
(2021/09/15 12:00:01.00)	49	52.1	51.1	50.2	47.4
(2021/09/15 12:05:02.00)	47.8	51.5	50	49	46.2
(2021/09/15 12:10:02.00)	48.6	63.5	52.2	49.6	46.6
(2021/09/15 12:15:02.00)	47.9	69.4	51.8	48.8	45.6
(2021/09/15 12:20:03.00)	47.4	61.9	52.1	48.7	45.5
(2021/09/15 12:25:02.00)	48.9	54.6	51.7	50.4	47.3
(2021/09/15 12:30:02.00)	48.8	57.8	55.3	50.2	46.7
(2021/09/15 12:35:02.00)	52.4	66.2	64	53	47.1
(2021/09/15 12:40:02.00)	46.3	52.6	49	47.3	45.1
Average	48.4	57.5	52.1	49.3	45.9
Maximum	52.4	69.4	64	53	47.4

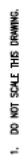
APPENDIX F



1. DO NOT SCALE THIS DRAWING.

0–40dB(A)	40–45dB(A)	45–50dB(A)	50–55dB(A)	55–56dB(A)	56–57dB(A)	57–58dB(A)	58–59dB(A)	59–60dB(A)	60–65dB(A)	>65dB(A)
										

REV	DATE	BY	CHKD	DATE
001	01/01/2004	001	001	01/01/2004
PROJECT: SERRAW HILL QUARRY, MILL LANE, EARL SHILTON				
DRAWN BY: EXTERNAL NIGHT-TIME Lsqg 8hour SOUND LEVELS				
CLIENT: AT CONTRACTING & PLANT HIRE LTD				
DRAWN BY: MILL HIRE		26726_04_120_02		
REF: -	A3	SCALE		
DATE: -		NTS		
STATE:		FOR INFORMATION		
TOWN: SERRAW HILL ROAD: SERRAW HILL VILLAGE: SERRAW HILL COUNTY: SERRAW HILL POSTCODE: SERRAW HILL		CONTACT: SERRAW HILL TEL: SERRAW HILL FAX: SERRAW HILL E-MAIL: SERRAW HILL		
				
M-EC ACOUSTIC AIR				



0–40dB(A)	40–45dB(A)	45–50dB(A)	50–55dB(A)	55–60dB(A)	60–65dB(A)	65–70dB(A)	70–75dB(A)	75–80dB(A)	80–85dB(A)	>85dB(A)
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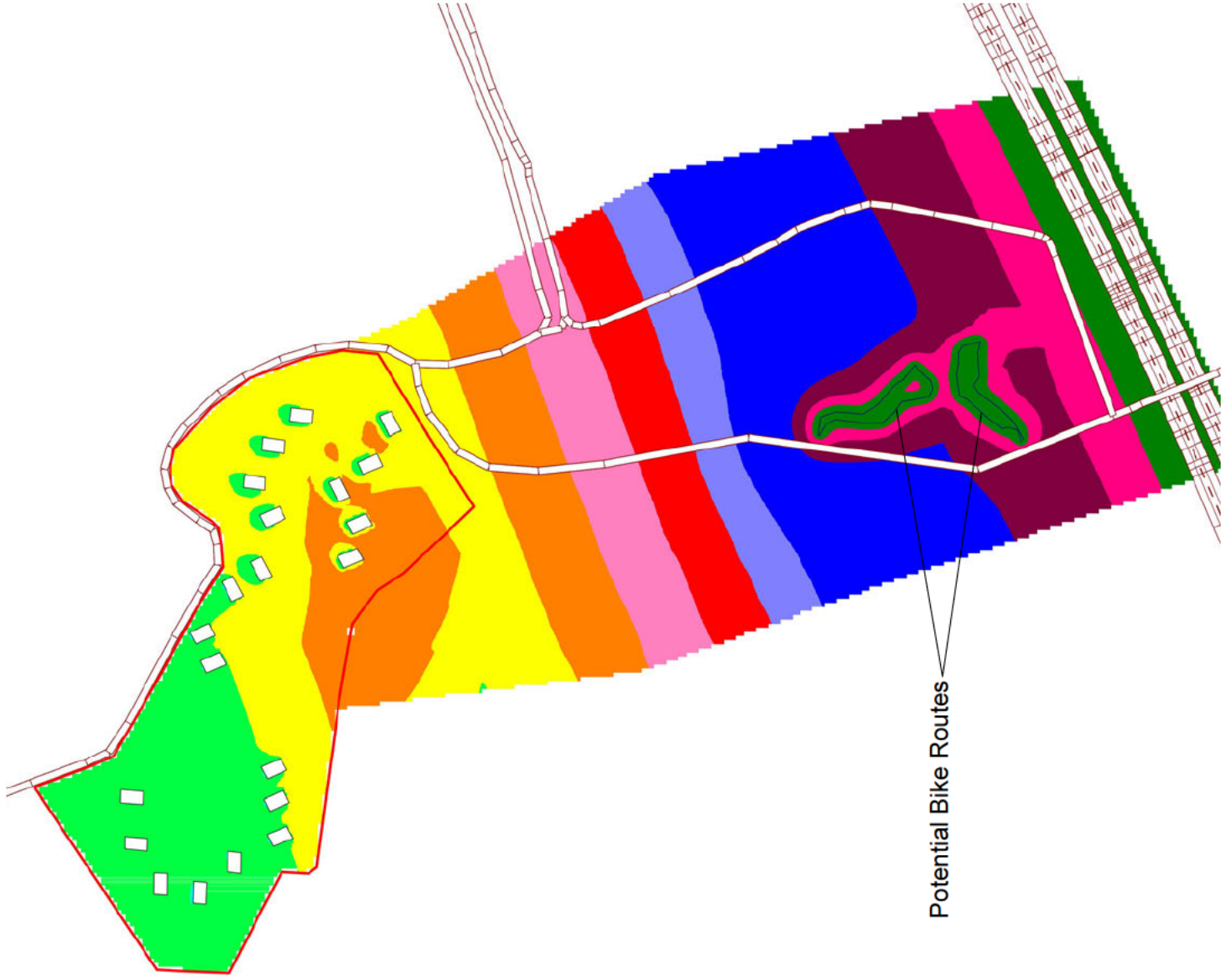
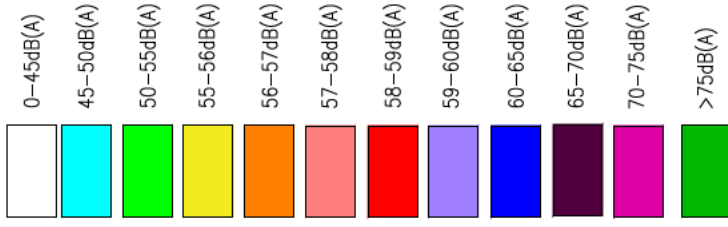
PROJECT	APPROVER'S ID	DATE	TIME	DAY	MONTH	YEAR
BARROW HILL QUARRY, MILL LANE, EARL SHILTON						
EXTERNAL NIGHT-TIME Lmax SOUND LEVELS						
SOUNDING FILE TITLE						
A1 CONTRACTING & PLANT HIRE LTD						
REPORT NUMBER	26726_04_120_03					
REVISION	-		SHEET NO		TOTAL	
			A3		NTS	
FOR INFORMATION						

MTC
ACOUSTIC AIR

NOTES:

1. DO NOT SCALE THIS DRAWING.

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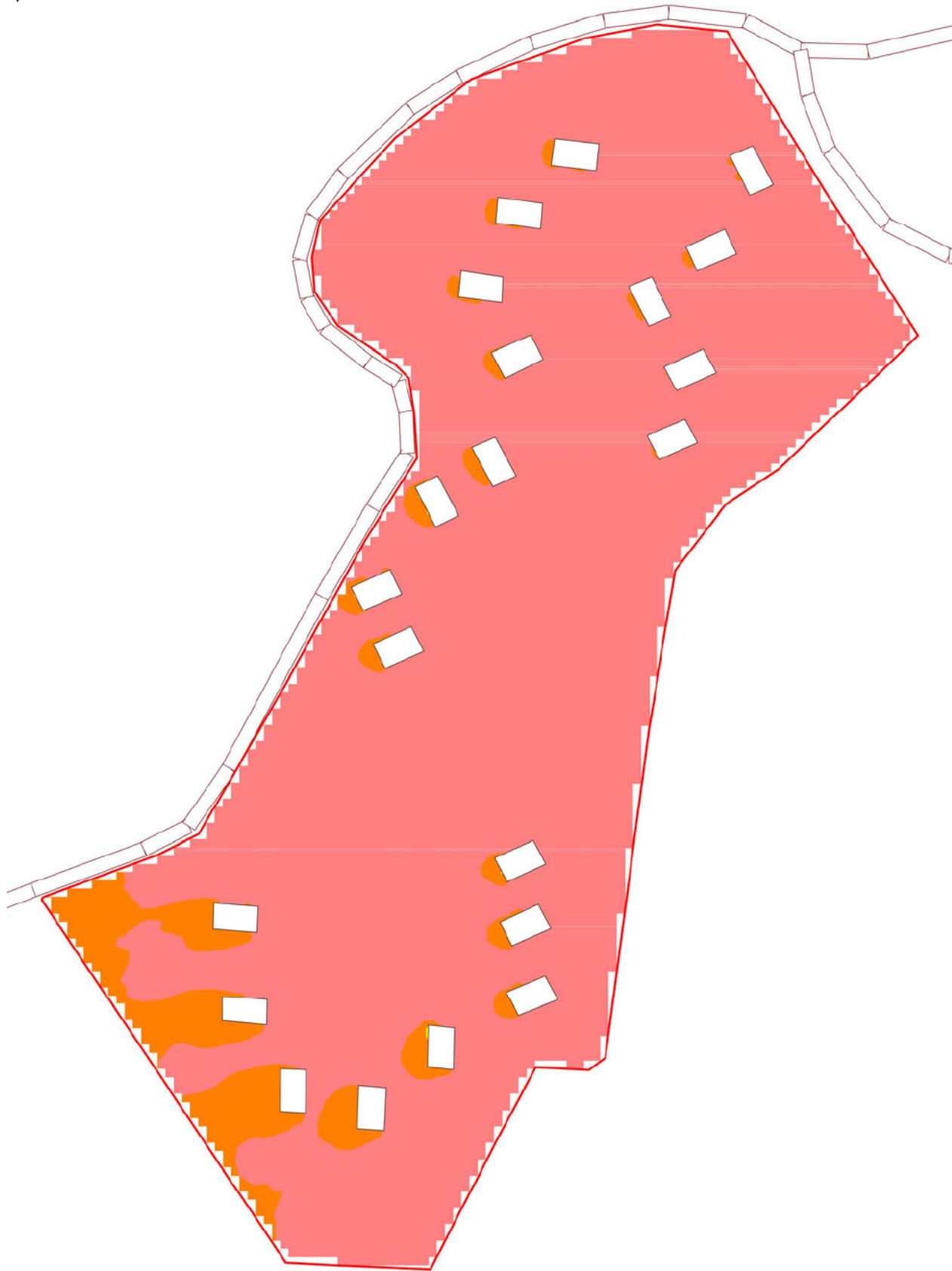
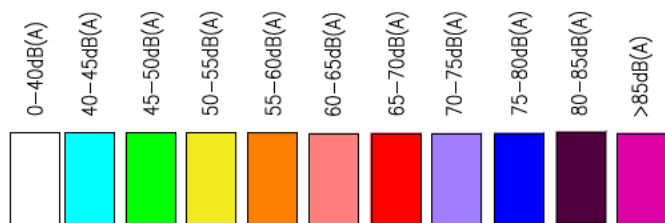


Potential Bike Routes

REV	DESCRIPTION	DATE	BY	CHK	APP	DATE
1	ISSUED FOR TENDERS	20/04/04				
2	REVISED TO SHOW	20/04/04				
3	REVISED TO SHOW	20/04/04				
4	REVISED TO SHOW	20/04/04				
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100	REVISED TO SHOW	20/04/04				

1. DO NOT SCALE THIS DRAWING.

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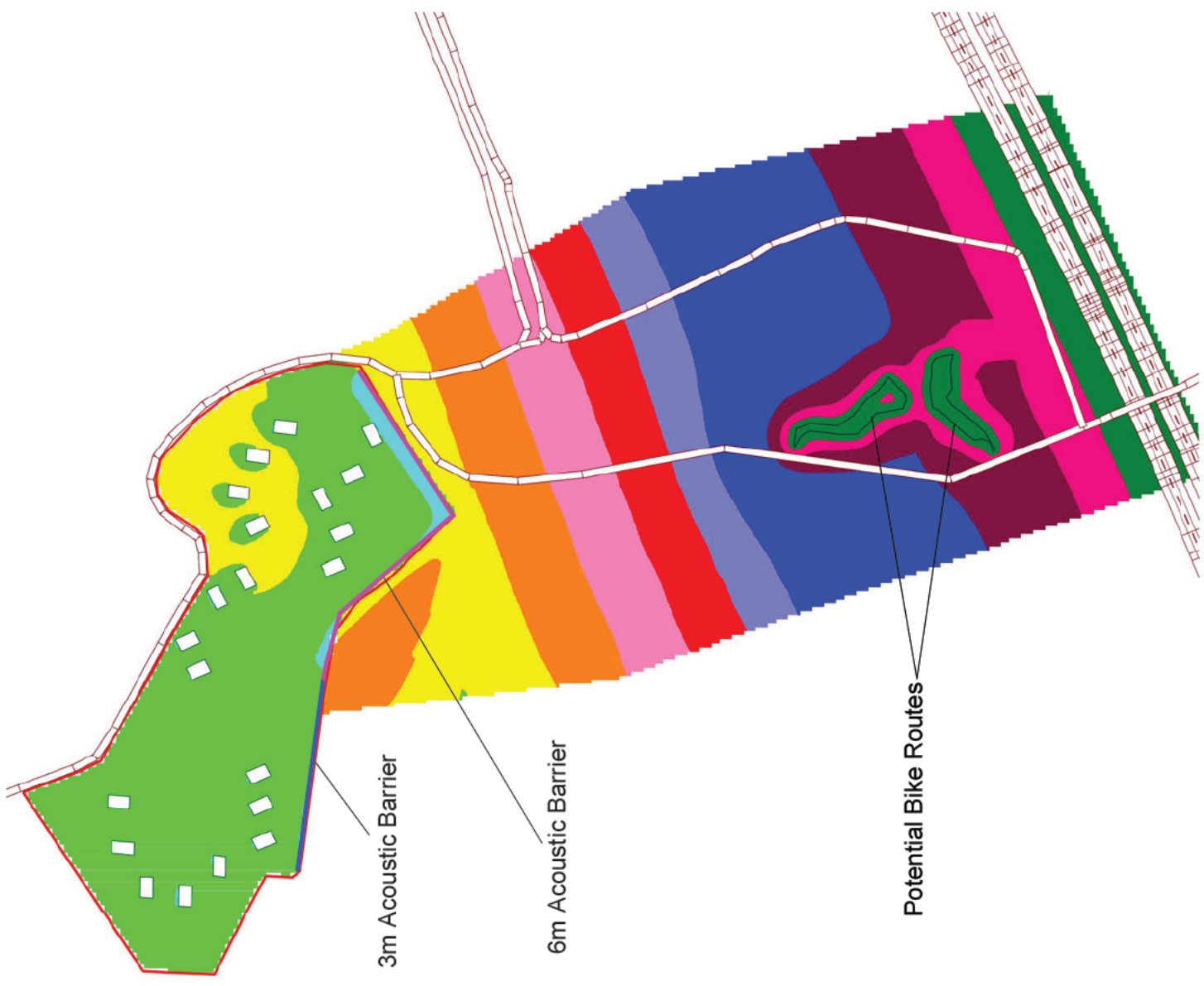
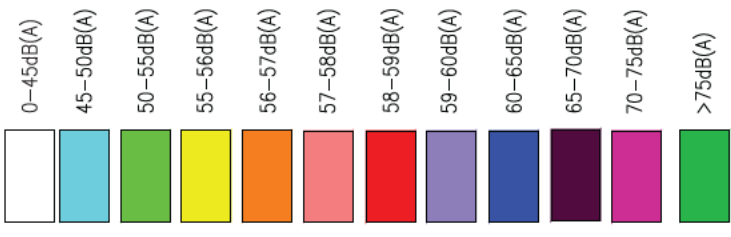
TOUGH	ADDITIONAL INFO	SHEET NO.	DATE	TIME	DAY	MONTH	YEAR
BARROW HILL QUARRY, MILL LANE, EARL SHILTON							
EXTERNAL NIGHT-TIME LAmax SOUND LEVELS WITH LAYOUT							
AT CONTRACTING & PLANT HIRE LTD							
26720_04_120_06							
SHEET A3							
NTS							
FOR INFORMATION							
 MPEC ACOUSTIC AIR CONDUCTED SURVEY TO DETERMINE NOISE LEVELS FROM THE PROPOSED LOADING UNLOADING OPERATIONS							



NOTES:

1. DO NOT SCALE THIS DRAWING.

KEY



REV	DESCRIPTION	BY	CHK	DATE
1	ISSUED FOR TENDERS	EARL SHILTON		
2	FOR INFORMATION			
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100	FOR INFORMATION			

APPENDIX G

Neil Forsdyke

From: Edd Liversidge [REDACTED]
Sent: 05 July 2021 15:27
To: Neil Forsdyke
Subject: Acoustics for windows

Afternoon Mr Forsdyke,

It was good speaking to you before. One of my suppliers has got back to me with some information regarding the acoustics of the windows.

It looks like the windows overall have an acoustic value of 34dB in total, the glazing itself has an acoustic value of 31dB. I hope this is of some help.

Kind Regards,

Edd Liversidge
Design and Technical Manager
Pemberton Park and Leisure homes Ltd
Woodhouse Lane
Wigan
Lancs
WN6 7NF
[REDACTED]

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APPENDIX H

PLASKOLITE

NOISE REDUCTION

Excess noise, whether it's from construction, heavy traffic, aircraft, trains or even noisy neighbors can be disruptive and even harmful to your health and well-being. Depending on the type of noise, its location with respect to the area to be protected and the pathway which the sound is transmitted, various sound protection measures can be deployed to reduce unwanted sounds and noises.

Sound pressure levels and sound reduction indexes are typically expressed in decibel units (abbreviated as dB). The human ear can also detect a difference of 3 dB in noise levels and perceives an increase by 10 dB as a *doubling* of loudness, e.g. car traffic noise at 70 dB seems twice as loud as a busy office environment measuring in at 60 dB. Commonly, there are three components to consider when solving noise problems. These are external noise, the absorption or deflection of noise from the wall or window glazing material and the existing noise in the room.

The goal of any noise reduction design strategy is to decrease the transmission of external noise into an interior space. TUFFAK® solid monolithic and multi-wall sheets can offer a permanent solution by reducing the transmittance of sound in a given area.

COMMON TERMS to NOISE REDUCTION

SOUND REDUCTION INDEX (ASTM E90-09)

The Weighted Sound Reduction Index (Rw) is a number used to rate the effectiveness of a soundproofing system (e.g. wall) or material (e.g. polycarbonate). Sound transmission loss for all materials varies with sound frequency with the loss typically being greater at higher frequencies. The higher the transmission loss (higher Rw), the better the material functions as a barrier to the passage of noise. Increasing the Rw by one unit translates to a reduction in sound of approximately 1 dB of noise level. Thicker materials achieve better noise reduction. TUFFAK® solid and multi-wall sheets achieve sound reduction not from absorption but from a reflection of the sound waves.

STC (ASTM E413-10)

STC stands for Sound Transmission Class. This is the most common rating used in North America for determining airborne sound transmission loss between 125 and 4,000 Hz. This range covers common noise including speech, television, music and similar sounds, but does not evaluate the material's ability to block low frequency noise, such as the bass in music or noise from heavy mechanical equipment. Therefore, the standard is considered by some to be outdated and limited in scope.

OITC (ASTM E1332-10a)

OITC stands for Outside-Indoor Transmission Class and is designed to indicate the sound transmission loss between outdoor and indoor spaces in a structure. The OITC rating represents transmission loss frequencies from 80 to 4,000 Hz. While STC is based on a noise spectrum targeting speech sounds, OITC uses a source noise spectrum that considers frequencies down to 80 Hz (aircraft/rail/truck traffic) and is weighted more towards lower frequencies.

SOUND PRESSURE LEVELS ASSOCIATED with COMMON NOISE SOURCES

Subjective Loudness	Sound Pressure (dB)	Noise Source
Painful	140	Jet aircraft takeoff - immediate vicinity
Intolerable	120	Pneumatic hammer at 1 meter
	110	Night club
Extremely noisy	100	Motorcycle
Very noisy	90	Machine shop
Moderately noisy	80	Busy city Highway
	70	Normal car traffic
Quiet	60	Business office
	50	Normal conversation
Very quiet	30	Whispering
	20	Ticking clock
	0	Threshold of hearing

A SOLUTION for NOISE REDUCTION

The table below shows sound reduction levels, in decibels, for TUFFAK® general purpose polycarbonate sheet. The ratings for TUFFAK GP would apply to other grades of solid TUFFAK polycarbonate as well.

mm (inch)	Rw (dB)	STC (dB)	OITC (dB)
3 (0.118")	24	24	19
4.5 (0.177")	27	27	22
6 (0.236")	29	29	24
9.5 (0.375")	33	33	27
12.7 (0.500")	35	34	30
18 (0.710")	37		

As an example, TUFFAK® 0.500" would have a sound reduction of 35 decibels when used as a sound barrier.

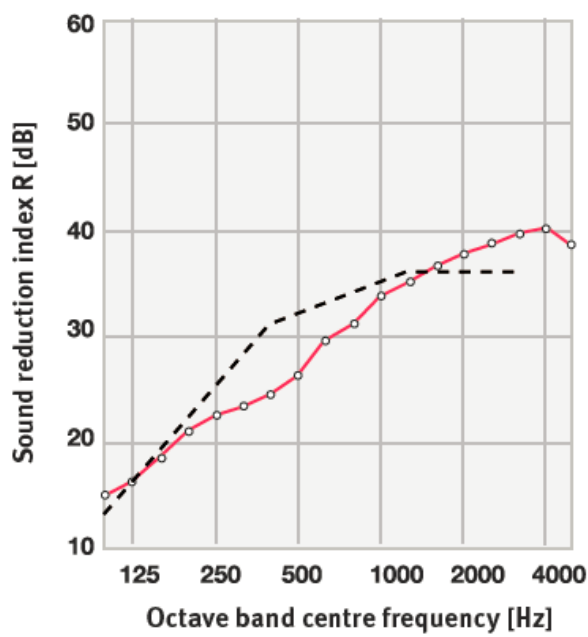
A significant sound reduction can be obtained combining TUFFAK® sheets with an air gap between the sheets.

mm (inch)	mm (inch)	mm (inch)	Rw (dB)	STC (dB)	OITC (dB)
PC 4 (0.158")	50 (1.97")	PC 4 (0.158")	31		
PC 4 (0.158")	150 (5.91")	PC 4 (0.158")	39		
PC 6 (0.236")	30 (1.18")	PC 6 (0.236")	32		
PC 6.35 (0.250")	12.7 (0.50")	PC 6.35 (0.250")		28	23
PC 10 (0.394")	30 (1.18")	PC 10 (0.394")	40		
PC 10 (0.394")	60 (2.36")	PC 10 (0.394")	45		
Glass 6.35 (0.250")	12.7 (0.50")	PC 6.35 (0.250")		31	26
Glass 6.35 (0.250")	12.7 (0.50")	PC 12.7 (0.50")		36	28

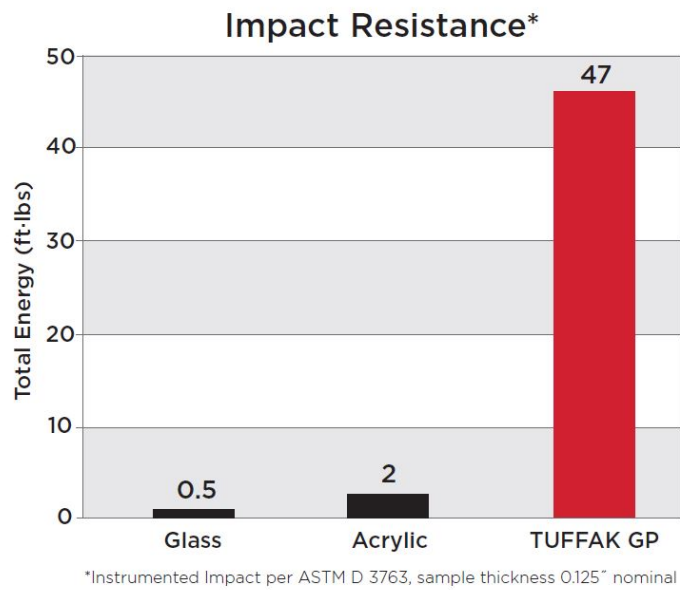
COMPARISON of NOISE REDUCTION CHARACTERISTICS of POLYCARBONATE to OTHER MATERIALS

Subjective Loudness	Sound Pressure (dB)
Acrylic sheet (0.118")	25
Acrylic sheet (0.236")	29
Acrylic sheet (0.472")	33
Glass (0.125")	25
Glass (0.250")	27
Plywood (1")	26
Steel (0.125")	37
Wood stud partition	38

SOUND REDUCTION SOLID POLYCARBONATE SHEET 8 mm (0.315")



TUFFAK® polycarbonate sheet is offered in UV stabilized, clear, tinted and colored. The material is also available with an extended UV and/or abrasion resistant coating. TUFFAK® polycarbonate exhibits high optical clarity and a good flame rating. Since TUFFAK® sheet offers extreme impact strength, it can be used as a transparent or colorful sound barrier to reduce noise levels while increasing safety.



DISCLAIMER:

These suggestions and data are based on information we believe to be reliable. They are offered in good faith, but without guarantee, as conditions and methods of use are beyond our control. We recommend that the prospective user determine the suitability of our materials and suggestions before adopting them on a commercial scale.

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