MEC
Development Technical Consultants

ACOUSTIC AIR

Proposed Holiday Park
Penstrowed Quarry, Caersws, Powys
Acoustics Assessment
May 2023

Report Ref: 26308-ENV-0401

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REPORT REF: 26308-ENV-0401

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REGISTRATION OF AMENDMENTS

Date	Rev	Comment	Prepared By	Checked By	Approved By
May 2023	-	First issue	**Neil S Forsdyke** Senior Acoustics & Air Quality Consultant	**Adam Walker** BSc (Hons) MIOA MInstSCVE Senior Acoustics Consultant	**Tim Rose** BA (Hons) MCIHT MTPS Director

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APPENDICES

1.0 INTRODUCTION

1.1 Mewies Engineering Consultants Ltd (M-EC), has been commissioned by GF Grigg Ltd (hereafter referred to as 'the Client') to undertake an Acoustics Assessment for a proposed Holiday Park on Land at Penstrowed Quarry, Caersws, Powys, SY17 5SG (hereafter referred to as 'the Site').

1.2 This report has been drafted in response to consultation comments received by the Local Planning Authority's (LPA) Environmental Health Officer (EHO), which are presented in **Appendix A**.

Assessment Scope

1.3 The following scope of works has been undertaken:

- An Environmental Sound Survey has been undertaken at a position representative of new receptors;
- Assessments have been undertaken in reference to BS 8233[1], BS 3632[2], and BS 4142[3];
- Appropriate noise limits for any mechanical/electrical service plant associated with the Site has been defined in accordance with BS 4142; and
- Where required, mitigation measures have been recommended to reduce noise impacts as far as practicable.

Disclaimer

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:

- The consequence of this documentation being used for any purpose or project other than that for which it was commissioned;
- The issue of this document to any third party with whom approval for use has not been agreed.

[1] BS 8233:2014 *'Guidance on sound insulation and noise reduction for buildings.'*
[2] BS 3632:2015 *'Specification for Residential Park Homes and Residential Lodges.'*
[3] BS 4142:2014 +A1:2019 *'Methods for rating and assessing industrial and commercial sound.'*

2.0 SITE DESCRIPTION

Existing Site

2.1 The Site, currently comprising the Penstrowed Quarry, is bound to all sides by open green fields.

2.2 The principal sources of noise affecting the Site will likely be from distant road traffic using the A489, located to the east of the Site, coupled with any contributions from a small concrete batching facility to the southeast (hereafter referred to as 'the Facility').

2.3 It should be noted that the local topography affords the Site significant screening from both the A489 and the Facility and, that both potential noise sources are located at a distance of approximately 160m or more from a position representative of new on-Site sensitive receptors.

2.4 An approximate redline boundary of the Site, along with a blueline boundary for the Facility, is presented in Figure 2.1.

Figure 2.1: Approximate Redline Boundary

Development Proposals

2.5 Development proposals include for touring caravan plots along the north eastern boundary, with holiday lodges across the remainder of the Site.

2.6 The proposed site plan is provided in **Appendix B**.

3.0 STANDARDS AND GUIDANCE

General

3.1 An acoustic glossary is provided in **Appendix C** to assist the reader.

Summary of Guidance and Standards

3.2 The following guidance and standards relevant to the assessment are presented herein:

- BS 8233:2014 *'Guidance on sound insulation and noise reduction for buildings'*;
- BS 3632:2015 *'Specification for Residential Park Homes and Residential Lodges'*; and
- BS 4142:2014 +A1;2019 *'Methods for rating and assessing industrial and commercial sound'*

3.3 For conciseness, the guidance and standards most appropriate to this assessment are summarised in this section.

BS 8223

3.4 BS 8233 provides recommendations for the control of noise in and around buildings. It suggests appropriate criteria and limits for different situations, which primarily are intended to guide the design of new buildings, or refurbished buildings undergoing a change of use.

3.5 The guidance provided includes appropriate internal and external noise level criteria which are applicable to residential buildings exposed to steady external noise sources. It is appreciated that this does not align with the variability typically found in noise sources produced by developments such as the Site, however, it is worth nothing the criteria for contextual purposes.

3.6 It is stated in the British Standard that it is desirable for internal ambient noise levels to not exceed the criteria set out in Table 3.1

Table 3.1: BS 8233:2014 Table 4 - Indoor Ambient Noise Levels for Dwellings

Activity	Location	07:00 – 23:00 ($L_{Aeq,16hr}$, dB)	23:00 – 07:00 ($L_{Aeq,8hr}$, dB)
Resting	Living Room	35	-
Dining	Dining Room/Area	40	-
Sleeping (daytime resting)	Bedroom	35	35

3.7 Recommendations for design criteria for external areas are also provided, in this regard it is stated that external amenity areas should not exceed 55 dB $L_{Aeq, T}$.

BS 3632

3.8 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 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.

3.9 With regard to noise, the build standard specified by BS 3632 is that caravan walls should achieve a sound reduction rating (R_w) no less than 35 dB.

BS 4142

3.10 BS 4142 describes methods for rating and assessing industrial and/or commercial sound and includes, but is not limited to, the assessment of:

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

3.11 The methods described in BS 4142 use outdoor sound levels to assess the likely effects of sound on people who are typically outside residential premises. Although indoor effects can be indicated where the façade composition is known. A summary of the approach set out in BS 4142 is set out below:

- Establish or predict the specific sound level of the source(s) by considering both the ambient (includes the source to be assessed) and residual (excludes the source to be assessed but includes all remaining sources) sound level;
- Measure the representative background sound levels, typically by measuring close to the receptor location;
- Rate the specific sound level to account for any distinguishing characteristics (see below);
- Estimate the impact by subtracting the background sound level from the rating level; and
- Consider the initial estimate of impact, as determined above, in the context of the noise and its environment.

3.12 The specific sound level is rated to account for distinguishing characteristics by using penalties for tonality, impulsivity, intermittency and other sound characteristics. The dominant acoustic characteristic should be applied to avoid large penalties which is in accordance with the Institute of Acoustics response to BS 4142.

3.13 An initial estimate of impact of the specific sound is obtained by subtracting the background sound level from the rating level. Typically, the greater the difference, the greater the magnitude of impact.

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context;
- At differences lower than +5 dB a low impact is likely, depending on the context. The lower the rating level is to the measured background sound level, the less likely it is that the specific sound source will have an impact.

3.14 The results of the initial assessment should then be considered in light of all pertinent contextual factors.

4.0 ENVIRONMENTAL SOUND SURVEY

4.1 Existing sound levels at the Site have been established through an Environmental Sound Survey. The survey has been undertaken in full accordance with the guidance set out in BS 7445[4].

4.2 A Sound Level Meter (SLM) was installed at two locations, as follows:

- Continuous Measurement 1 (CM1): within the Site area, at a position representative of the nearest sensitive receptors to both the A489 and the Facility; and
- Sample Measurement 1 (SM1): adjacent to the boundary with the Facility.

4.3 The survey was undertaken between Monday 17th and Tuesday 18th April 2023.

4.4 A monitoring location plan is provided in Figure 4.1.

Figure 4.1: Measurement Positions

Equipment

4.5 Measurements were taken using a Class 1 integrating/averaging SLM housed in environmental protection apparatus. The SLM was field calibrated before and after the survey using a Class 1 calibrator, with no significant drift in calibration noted.

[4] BS 7445-1:2003 'Description and measurement of environmental noise, Part 1: Guide to quantities and procedures.'

4.6 The SLM was installed in a free field position at a height of 1.5m above local ground level, and set up to capture the following parameters at a minimum: L_{Aeq}, L_{A90} and L_{AFmax} values.

4.7 Full details of the equipment used to undertake the survey are presented in Table 4.1.

Table 4.1: Equipment and Calibration Details

Description	Manufacturer & Type No.	Serial No.	Calibration Due Date
Sound Level Meter	Type NOR140	1407932	26/02/2025
Pre-Amplifier	Type 1209	23695	
Microphone	Type 1225	505583	
Calibrator	Norsonic 1251	34315	05/03/2024

Meteorological Conditions

4.8 Weather conditions remained dry throughout the monitoring period, with north easterly winds of no more than 2.5 m/s noted during set up and collection of the SLM.

4.9 It can therefore be concluded that there were no adverse meteorological conditions that could influence the survey outcome.

Observations

4.10 Site notes indicate the area as a whole to be very quiet, with the predominant source of noise at CM1 to be distant road traffic. During the attended measurement periods, there was no audible noise on the Site from the Facility, and certainly no dominant noise that would warrant assessment under BS 4142. Nevertheless, further consideration has been given within the following assessment.

Results

4.11 A summary of the measured sound levels at CM1 are presented in Table 4.2.

Table 4.2: Summary of Measured Sound Levels at CM1, dB

Date	Period	$L_{Aeq, T}$	Modal $L_{A90, T}$	Minimum $L_{A90, T}$	Typical $L_{AFmax, 1min}$[(a)]
Mon 17th April	Daytime 23:00 – 07:00[(b)]	52	46	31	69
	Night-time 07:00 – 23:00	46	38	30	63
Tue 18th April	Daytime 23:00 – 07:00[(c)]	53	49	39	64

[(a)] Maximum noise level not exceeded more than 10 times per measurement period.
[(b)] T = 12.5hr
[(c)] T = 3.5hr

4.12 The calculated daytime $L_{Aeq, 16hr}$ and measured night-time $L_{Aeq, 8hr}$ were 53 dB and 46 dB respectively (rounding to the nearest whole number for assessment purposes).

4.13 Analysis of the night-time $L_{AFmax, 1min}$ noise levels shows that the individual noise events typically fall below 63 dB, but with ten events causing peaks of between 63 – 67 dB. However, analysis of the audio recordings

show that all significant events, which predominantly occurred during the early morning hour of 05:00 – 06:00, were associated with bird song.

4.14 The average $L_{A90, T}$ background sound level measured during the daytime was 47 dB, and at night the average was 38 dB. The lowest measured L_{A90} during the day was 31 dB and at night 30 dB.

4.15 With regard to derivation of the L_{A90} background noise level for assessment purposes, Section 8 of BS 4142 makes it clear that the objective of the assessment "is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods."

4.16 Therefore, for noise control purposes it is inappropriate to base the controls on the very lowest (single minimum) value since this would be overly restrictive and unreasonable.

4.17 Paragraph 8.14 of BS 4142 similarly remarks that "The monitoring duration should reflect the range of background sound levels for the period being assessed. In practice, there is no 'single' background sound level as this is a fluctuating parameter. However, the background sound level used for the assessment should be representative of the period being assessed."

4.18 The subsequent Note 1 states that "A representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either the minimum or modal value".

4.19 The noise measurements demonstrate that the background sound levels on the Site remain relatively stable, ranging from 47 dB L_{A90} during the day, to 38 dB at night.

4.20 Therefore, the lower the average value of 47 dB L_{A90} is considered to be an appropriate value to use for assessment purposes during the daytime, with the average value of 38 dB L_{A90} applicable for assessment purposes during the night-time.

4.21 With regard to noise levels adjacent to the Facility, the sample measurements undertaken at SM1 showed a daytime $L_{Aeq, T}$ of 59 dB, with infrequent $L_{Aeq, 1min}$ values of between 64 – 66 dB due to operational movements of a JCB, and associated aggregate crushing activities.

5.0 ASSESSMENT OF IMPACT

Fixed External Plant (Extracts/Ventilation Systems)

5.1 Should there be any external plant associated with the Site, the approach has been to devise an appropriate acoustic criterion that, applied to the selection and siting of equipment during the detailed design, will enable the equipment to operate during sensitive periods without adversely affecting the ambient noise climate and without causing complaints from new sensitive receptors on the Site.

5.2 The background sound levels to be used for noise control purposes have been defined in Section 4. A value of 47 dB $L_{A90, 1hr}$ is recommended for the control of any fixed plant that may operate during daytime hours (07:00 – 23:00), and a value of 38 dB $L_{A90, 15mins}$ is recommended during night-time hours (23:00 – 07:00).

5.3 The operation of any fixed plant would have no impact upon sensitive receptors if the operation of the plant produces a Rating Level that does not exceed the L_{A90} background sound level as measured at 3.5 metres from the façade of the nearest noise sensitive premises.

5.4 On this basis, the design criterion for new plant such as extracts or ventilation units shall be that the overall Rating Level measured at 3.5 metres from the facade of the nearest sensitive receptor shall not exceed 47 dB for all daytime and evening operations, or 38 dB at night-time. The Rating Level must allow for any tonal content through the addition of appropriate acoustic character corrections as defined by BS 4142 where tonal noise is present.

5.5 Use of the above limits for the design and installation of any external plant will ensure that its operation does not adversely affect the existing background sound level and does not give rise to adverse impacts under BS 4142. This is a matter that can be dealt with by way of a routine planning condition.

Holiday Lodges and Touring Caravans

5.6 There are no noise criteria applicable to short-term holiday lets, with the closest comparable guidance presented within BS 8233 relating to residential developments. Therefore, assessment on external and internal noise levels has been undertaken in reference to the criteria contained with BS 8233.

External Sound Levels

5.7 The noise criterion often the most difficult to meet is the BS 8233 outdoor criterion of 55 dB $L_{Aeq, 16hr}$ applicable private amenity spaces such as gardens. As presented in Section 4, the daytime ambient sound levels ranged from 52 – 53 dB $L_{Aeq, 16hr}$, which fully satisfies the BS 8233 criterion. Therefore, any site layout can be adopted without the need for mitigation.

Internal Sound Levels

5.8 With regard to internal L_{Aeq} and L_{Amax} noise levels, the relevant BS 8233 criterion to be met and the maximum exceedance of the criterion is shown in Table 5.1.

Table 5.1: Day and Night-time $L_{Aeq,T}$ and L_{Amax} Sound Levels, dB

Situation	Measured External Sound Level	Internal Acoustic Criterion	Exceedance
Daytime Ambient $L_{Aeq, 16hr}$	53	35	18
Night-time Ambient $L_{Aeq, 8hr}$	47	30	17
Night-time Maximum $L_{AFmax, T}$	63[(a)]	45	18
[(a)] Night-time level exceeded 10 times across measurement period			

Holiday Lodges

5.9 Residential park homes are traditionally thin-walled, single-glazed units with poor insulation. However, with the introduction of BS 3632, residential park homes are now required to have external walls achieving a sound reduction rating (R_w) of no less than 35 dB.

5.10 The proposed Holiday Lodges at Penstrowed Quarry will be timber built, fully insulated, and therefore, will exceed the minimum specification introduced by BS 3632. In any event, external walls achieving the minimum sound reduction rating of 35 dB R_w presented within BS 3632, would be more than sufficient to enable all internal criteria to be met.

5.11 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.

5.12 The information in Table 5.1 indicates that the sound reduction of the glazing system will need to provide at least 18 dB R_w. Normal thermal double glazing having a configuration of 4/12/4 or 4/16/4, where the information is presented in terms of the thickness of one pane of glass in mm, followed by the size of the air gap, followed by the thickness of the second pane of glass, typically provides a sound reduction of 31 dB R_w as indicated by the data in **Appendix D**, which would be more than sufficient to enable all internal noise standards to be met. Window manufacturers will be able to provide certification showing which of their window designs are capable of achieving the required sound reductions.

5.13 Opening windows for ventilation purposes would reduce the insulation provided by the façade and internal noise levels would then exceed the BS 8233 standards. If the LPA 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. Passive acoustic ventilators such as acoustic trickle vents could be installed within the window frames to enable occupiers to obtain natural ventilation with windows closed, without any loss of amenity due to noise intrusion.

Touring Caravans

5.14 For the older, more traditionally built touring caravans visiting the Site, these are likely to be of a thin-walled, single polycarbonate 'glazed' construction, with poor insulation. Once again, windows will be the 'weakest' point of the caravan's construction, regardless of its age and therefore, the outside to inside sound reduction to be provided by the 'glazed' elements needs to be considered.

5.15 The information in **Appendix E** demonstrates that a single sheet of 3mm thick general purpose polycarbonate, such as that used within traditional caravan constructions, is capable of providing a sound reduction of 24 dB R_w, which would satisfy the BS 8233 internal noise criteria.

The Facility

BS 4142 Assessment

5.16 Site notes and analysis of the audio recordings indicate that despite operational activity at the Facility, no audible noise on the Site was experienced, and certainly no dominant noise that would warrant assessment. Nevertheless, further consideration in accordance with BS 4142 has been undertaken.

5.17 BS 4142's character corrections are flexible according to whether the acoustic character is just perceptible at the noise receptor, or is clearly perceptible or highly perceptible, and range from 0 to 6 dB for tonal noise, 3 to 9 dB for impulsive noise, and 3 dB for other non-tonal/impulsive acoustic characteristics. Noise from the Facility was inaudible on the Site and therefore, no correction is required within the following assessment.

5.18 However, in order to provide a robust scenario, a 3 dB correction for other non-tonal/impulsive acoustic characteristics has been added. In addition, no 'on-time' corrections have been applied to the specific sound level to account for periods of inactivity at the Facility, with the highest $L_{Aeq, 1min}$ value as measured at SM1, used within the subsequent BS 4142 assessment presented in Table 5.2 below.

Table 5.2: BS 4142 Assessment

Assessment Step	Daytime	Night-time
Specific Sound Level [A][(a)]	66 dB	66 dB
Distance Correction [B]	-24 dB	-24 dB
Screening Attenuation [C][(b)]	-10 dB	-10 dB
Acoustic Character Correction [C]	+3 dB	+3 dB
Rating Level [E = A + B + C + D]	35 dB	35 dB
Background Sound Level [F]	47 dB	38 dB
Rating over Background [G = E - F]	-12 dB	-3 dB
Estimation of Impact[(c)]	Low	Low

[(a)] Highest $L_{Aeq, 1min}$ value as measured at SM1
[(b)] Conservative attenuation of 10 dB afforded due to local topography
[(c)] Estimation of impact depending on the context.

5.19 At the nearest sensitive receptor on the Site, the Rating Level due to operational noise from the Facility lies significantly lower than the background sound level. Therefore, the overall conclusion in accordance with BS 4142 is that "*Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context*".

Context

5.20 Context is an important factor in determining the BS 4142 impact upon sensitive receptors. Section 8 paragraph 8.5 states the following "... *'Where a new noise-sensitive receptor is introduced and there is extant industrial and/or commercial sound, it ought to be recognised that the industrial and/or commercial sound*

forms a component of the acoustic environment. In such circumstances other guidance and criteria in additional to or alternative to this standard can also inform the appropriateness of both introducing a new noise sensitive receptor and the extent of required noise mitigation'.

5.21 It is important to note that there is no specific noise criteria applicable to short-term holiday lets, with the closest comparable guidance presented within BS 8233 relating to residential developments.

5.22 Therefore, given that the BS 4142 assessment demonstrates operational activity will have a low impact on the Site, coupled with the fact that noise from the Facility was inaudible on the Site, and external and internal criteria contained within BS 8233 are fully satisfied for new on-Site sensitive receptors, there are no noise constraints to the proposed development, and the decision maker may grant planning permission with conditions where appropriate.

6.0 CONCLUSIONS

6.1 Mewies Engineering Consultants Ltd (M-EC), has been commissioned by GF Grigg Ltd to undertake an Acoustics Assessment for a proposed Holiday Park on Land at Penstrowed Quarry, Caersws, Powys, SY17 5SG (hereafter referred to as 'the Site').

Fixed External Plan (Extracts/Ventilation Systems)

6.2 Should any external plant be used on the Site, there would be no impact upon new sensitive receptors if the operations of the plant produce a Rating Level that does not exceed the L_{A90} background sound level as measured at 3.5 metres from the façade of new on-Site receptors.

6.3 Based on the Site noise measurements, the design criterion for new plant such as extracts, air-conditioning units or refrigeration units shall be that the overall Rating Level measured at 3.5 metres from the façade of the nearest receptor shall not exceed 47 dB for all daytime and evening operations, or 38 dB at night-time. The Rating Level must allow for any tonal content through the addition of appropriate acoustic character corrections as defined by BS 4142 where tonal noise is present. This is a matter that can be controlled by a planning condition at the Reserved Matters stage.

Holiday Lodges and Touring Caravans

6.4 There is no set guidance relating to noise on short-term holiday lets, with the closest relevant guidance being BS 8233, 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 is the BS 8233 outdoor criterion of 55 dB $L_{Aeq, 16hr}$ applicable private amenity spaces such as gardens. The daytime ambient sound levels ranged from 52 – 53 dB $L_{Aeq, 16hr}$, which fully satisfies the BS 8233 criterion. Therefore, any site layout can be adopted without the need for mitigation.

6.6 The proposed Holiday Lodges at Penstrowed Quarry will be timber built, fully insulated, and therefore, would be more than sufficient to enable all internal criteria to be met.

6.7 The use of normal thermal double glazing, having a configuration similar to 4/12/4 or 4/16/4, would equally enable all internal noise standards to be satisfied.

6.8 Opening windows for ventilation purposes would reduce the insulation provided by the Holiday Lodge façade. Therefore, if the Local Planning Authority considers it necessary to satisfy internal noise standards with a degree of ventilation, passive acoustic ventilators such as acoustic trickle vents installed within the window frames could be used, which would enable occupiers to obtain natural ventilation with windows closed, without any loss of amenity due to noise intrusion.

6.9 With regard to touring caravans, polycarbonate 'glazed' windows would represent the 'weakest' point of the caravan's construction, regardless of its age.

6.10 Nevertheless, a single sheet of 3mm thick general purpose polycarbonate, such as that used within traditional caravan constructions, is more than capable of providing the necessary sound reduction required to enable all BS 8233 internal noise criteria to be met.

The Facility

6.11 The Rating Level due to operational noise from the Facility lies significantly lower than the background sound level. Therefore, the overall conclusion in accordance with BS 4142 is that "*Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context"*.

6.12 There are no other outstanding noise issues, therefore, the overall conclusion of the acoustics assessment is that the decision maker may grant planning permission with conditions where appropriate.

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APPENDICES

APPENDIX A

Chantelle Lloyd

From: Paul Bufton
Sent: 23 March 2023 16:31
To: Planning Consultations
Cc: Rhian Griffiths
Subject: 22/1966/FUL

Rhian,

Thank you for the consultation. Environmental Protection require more detail in two areas:-

Foul drainage
I note the applicant is proposing a treatment plant discharging to watercourse. Whilst I would have no objection to this the drainage strategy does raise a question mark over flow. Whilst this is not a matter for EP to comment on directly my concern is that if this is not a viable option then with no mains sewer in the area and a very large soakaway required if going to ground this maybe problematic. I feel more work is required to give reassurances.

Noise
The proposed site is with 180m of an existing concrete batching plant, which I do not believe to have any noise controls attached to it. The applicant will need to carry out a noise assessment to demonstrate that they are not introducing a potential new receptor for noise into the area and that the site will experience a reasonable level of amenity

Best regards

Paul

Paul Bufton
Uwch Swyddog Iechyd yr Amgylchedd (Gwarchod yr Amgylchedd) Senior Environmental Health Officer (Environmental Protection)
(Gwarchod yr Amgylchedd) – Cyngor Sir Powys (Environmental Protection) – Powys County Council
([redacted])
([redacted])
Croeso I chi gysylltu a ni yn Gymraeg. Byddwn yn ymateb yn Gymraeg heb oedi.
You are welcome to contact us in Welsh. We will respond in Welsh, without delay.

Follow us on Twitter @PowysEnvHealth

schedule. If you have any concerns regarding the use of your personal data please contact the Data Protection Officer by email at Information.Compliance@powys.gov.uk or by phone at 01597 826400. Please note that further information on the Data Protection and Privacy can be found at the following address: http://www.powys.gov.uk/privacy

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APPENDICES

APPENDIX B

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Project	**Proposed Holiday Park at Penstrowed Quarry, Caersws, Powys, SY17 5SG**		
Drawing Status	**Stage 1: Feasibility**	Drawing Title	**Proposed Site Plan**
Scale **1:2500@A3** Date **09.09.20**		Drawing No	**V071.1.3.101**
Drawn by **LW** Checked **TM**		Rev	

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APPENDICES

APPENDIX C

GLOSSARY OF TECHNICAL TERMS

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude, but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source.

The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurements, and the levels are denoted as dB(A) or L_{Aeq}, L_{A90} etc, according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

Typical sound levels found in the environment

Sound Level	**Location**
0 dB(A)	Threshold of hearing
20 to 30 dB(A)	Quiet bedroom at night
30 to 40 dB(A)	Living room during the day
40 to 50 dB(A)	Typical office
50 to 60 dB(A)	Inside a car
60 to 70 dB(A)	Typical high street
70 to 90 dB(A)	Inside a factory
100 to 110 dB(A)	Burglar alarm at 1m away
110 to 130 dB(A)	Jet aircraft taking off
140 dB(A)	Threshold of pain

Descriptor	Terminology
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level	The sound level is the sound pressure relative to a standard reference pressure of 20μPa (20x10-6 Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1 / s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa.
A-weighting (db(A))	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq, T}$	A noise level index called the equivalent continuous noise level over the time period, *T*. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{AFmax, T}$	A noise level index defined as the maximum noise level during the measurement period. L_{Max} is sometimes used for the assessment of discrete loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. It is typically measured using the 'fast' sound level meter response.
$L_{90, T}$	A noise level index. The noise level exceeded for 90% of the time over the period, *T*. *L*90 can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10, T}$	A noise level index. The noise level exceeded for 10% of the time over the period, *T*. *L*10 can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m.
Façade	At a distance of 1m in front of a large sound reflecting object such as a building facade.
Fast/Slow Time Weighting	Averaging times used in sound level meters.
Octave Band	A range of frequencies whose upper limit is twice the frequency of the lower limit
One-third Octave Band	A frequency band in which the upper limit is 21/3 times the frequency of the lower limit.
Rating Level	The specific sound level, plus any adjustment for characteristic feature of sound in BS 4142.
Specific Sound Level	The A-weighted L_{eq} sound level produced by a sound source during a specified period of time. Commonly known as the sound source under investigation as defined in BS 4142.
Typical Maximum Level	The 90^{th} percentile maximum event level (L_{AFmax}) measured during a period. Used for assessing night-time maximum levels under typical and overheating conditions.

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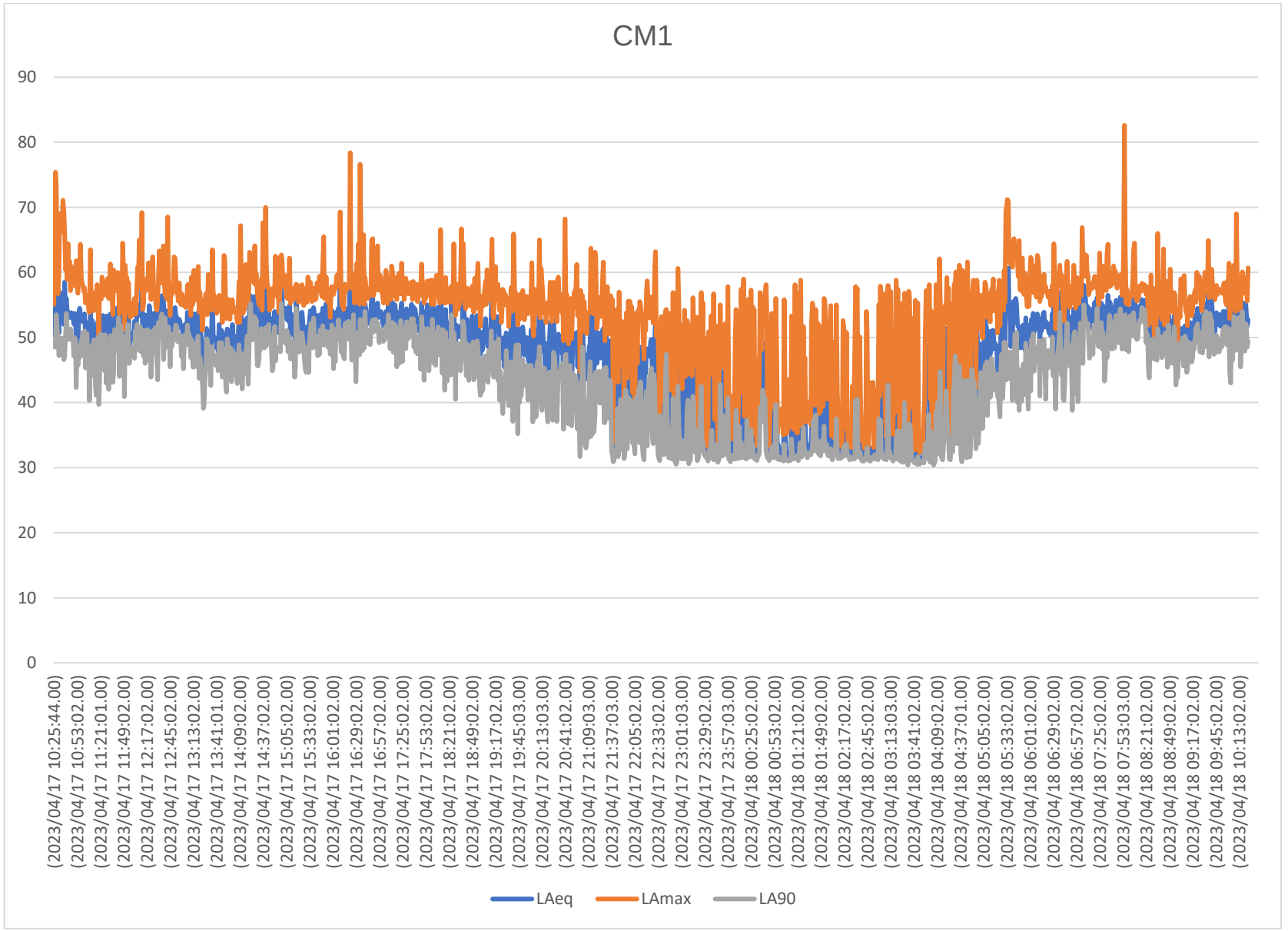
APPENDICES

APPENDIX D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LAeq
LAmax
LA90

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(2023/04/18 11:05:02.00)	50.1	57.5	53.7	45.7
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(2023/04/18 11:08:02.00)	48.4	57.5	51.4	42.3
(2023/04/18 11:09:02.00)	49.8	57.2	52.6	45
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(2023/04/18 11:11:03.00)	51.4	62.2	54.4	47.6
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(2023/04/18 11:13:02.00)	52.8	60.1	54.8	49
(2023/04/18 11:14:02.00)	52.5	60.3	54.2	49.4
(2023/04/18 11:15:03.00)	47.4	60.2	50.3	43.1
(2023/04/18 11:16:03.00)	49	56.1	51.6	45.2
(2023/04/18 11:17:02.00)	46.6	58.3	48.8	43.4
(2023/04/18 11:18:03.00)	46.7	58	48.1	43.2
(2023/04/18 11:19:03.00)	47.9	49.1	-	47.2
Average	58.8	54.4	62.5	57.1
Maximum	66.8	79.4	69.5	63.4

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APPENDICES

APPENDIX E

Indicative Sound Insulation Performance of Different Window Configurations

Third octave band centre frequency Hz	Sound Insulation (dB) for Glass Thickness (Hz)																					
	4/16/4 or 4/12/4		6/12/6		6/12/6.4 PVB		10/12/4		10/12/6		10/12/4.6 PVB		Acoustic Laminate									
													6/12/7		6/12/11		10/12/16		13/12/13		16/12/16	
100	25		17		19		23		27		27		25		26		26		30		31	
125	24	24	26	20	24	21	28	25	27	26	28	27	27	26	25	26	28	27	27	28	34	32
160	23		22		21		26		24		26		26		25		26		27		33	
200	21		18		19		19		24		26		23		25		24		31		34	
250	21	20	18	19	19	20	23	22	29	27	30	29	24	28	28	28	28	27	38	34	38	37
315	19		24		24		26		31		32		28		32		31		39		39	
400	22		27		28		31		33		34		30		35		34		41		43	
500	25	25	29	29	32	31	33	33	34	34	36	36	34	38	39	38	38	37	44	44	46	45
630	30		33		34		36		37		40		37		43		41		48		48	
800	33		37		38		39		39		41		42		46		44		51		50	
1000	36	35	39	38	40	39	41	40	41	40	42	41	45	47	47	47	45	45	53	52	48	46
1250	38		39		40		41		41		41		46		47		46		52		43	
1600	40		39		39		41		39		41		46		46		44		49		43	
2000	41	38	34	36	35	37	45	43	37	38	42	42	45	43	43	43	42	44	45	47	46	46
2500	35		37		39		45		40		44		48		42		44		48		50	
3150	31		42		44		42		43		49		51		47		51		52		53	
4000	40	35	47	45	49	47	44	44	47	46	53	52	52	51	54	51	56	54	57	55	59	57
R_w dB	31		33		34		36		38		40		38		41		42		45		46	
R_w+C_{tr} dBA	25		26		27		29		32		34		31		33		37		38		41	

Note:
1. The glass thickness is presented in terms of the thickness of one pane of glass in mm, followed by the air gap in mm, followed by the thickness of the second pane of glass in mm.
2. 6.4mm PVB glass denotes a laminated glass consisting of a tough plastic interlayer made of polyvinyl butyral (PVB) bonded together between two panes of glass.

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APPENDICES

APPENDIX F

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.

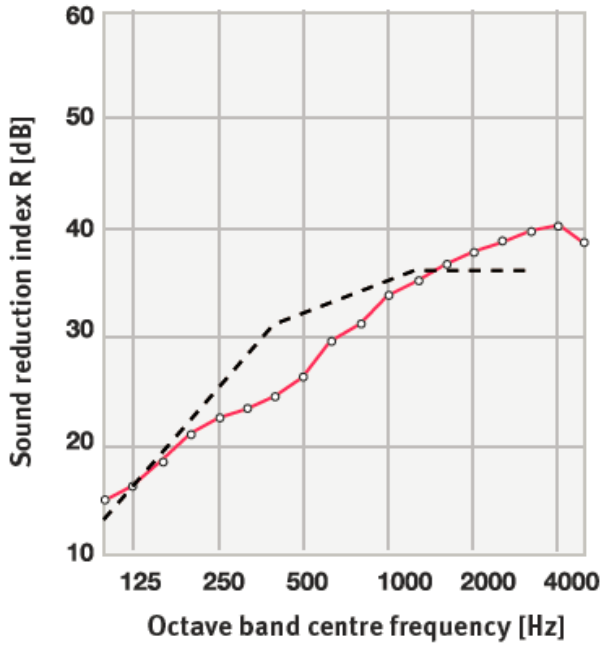
A significant sound reduction can be obtained combining TUFFAK® sheets with an air gap between the sheets.

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

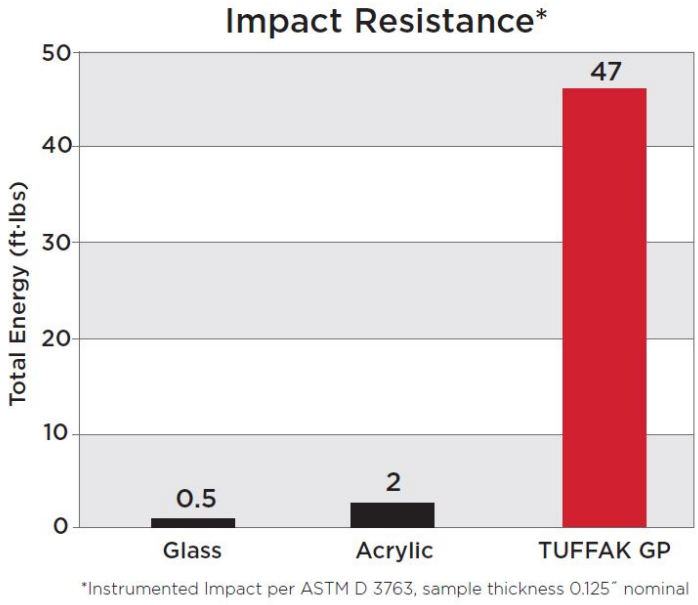
COMPARISON of NOISE REDUCTION CHARACATERISTICS of POLYCARBONATE to OTHER MATERIALS

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.

- CIVIL ENGINEERING
- TRANSPORT
- FLOOD RISK & DRAINAGE
- STRUCTURES
- GEO-ENVIRONMENTAL
- ACOUSTIC AIR
- UTILITIES
- GEOMATICS
- LIGHTING
- EXPERT WITNESS

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