Car Park at

Exeter Golf Academy, Exeter Golf and Country Club, Topsham Rd, Exeter EX2 6HA

Noise impact assessment of proposed gravel surface

for

Peter Lacey

ACT Acoustics

Contents

Document information

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1.0	Mike Wood	15 April 2025	First issue.

Check that this report is the latest version by either scanning or clicking through the QR code below:

Management Summary

Peter Lacey has commissioned ACT Acoustics to provide a noise impact assessment of proposed gravel surface for a car park at Exeter Golf Academy, Exeter Golf and Country Club, Topsham Rd, Exeter EX2 6HA.

A ring-bound gravel driving surface has been proposed for the car park surface. We understand that concern has been raised regarding the potential generation of noise from cars driving on this surface. This report is intended to quantify the likely should level and provide an assessment of the likely impact on nearby sound sensitive locations.

To make our assessment, we have:

- Undertaken an unattended survey of the existing background sound levels at the site;
- Conducted test measurements of cars traveling across gravel surface similar to that proposed;
- Used the results of the attended measurements of car noise to calibrate a sound model of the site; and
- Used the sound model to predict the likely sound levels at the nearest sound sensitive location to the car park in question.

We have then assessed the results of the sound model in accordance with BS 4142:2014+A1.

The results show that the rating sound level dB L_{ArTr} is between 8 dB below the prevailing background sound level (dB L_{A90}). The results indicate that the likelihood of adverse impact is *negligible*. We therefore see no reason to refuse planning permission on noise grounds.

1 Introduction

1.1 Site address

Exeter Golf Academy, Exeter Golf and Country Club, Topsham Rd, Exeter EX2 6HA

1.2 Background

The layout of the site showing the location of the car park is shown in Figure 1.

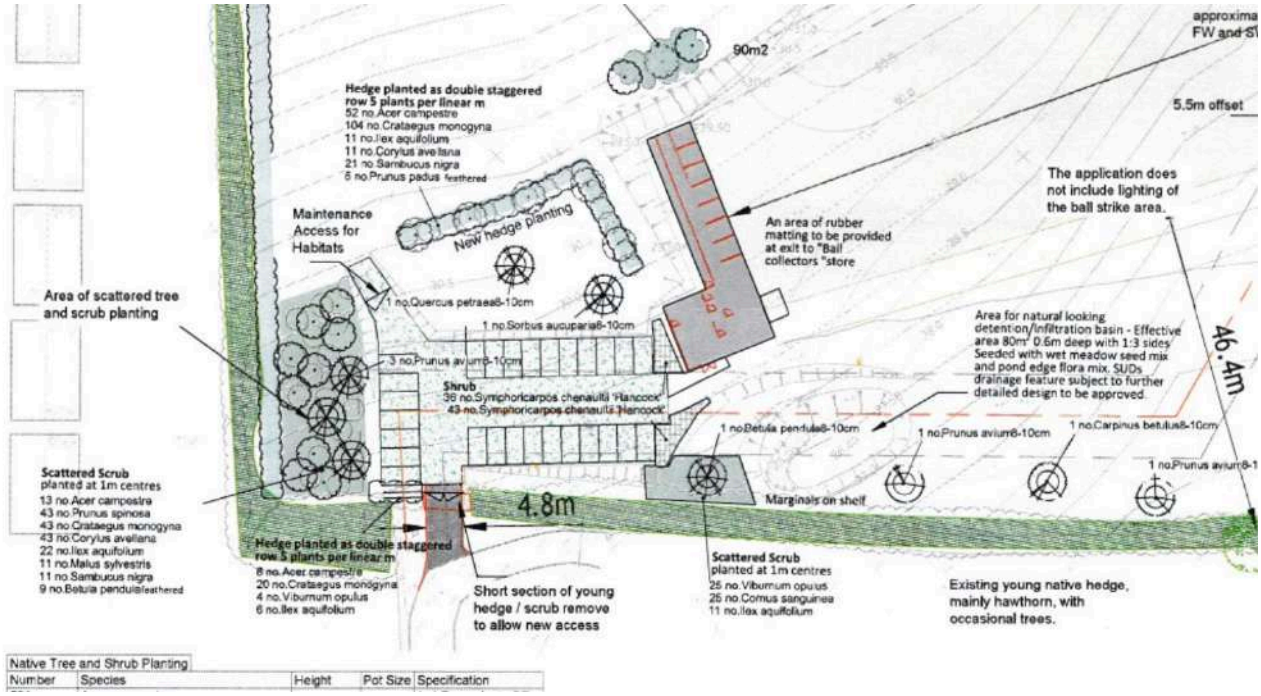

Figure 1: Plans for the Golf Academy showing the location of the car park

A ring-bound gravel driving surface has been proposed. We understand that concern has been raised regarding the potential noise from cars driving on this surface. This report is therefore intended to quantify the likely sound level and provide an assessment of its impact (if any) on nearby sound sensitive locations.

The nearest sound sensitive locations are to the west and north-west of the site on Tolards Road (Figure 2).

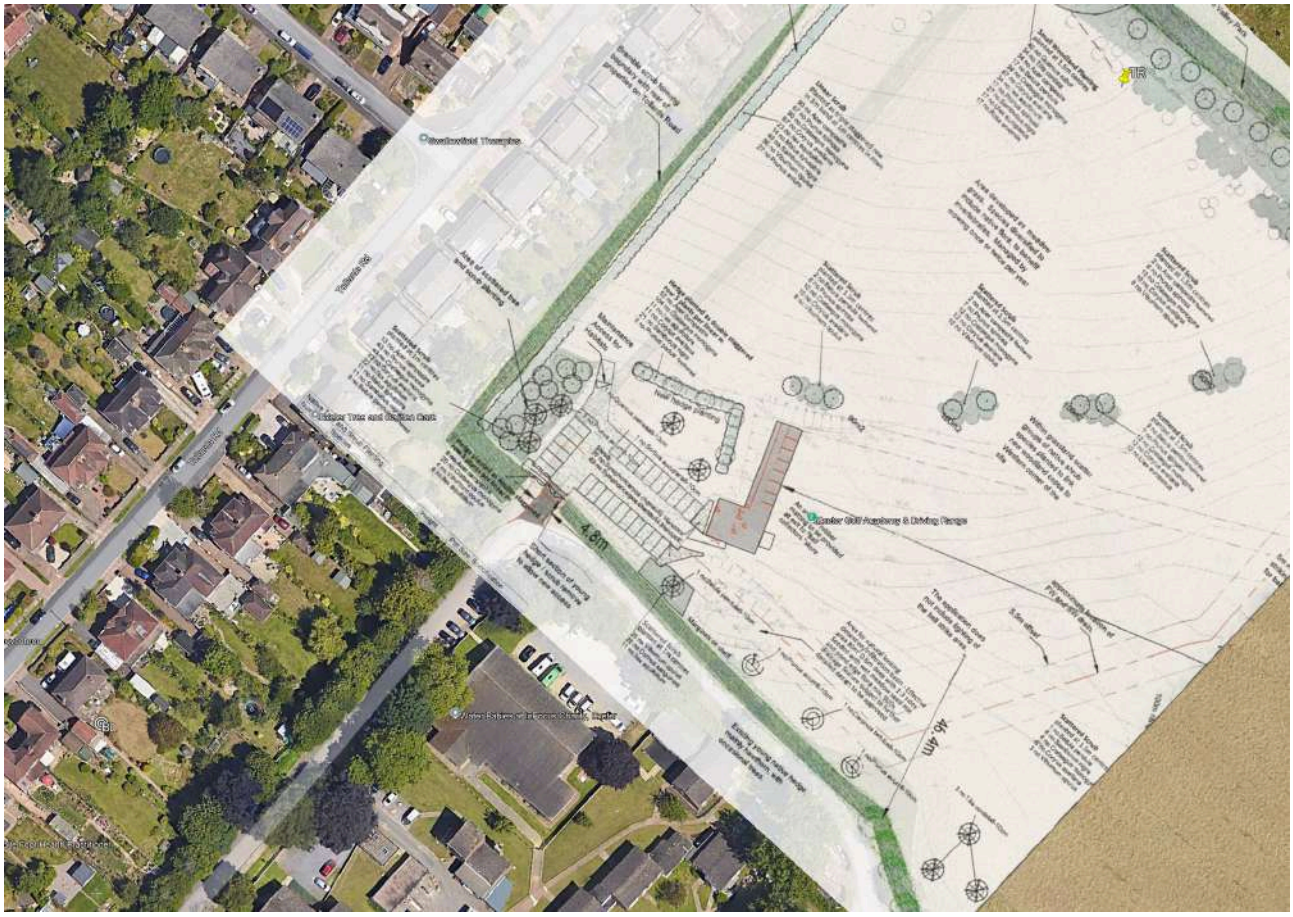

Figure 2: Location of the site

1.3 Opening hours

We understand that the driving range will be open between during daylight hours throughout the year. We do not expect the range to be open any later than 2200.

1.4 Approach to the assessment

To make our assessment, we have:

- Undertaken a baseline sound survey at the site to establish the existing background sound levels;
- Taken measurements of car movements on a gravel surface similar to that proposed;
- Created a sound model of the site to estimate the rating sound level at the nearest sound sensitive locations; and
- Calculated the rating sound level (dB L_{ArTr}) in accordance with BS 4142:2014+A1 to determine the likelihood of adverse impact.

1.5 Scope and limitations

The scope of our assessment is limited to providing a noise impact assessment of cars moving across the proposed ring-bound gravel surface. Please make sure that you have read and understood the disclaimer at the end of this report.

2 Regulations and Standards

2.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF) was updated in July 2021. The framework replaces the previous NPPF (2021) and the Planning Policy Guidance 24 (Planning and Noise). Paragraph 174 of NPPF states:

> Planning policies and decisions should contribute to and enhance the natural and local environment by:
>
> 1. protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan);
> 2. recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services - including the economic and other benefits of the best and most versatile agricultural land,
> 3. maintaining the character of the undeveloped coast, while improving public access to it where appropriate;
> 4. minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures;
> 5. 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 or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and
> 6. remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.

Further, Paragraph 185 states;

> 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:
>
> 1. 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;
> 2. identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and
> 3. limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.

The NPPF does not provide any guidance on how noise should be assessed, nor does it provide any criteria with which the adverse effects of noise can be quantified.

2.2 Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) is referred to in the NPPF. Published in March 2010, the NPSE aims to provide clarity regarding current policies and practices as well as enabling noise decisions to be made within the wider context, at the most appropriate level, in a cost effective manner and in a timely fashion. It applies to all forms of noise including environmental noise, neighbour and neighbourhood noise.

The NPSE sets out the long term vision of the Government's noise policy. This is supported 'through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

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

The NPSE introduces the concept of 'effect levels' to relate the impact of noise the to stated policy aims.

- *No observable effect level (NOEL)* — This is the level below which no effect can be detected. Below this level, there is no detectable effect on health and quality of life due to noise.
- *Lowest observable effect level (LOAEL)* — This is the level at which adverse effects on health and quality of life can be detected.
- *Significant observable adverse effect level (SOAEL)* — This is the level at which significant adverse health effects start to occur.

Where there is potential for noise impact, the NPSE states:

> The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development [detailed in paragraph 1.8]. This does not mean that such adverse impacts cannot occur.

The NPSE does not provide any assessment criteria for the various effect levels, and each case needs to be considered on its own merits. The NPSE emphasises that Local Planning Authorities are required to take a balanced approach in considering the benefits of a development. Paragraph 2.18 of the NPSE states:

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

The planning need is outside the scope of this report. Planning issues other than noise should be addressed by others.

2.3 Planning Practice Guidance: Noise

The UK Government has published advice on how planning can manage potential noise impacts in new development. It states:

> Noise needs to be considered when development may create additional noise, or would be sensitive to the prevailing acoustic environment (including any anticipated changes to that environment from activities that are permitted but not yet commenced). When preparing plans, or taking decisions about new development, there may also be opportunities to make improvements to the acoustic environment. Good acoustic design needs to be considered early in the planning process to ensure that the most appropriate and cost-effective solutions are identified from the outset.

The guidance goes on to state:

> At the lowest extreme, when noise is not perceived to be present, there is by definition no effect. As the noise exposure increases, it will cross the "no observed effect" level. However, the noise has no adverse effect so long as the exposure does not cause any change in behaviour, attitude or other physiological responses of those affected by it. The noise may slightly affect the acoustic character of an area but not to the extent there is a change in quality of life. If the noise exposure is at this level no specific measures are required to manage the acoustic environment.
>
> As the exposure increases further, it crosses the "lowest observed adverse effect" level boundary above which the noise starts to cause small changes in behaviour and attitude, for example, having to turn up the volume on the television or needing to speak more loudly to be heard. The noise therefore starts to have an adverse effect and consideration needs to be given to mitigating and minimising those effects (taking account of the economic and social benefits being derived from the activity causing the noise).
>
> Increasing noise exposure will at some point cause the "significant observed adverse effect" level boundary to be crossed. Above this level the noise causes a material change in behaviour such as keeping windows closed for most of the time or avoiding certain activities during periods when the noise is present. If the exposure is predicted to be above this level the planning process should be used to avoid this effect occurring, for example through the choice of sites at the plan-making stage, or by use of appropriate mitigation such as by altering the design and layout. While such decisions must be made taking account of the economic and social benefit of the activity causing or affected by the noise, it is undesirable for such exposure to be caused.
>
> At the highest extreme, noise exposure would cause extensive and sustained adverse changes in behaviour and / or health without an ability to mitigate the effect of the noise. The impacts on health and quality of life are such that regardless of the benefits of the activity causing the noise, this situation should be avoided.

The Government provides the following noise exposure hierarchy to help planners to make objective decisions regarding responses to noise:

Response	Examples of outcomes	Increasing effect level	Action
No Observed Effect Level			
Not present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, 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 small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, 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
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

Figure 3: Noise exposure hierarchy

The table does not provide quantitative levels for the above effects. However, where noise is audible it is not necessarily intrusive. The impact is based primarily on the level of noise.

2.4 Noise — BS 4142:2014+A1

The impact of noise from from industrial activities is determined using BS 4142:2014+A1 (herin referred to as *BS 4142*). A summary of the assessment requirements for assessment in accordance with BS 4142 are summarised below.

BS 4142 provides a method of assessment of industrial and commercial noise sources in mixed residential and industrial areas. The method assesses the noise by calculating the *noise rating level* (LArTr) and comparing this to the prevailing background noise level (LA90).

The background noise level is the noise that is exceeded for 90% of the time *in the absence of the noise being assessed*. The reason for measuring the background noise is that low background noise levels can make the noise being assessed more audible (and therefore increasing the impact), whereas high background noise levels can mask the sound. Since background noise levels typically vary throughout the day, they are usually measured by a noise survey lasting more than 24 hours.

The noise rating level is the noise level from the source in question plus any penalties. The rating level is compared to the background noise level to determine its likely impact on noise sensitive locations.

To calculate the noise rating level, the noise source (technically referred to as the *specific noise level*, Ls) is either measured in the field or calculated.

If the specific noise level is measured in the field, it will also include the residual noise (Lr) of the surrounding landscape. The total of the residual noise and the specific noise is the ambient noise level La.

In order to calculate the specific noise level, we must take measurements when the specific noise both *on* and *off*. The specific noise level is then calculated from:

$$L_{\mathrm{s}} = 10 \times \log 10\left(10^{\frac{L_{\mathrm{a}}}{10}} - 10^{\frac{L_{\mathrm{r}}}{10}}\right)$$

The noise rating level is:

$$L_{\mathrm{ArTr}} = L_{\mathrm{s}} + P$$

Where P is the sum of the noise penalties.

Noise penalties

In calculating the noise rating level (LArTr), BS 4142 requires that penalties are applied based on the character of the noise being assessed. Penalties are applied for any tonal, impulsive or intermittent sounds.

Tonality

For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.

Impulsivity

A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible.

Intermittency

When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. This can necessitate measuring the specific sound over a number of shorter sampling periods that are in combination less than the reference time interval in total, and then calculating the specific sound level for the reference time interval allowing for time when the specific sound is not present. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.

Assessment of the impacts

Once the noise rating level is calculated, the likely impact is assessed. BS 4142 section 11 gives the following guidance on assessing the impacts from noise:

1. Typically, the greater this difference, the greater the magnitude of the impact.
2. A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
3. A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
4. The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

Typically, parity with the prevailing background sound is recommended, but for low background noise levels (such as during the night), BS 4142 provides the following additional guidance:

> "For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low. Where the background sound levels and rating level are low absolute levels might be as or more relevant than the margin by which the rating level exceeds the background sound level, this is especially true at night."

Low background noise means that the absolute noise level from fixed plant is more important than how much louder than the background noise level it is. In these cases, we can additionally assess the noise levels using the guidelines in BS8233:2014. The guidance recommends that for a good night's sleep the sound pressure level from all sources should not exceed 30 dBA LAeq,8hr in bedrooms at night. External sound levels in the vicinity of the receptors (assuming windows are open for ventilation) should therefore not exceed 45 dB LAeq,8hr. However, it must be noted, the BS8233:2014 criteria are for anonymous sources of noise. Therefore, it is recommended that noise generating uses target noise levels 5 dB below this level to minimise the risk of complaints.

3 Baseline sound survey

3.1 Survey methodology

British Standard 7445 (Description and measurement of environmental sound: Guide to quantities and procedures) provides guidance on the quantification of environmental sound. It provides the framework within which environmental sound should be quantified. . It comprises three parts:

- Part 1 (2003): provides a guide to quantities and procedures;
- Part 2 (1991): provides a guide to the acquisition of data pertinent to land use.
- Part 3 (1991): provides a guide to the application of sound limits.

BS 7445 also refers to BS EN 61672, which details the required equipment necessary for proper measurement.

To facilitate the comparison of results (measurements of sound from different sources), it may be necessary to carry out measurements under selected meteorological conditions which are reproducible and correspond to quite stable sound propagation conditions [Part 2, paragraph 5.4.3.3].

4 Summary of survey results for Location 1

4.1 Sound climate

During out visits to site, the soundscape at Location 1 was dominated by:

- Road traffic noise; and
- Occasional birdsong.

4.2 Time series results

The figure below shows a time series of the results during the survey period:

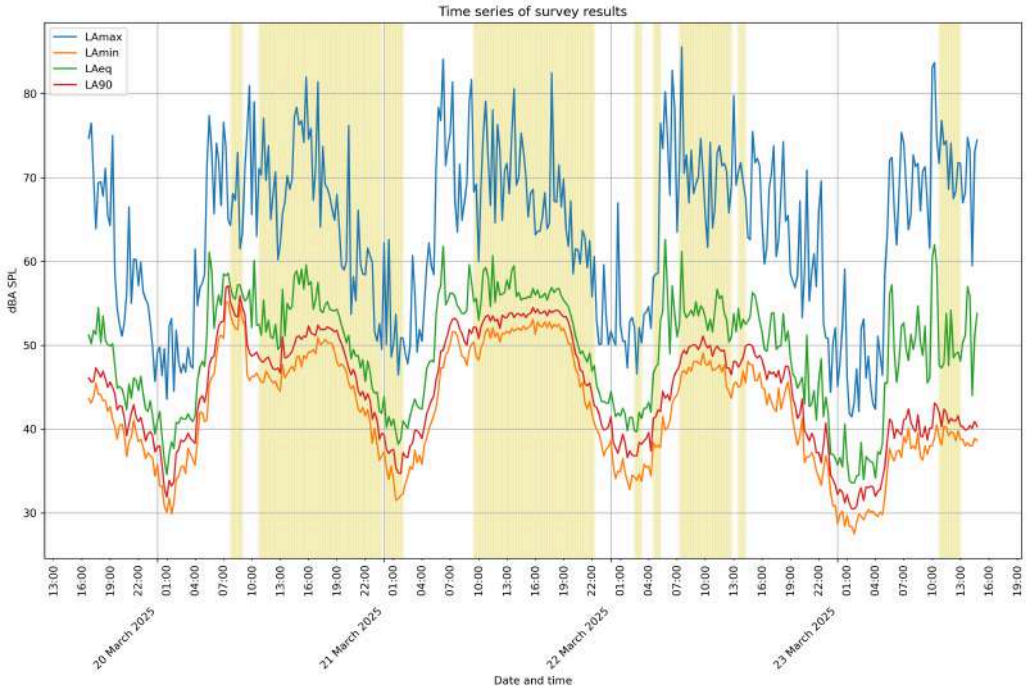

Figure 4: Time-series results for the survey period (Location 1)

4.3 Histograms of measured values

The distribution of the sound levels is shown below in the following histograms:

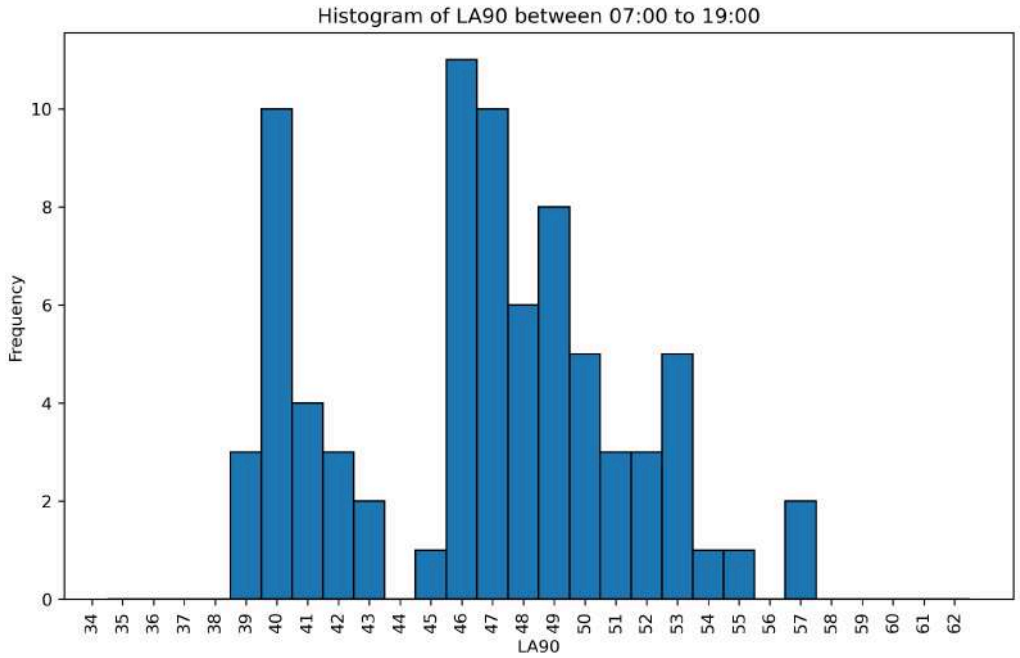

Figure 5: Histogram of LA90 for the period 07:00 to 19:00 (Location 1)

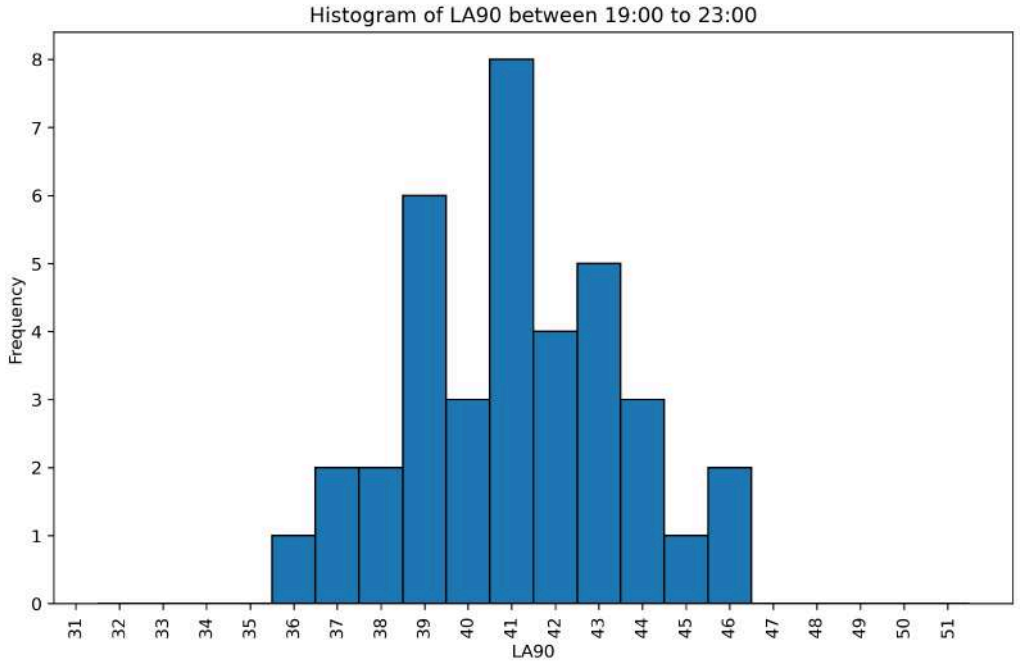

Figure 6: Histogram of LA90 for the period 19:00 to 23:00 (Location 1)

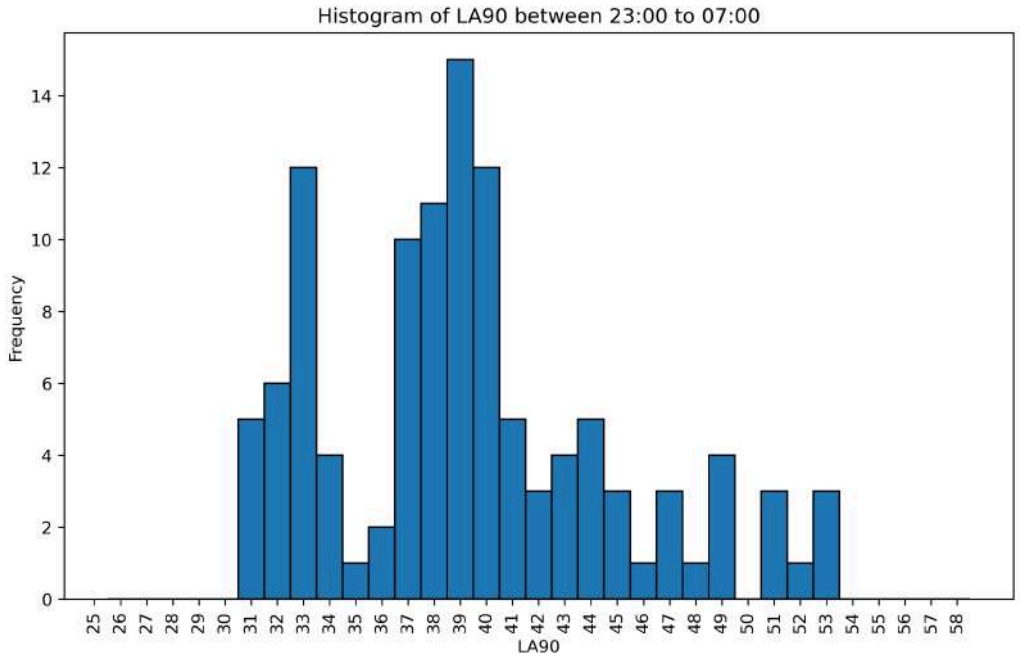

Figure 7: Histogram of LA90 for the period 23:00 to 07:00 (Location 1)

4.4 Summary statistics

The typical values for each period are:

Period	$L_{A90,15mins}$ (mode)
07:00 to 19:00	40
19:00 to 23:00	41
23:00 to 07:00	39

We take the above values to be representative of the sound levels at Location 1.

5 Sound model

5.1 Methodology

We created a noise model of the proposed development using iNoise 2024.3. The settings used in the model are;

- Calculation methodology: ISO 9613-2
- Ground factor: 0.5 (Mixed ground)
- Dmax set in accordance with ISO 9613 (D_{max1} = 20.0, D_{max2} = 25)
- Temperature (Kelvin): 293.15
- Pressure (kPa): 101.33
- Air humidity (%): 60

We used the noise model to calculate the sound level at each of the noise sensitive locations.

5.2 Sound sources

To determine the likely sound level from cars moving on the proposed gravel, we undertook sound measurements of car tyres moving over a similar gravel surface on Monday 24 March 2025.

The car used for testing was a 2004 Ford Fusion, 1.4 l diesel and measurements were taken at a steady distance of 5.6 m with the car traveling at approximately 5 mph. Figure 8 shows the location of the measurement position as well as the car used and the location

Figure 8: Photograph of sound measurement being made as the car moving across the gravel surface

Figure 9: Photograph of the unbound gravel surface on which the measurements were taken

The gravel surface used for the assessment was a loose-bound gravel with a more coarse consistency than the ring-bound gravel proposed. The sound levels from this surface should be assumed to be louder than those on the proposed surface and therefore represent the worst case.

Measurements were taken of both the car moving on the gravel and the residual acoustic environment, facilitating calculation of the sound pressure level of the car alone. Details of the equipment used are in the appendix.

Weather conditions during the measurement period we fine and dry with temperatures of around 11°C, a wind speed of approximately 4 m/s (NNW) and full cloud cover (8 Oktas). There was no precipitation during the measurements.

The results are shown in Table 2. The measurements represent a 10 second period whilst the car was passing by the measurement point and have been corrected for residual noise:

Band [Hz]	63	125	250	500	1000	2000	4000	8000
Specific sound (L_{Zeq})	61	57	55	55	58	53	45	38
A-weighting (dB)	-26	-16	-9	-3	0	1	1	-1
Specific sound (L_{Aeq})	35	41	47	52	58	54	46	37

Table 2: Car measurement results at 5.6 m

Based on the above, the broadband sound pressure level of the car is 61 dB L_{Aeq} at 5.6 m. For an incoherent line source, this equates to a sound power level of 74 L_{Aw}/m^2.

We can then calculate the total sound power emission of the car park area (Table 3).

Value	Value	Unit
Time taken for 1 car to arrive/depart	30	Seconds
Time take for a pass-by at the measurement location	10	Seconds
Number of cars arriving/departing per hour	5	Number
Percentage of time car par in use	4%	Ratio
Effective sound power per m	56	L_{Aw}/m
Average length of route	35	m
Total sound power level of route	71	L_{Aw}

Table 3: Total sound power of the car park area

The above calculate shows that the total sound power levels emitted by the car park is 76 dB L_{Aw}. This assumes that:

- The are up to 5 cars arriving and departing each and every hour;
- Each arrival and departure takes around 30 seconds[1] ; and
- The average length travel for each car departing and arriving is up to 35 m.

5.3 Sound sensitive locations

The sound sensitive locations used in the model are shown in Figure 10.

Figure 10: Nearest sound sensitive locations considered in the noise model

[1]This is typical of similar facilities

5.4 Sound contours

The estimated sound contours are shown in Figure 11. The values shown represent the specific sound level dB L_s.

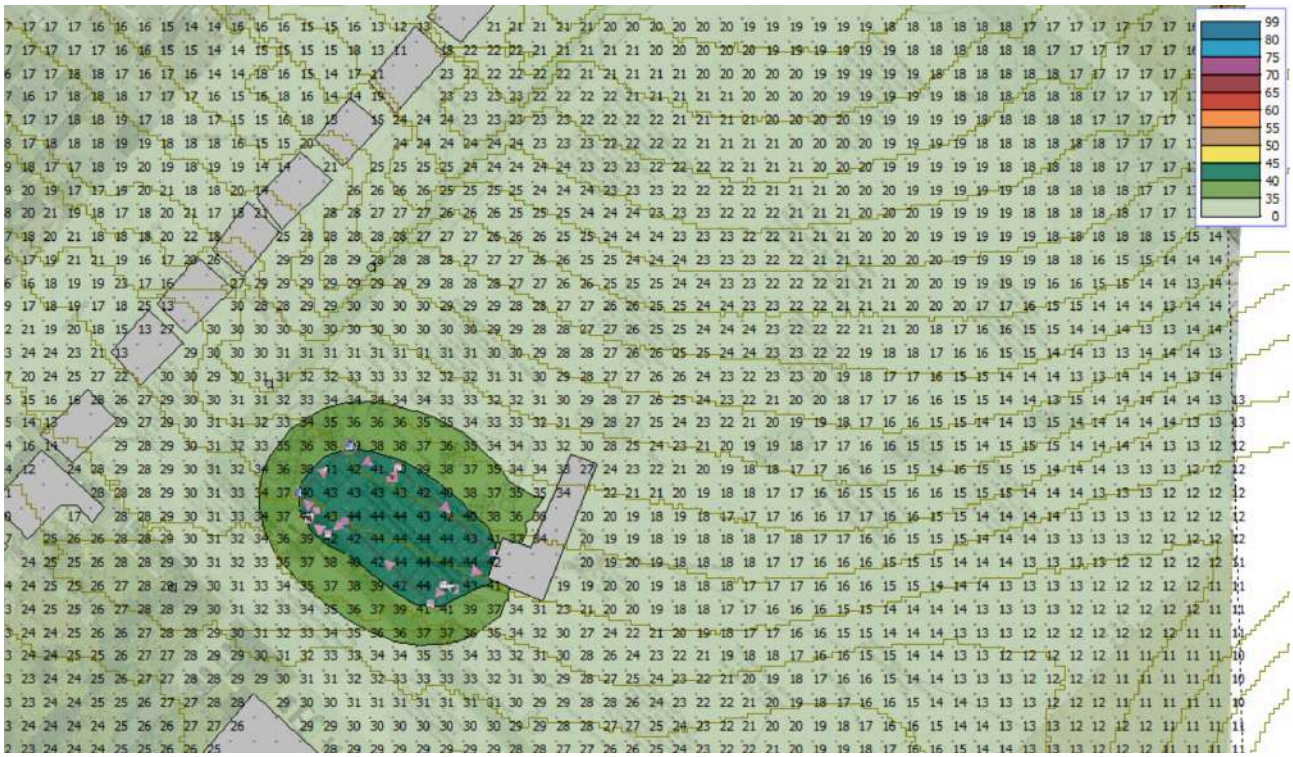

Figure 11: The estimated sound egress from the site (dB L_s)

5.5 Tabular results

The sound levels at each of the sensitive location are:

Location	Specific noise level dB L_s
NSL1	29
NSL2	32
NSL3	29

6 Assessment in accordance with BS 4142:2014+A1

6.1 Assessment during the daytime period

For the assessment of the daytime period, we have applied the following acoustic feature corrections:

Feature correction type	Value	Reasoning
Tonality	0	We do not expect any tonal elements therefore no penalty is applied.
Impulsivity	0	We do not expect any impulsive elements therefore no penalty is applied.
Intermittency	0	We do not expected any audible intermittency, therefore no penalty is applied.
Total	0	

Table 4: Acoustic feature corrections for the daytime period

The assessment table for the daytime period is shown below:

Element	Value	Unit	Comments
Specific sound level	32	dB L_s	The sound level of the subject being assessed at the nearest sound sensitive location.
Acoustic feature corrections	0	dB	To total feature correction due to the character of the sound.
Rating sound level	32	dB L_{ArTr}	The rating sound level as defined by BS 4142:2014+A1. This is equal to the specific souund level plus the acoustic feature corrections
Background sound level	40	dB L_{A90}	The prevailing background sound level at the nearest sound sensitive location for the daytime period.
Difference	−8	dB	The different between the rating sound level and the prevailing background sound level. The value is the principal measure of sound impact.

Table 5: BS 4142:2014+A1 assessment table for the daytime period at the nearest NSL

The results show that the rating sound level is below the background sound level at the nearest noise sensitive locations. This indicates that the likelihood of adverse impact for the daytime is *negligible*.

7 Appendix

7.1 Typical noise levels

The below table shows typical noise levels for reference:

Source	*dBA SPL*
Jet aircraft at a 50m distance	140
Threshold of pain	130
Threshold of discomfort	120
Chainsaw at a 1m distance	110
Disco, 1m from speaker	100
Diesel truck at a 10m distance	90
Kerbside of busy road at a 5m distance	80
Vacuum cleaner at a 1m distance	70
Conversational speech at a 1m distance	60
Average home	50
Quiet library	40
Quiet bedroom at night	30
Background in TV studio	20
Rustling leaves in the distance	10
Threshold of human hearing	0

7.2 Calibration certificates

Component type	Manufacturer	Model	Serial No.	Calibration due
Sound level meter	Svantek	SVAN 307A	158636	17 February 2025
Microphone capsule	Svantek	ST30A	157851	17 February 2025
Pistonphone	CEL Instruments	CEL-284-2	5819051	12 August 2025
Sound level meter	NTi Audio	XL2-TA	A2A-08975-E0	7 March 2027
Microphone capsule	NTi Audio	MC230A	A29597	7 March 2027
Pre-amplifier	NTi Audio	MA220	5050	7 March 2027

7.3 Glossary

We have provided a list of common acoustic terminology below. We hope this helps the reader understand some of the more technical (and non-technical) terms. However, in the case of any confusion, please don't hesitate to get in touch and we will be happy to explain further.

7.3.1 General terminology

- *Sound:* The audible transmission of vibrations through air or water.

- *Noise:* Unwanted sound. Sound that causes disturbance.
- *Ground-borne Vibration:* Vibration transmitted through the ground. Has the potential cause disturbance, even damage at sufficient levels. Typically measured as Vibration Dose Values (VDVs).
- *Re-radiated Noise (or 'Ground-borne Noise'):* Ground-borne vibration can cause walls, floors and ceilings to radiate noise. This is often referred to as ground-borne noise. Mechanical plant may also generate noise by similar means.
- *Cross-talk:* Sound transmission between rooms via ventilation ducting.
- *Decibel (dB):* The standard unit for defining sound pressure levels. The range of normal hearing is between 0 dB and 130 dB Where 130 dB is the upper threshold of pain. A change of 1dB in sound pressure levels is barely perceptible and 3dB is normally the minimum audible difference. A change of 5dB is clearly audible. A change of 10dB roughly corresponds to a halving or doubling of perceived loudness.
- *dBA (A-weighted decibel):* A-weighted decibels use a frequency weighting to correspond to how the human ear hears sound.

7.3.2 Environmental noise terminology

- *LAeq,T (equivalent continuous noise level):* The A-weighted equivalent average noise level (LAeq) is commonly used to describe the average noise level in a given environment over the measurement period.
- *LA10,T:* The A-weighted level of noise exceeded for 10% of the specified measurement period (T). It gives an indication of the upper limit of fluctuating noise and is commonly used in traffic noise measurements.
- *LA90,T:* The A-weighted level of noise exceeded for 90% of the specified period (T). It is commonly used to define background noise level; the underlying level in the absence of intermittent noise.
- *LAmax (maximum noise level):* The highest A-weighted noise level recorded during the measurement period. It is measured using the fast sound level meter response.
- *Hz (Hertz):* Hz is the unit of frequency, equal to one pressure fluctuation cycle per second. Frequency is related to the pitch of a sound.
- *Free-field:* A sound measurement taking in the absence of any reflecting objects. Generally measured outside and away from buildings.
- *Facade-level:* A measurement taken in close proximity (e.g. 1 m) to a reflective surface other than ground, such as a building facade. This typically increases the measured level by around 3 dB.

7.3.3 BS 4142 terminology

- *BS 4142:2014+A1:* A British Standard that provides guidance on assessing the effect of noise from industrial and commercial operations on residential dwellings.
- *Ambient sound:* The sound that comprises the total sound for a specific situation and time (e.g. distant road traffic plus wildlife plus an air conditioning unit or other commercial noise source). The ambient sound comprises the residual sound and the specific sound when present.
- *Ambient sound level (L_a)*: This is the equivalent average sound level (dB L_{Aeq}) at a given location.
- *Specific sound level (L_s)*: The sound arising from the source being assessed (e.g. an air conditioning unit or other commercial noise source).
- *Residual sound*: ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.
- *Residual sound level (L_r)*: The sound remaining when the specific sound is inaudible (e.g. distant road traffic plus wildlife)
- *Rating level (L_{ArTr})*: The specific sound level with penalties for characteristic features of the noise (i.e. tonality, intermittency or impulsivity)
- *Background sound level (L_{A90}):* The sound level that is exceeded for 90% of the time.

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All design advice given in this report should be checked with a suitably qualified structural engineer, fire safety engineer, chartered building surveyor, building services engineer and your local building control officer as required. Suitably qualified consultants can be found at the Institution of Structural Engineers, the Royal Institution of Chartered Surveyors and the Chartered Institution of Building Services Engineers. The manufacturer's guidance should be followed in full for all recommended products in this report.

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