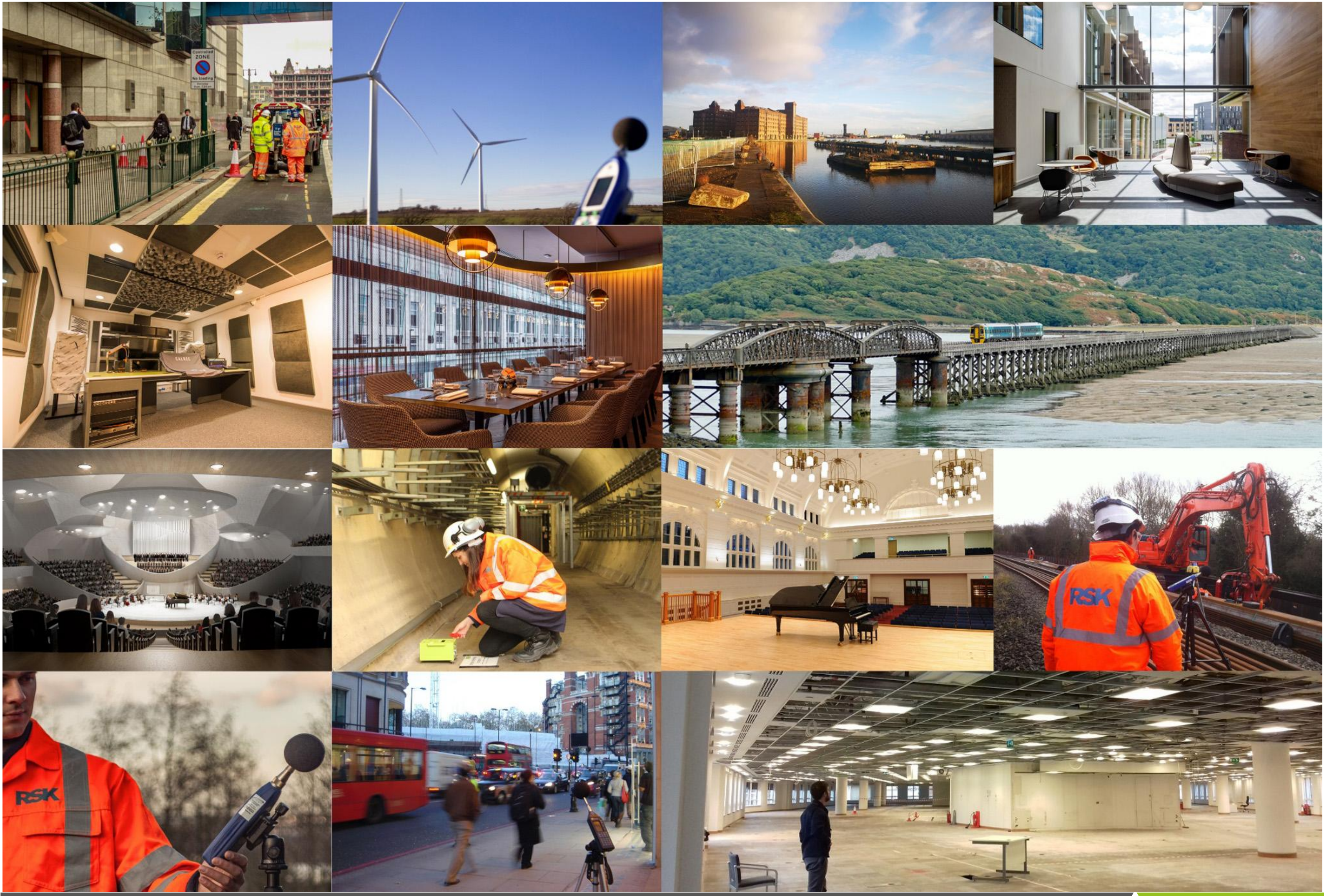

NOISE IMPACT ASSESSMENT

BAYSGARTH SCHOOL, BARTON UPON HUMBER - TEST RACETRACK

RSK Environment Ltd

2063166-RSKA-RP-001-(02)

General notes

Project Name:	Baysgarth School, Barton Upon Humber - Test Racetrack
Title:	Noise Impact Assessment
Client:	RSK Environment Ltd
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1 Introduction

1.1 Overview

RSK Acoustics (RSKA) has been instructed by RSK Environment Ltd on behalf of Baysgarth School to undertake a noise impact assessment in relation to proposals for the development of a purpose-built racetrack within the grounds of Baysgarth School, Barton-Upon-Humber, North Lincolnshire, DN18 6AE.

The assessment is informed by an attended survey to capture operational source data and a baseline noise survey, undertaken at positions representative of the nearest noise sensitive receptors (NSRs), to determine typical background sound levels during both daytime and night-time periods. This report describes the assessment methodology and the baseline conditions currently prevailing across the application site, to evaluate the suitability of the proposed development.

1.2 Objectives

The aim of this noise assessment is to:

- Quantify and report the prevailing noise climate at nearest NSRs to the development;
- Present relevant impact assessment thresholds from local and national guidelines;
- Predict the operational noise from the development at the nearest NSRs;
- Assess the predicted noise levels against the relevant noise impact thresholds; and
- Specify noise mitigation measures where necessary.

1.3 Exclusions

Operational traffic movements from the test track development have not been assessed given the type of proposed operation on the site. Any additional operational traffic movements from vehicles entering and exiting the site to use the development are not likely to have a significant impact and have therefore not been quantified in this assessment.

Vibration generation from the operational development and its impact on nearby residents would be minimal due to the distances to the NSRs. It is also anticipated that the development will not generate significant vibration. Therefore, operational vibration has been scoped out of the assessment.

2 Regulatory Framework

2.1 National Policy and Guidance

2.1.1 National Planning Policy Framework (NPPF): 2024

The National Planning Policy Framework (NPPF) (published March 2012 & updated December 2024) is the means by which noise is considered within the planning regime. The NPPF does not contain assessment design target, instead providing a series of policies, giving local authorities the flexibility in meeting the needs of local communities. The NPPF states:

"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 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."

"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 impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

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."

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

2.1.2 Noise Policy Statement for England (NPSE): 2010

Environment, Food and Rural Affairs (Defra) and sets out the approach to noise within the Government's sustainable development strategy.

The significance of impacts from noise are defined within the NPSE as follows:

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

NOEL – (No Observed Effect Level) - This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL (Lowest Observed Adverse Effect Level) - This is the level above which adverse effects on health and quality of life can be detected.

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

SOAEL – (Significant Observed Adverse Effect Level) - This is the level above which significant adverse effects on health and quality of life occur."

The three aims of the NPSE are to:

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

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

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

2.1.3 Planning Practice Guidance (PPG)

The Department for Communities and Local Government 'Planning Practice Guidance' (PPG) expands upon the NPPF and NPSE. The guidance does not include any specific noise levels but sets out further principles that should underpin a noise assessment. The PPG states:

"Plan-making and decision making need to take account of the acoustic environment and in doing so consider:

whether or not a significant adverse effect is occurring or likely to occur;

whether or not an adverse effect is occurring or likely to occur; and

whether or not a good standard of amenity can be achieved."

It then refers to the NPSE and states that the aim is to identify where the overall effect of the noise exposure falls in relation to SOAEL, LOAEL and NOEL and presents a table, reproduced below. The implication of the final line of the table is that only the 'noticeable and very disruptive' outcomes are unacceptable and should be prevented.

Response	Examples of outcomes	Increasing effect level	Action
NOAEL *(No Observed Effect Level)*			
Not present	No effect	No observed effect	No specific measures required
NOAEL *(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
LOAEL *(Lowest Observable 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

Response	Examples of outcomes	Increasing effect level	Action
SOAEL *(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

Table 1 Summary of noise exposure hierarchy

2.2 Local Policy and Guidance

2.2.1 Local Authority Consultation

Consultation was sought with North Lincolnshire Council (NLC) via email on 16 May 2025, detailing RSKA's proposed approach to the survey and assessment.

A response was received from Karen Robinson on Wednesday 21 May 2025, agreeing in general with RSKA's methodology proposed, whilst advising that there are no local authority guidance or amendments to the current BS 4142:2014 criteria that they need to make us aware of.

2.3 British Standards and Other Guidance Documents

2.3.1 British Standard (BS) 7445-1:2003

The three-part standard BS 7445 'Description and measurement of environmental noise. Guide to quantities and procedures' provides the framework within which environmental noise should be quantified. Part 1 provides a guide to quantities and procedures and Part 2 provides a guide to the acquisition of data pertinent to land use. Part 3 provides a guide to the application of noise limits.

BS 7445 also refers to a further standard, BS EN 61672, which prescribes the equipment necessary for such measurements. Whilst BS 7445 does not prescribe the meteorological conditions under which noise measurements should or should not be taken, it does (part 2, paragraph 5.4.3.3) recommend that in order:

"…to facilitate the comparison of results (measurements of noise from different sources), it may be necessary to carry out measurements under selected meteorological conditions which are reproducible and correspond to quite stable propagation conditions."

These conditions include:

- Wind speed not exceeding 5 m/s (measured at a height of 3 to 11 metres above the ground);
- No strong temperature inversions near the ground; and
- No heavy precipitation.

2.3.2 BS 4142:2014+A1:2019

BS 4142:2014+A1:2019 *'Methods for rating and assessing industrial and commercial sound'* describes the methods for rating and assessing noise of an industrial or commercial nature. The standard is applicable for the purpose of assessing sound from multiple sources at existing dwellings, including the following:

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

Where certain acoustic features are present at the assessment location, a character correction should be applied to the specific sound level to give the rating level to be used in the assessment. The difference between the background sound level and the noise rating (including any penalties) is then calculated.

- 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 adverse impact depending on the context.
- 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.

As indicated above, the significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. BS4142 states that:

"An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context".

Where the initial estimate of the impact needs to be modified due to the context, all pertinent factors should be taken into account, including:

- The absolute level;
- The character and level of the residual sound; and
- The sensitivity of the receptor and whether dwellings will already (or likely) to incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:
    - façade insulation treatments,
    - ventilation and/or cooling, and
    - acoustic screening.

2.3.3 BS 3744:2010

The international standard *BS 3744:2010 'Acoustics. Determination of sound power levels of noise sources using sound pressure. Engineering method in an essentially free field over a reflecting plane.'* specifies methods for determining the sound power level or sound energy level of a noise source from sound pressure levels measured on a surface enveloping the noise source (machinery or equipment) in an environment that approximates to an acoustic free field near one or more reflecting planes.

The sound power level (or, in the case of noise bursts or transient noise emission, the sound energy level) produced by the noise source, in frequency bands or with A-weighting applied, is calculated using those measurements.

The methods specified in this International Standard are suitable for all types of noise (steady, non-steady, fluctuating, isolated bursts of sound energy, etc.) defined in ISO 12001 and is applicable to all types and sizes of noise source (e.g. stationary or slowly moving plant, installation, machine, component or sub-assembly), provided the conditions for the measurements can be met.

3 Proposed Development

3.1 Site Location and Description

The development site is located within the Baysgarth school grounds, Barton-Upon-Humber under the local authority of North Lincolnshire Council (NLC). The site is bounded by residential properties along Barrow Road (A1077) to the north, residential properties along Caistor Road to the west and south and properties along Meadow Drive to the east. Beyond the southern and eastern properties, lies mainly agricultural land.

The current environment is an active high-activity educational setting with the surrounding playing fields and football pitches available during break and lunch times for the learners and also used into the evenings and weekends for local community and sports groups.

3.2 Development Proposals

Over the last six years, the design engineering team at Baysgarth School has championed Greenpower which has made a significant impact on the landscape providing their learners with a unique STEM initiative, driven through a desire to raise the profile of the STEM field subjects for the new generation of learners. This initiative has led the learners at Baysgarth into designing and building Greenpower electric kit cars since 2018 gaining hands-on science, maths and engineering skills and treating the whole project as if they were a professional race team, helping the school to become the Centre of Excellence in the process.

As a result, the school plan to create a test racetrack encircling the lower field at Baysgarth School. This resource enables in-depth testing for learners to collect data for analysis in their decision making for race day's and to also have the track host Greenpower Goblin events for primary-age learners. As well as enhancing the skills of the area's children, the track will also become a useful resource for the wider community. In keeping with the green theme, the track is planned to be constructed using recycled plastics.

The site masterplan provided by the client illustrates a three-metre-wide track which will encircle part of the school field, with metal palisade fencing planned at the boundary to the northwest section and wooden boundary fencing to the southwest section where the nearest residential properties along Nightengale Road reside.

The masterplan for the proposed test track can be seen in Appendix C.

3.2.1 Operational Assumptions

From correspondence with the client, it is proposed that the operation of the test track will only be during daytime hours only. It is also proposed that only one electric kit car will be operational on the test track at any one time.

For the purposes of measurement and assessment, it was determined that the greatest noise emissions were likely due to pass-by noise from the internal components of the electric car including tyre / surface noise interaction when the kit cars are in operation around the track and additionally noise generated when the kit cars are idle (in neutral) with full throttle capacity. Therefore, this assessment will focus on the noise emissions generated for both scenarios.

At this stage, it has not yet been confirmed the on-time events expected for the race kit cars on the test track and the test tracks exact frequency of use, however it is safe to assume that the test track would not be in constant operation.

Additionally, the idle, full throttle scenario, being a potential source of noise emissions, is unlikely to be experienced every time a race kit car is using the track. Therefore this scenario is applied to provide a conservative, worst-case situation for assessment.

3.3 Existing Receptors

Table 2, below, lists the noise sensitive receptors considered in the assessment, along with their distance and direction from the site boundary of the proposed test track. The receptors are also depicted in Figure 1 presented overleaf which also shows the development site extents.

Where multiple dwellings have been identified as a single NSR, the most affected point has been considered.

Ref.	NSR Name/Description	Approximate Distance from development boundary (m; direction)
NSR1	2a Barrow Road	130; SE
NSR2	10 Barrow Road	110; S
NSR3	18 Barrow Road	110; S
NSR4	17 Nightengale Road	40; E
NSR5	19 Nightengale Road	60; NE
NSR6	34 Caistor Road	150; N
NSR7	3 Caistor Road	100; E

Table 2 NSR Locations

Figure 1 Development Extents and NSR Locations

4 Noise Survey Methodology

The noise monitoring comprised of an unattended baseline noise survey undertaken from 28 March 2025 to 03 April 2025 utilising two measurement positions (UL1 and UL2), chosen for a six day-long monitoring period, representative of the nearest NSRs. Additionally, to capture the noise data from a race kit car, an attended noise survey was undertaken on Thursday 05 June 2025 where measurements were recorded to capture the noise emissions of a typical race kit car in action and when idling at full throttle capacity.

4.1 Survey Details – Attended Source Measurements

The site visit took place in the daytime working hours of Wednesday 05 June 2025 with the aim to measure and quantify the noise emissions of a race kit car under two typical main noise generated scenarios, in operation, simulating its use around the proposed racetrack and when in idle mode with full throttle running.

The race kit car used for the measurements was a Greenpower Formula 24 model (F24), which is a self-assembly single seater kit car run using a single 24-volt DC motor powered by two 12-volt batteries. The F24 comprises a fully welded 2-part steel space frame chassis supported by four strong 20-inch wheels with free running hubs allowing the kit car to average speeds between 20-30MPH. It was noted that the F24 was using 'kojak' wheels which are designed to be tread-less and therefore reduces tyre / surface noise interaction. The Baygarth design team plan on using this technique on all the kit cars tested on the track going forward.

To undertake the first set of measurements and to capture the pass-by noise from the operation of the F24, a single sound level meter was set-up within the school's tennis court arena which is where the current cars are tested. Additionally the surface of the tennis court arena was composed of porous asphalt which has similar properties to the surface for the proposed test track. The meter was set-up accordingly halfway along a straight section of the tennis court so that it would be positioned 1 metre the from source horizontally as it passed by, also allowing for the kit car to accelerate to an acceptable speed as it passed the microphone point. It was determined that to capture sufficient data, several pass-by events were needed so that the kit car could be recorded reaching a typical average speed to that expected on the test track. Measurements were taken as 1-second samples so the precise moment the kit car passed the measurement point could be analysed. A run duration of 4 pass-by events were achieved so that the highest speed capable at the time in the present conditions could be reached.

The second set of measurements were intended to measure the sound power level of the F24 when in an idle state but with full throttle capacity, therefore simulating a typical starting situation before a test run. The locations for this measurement were coordinated to be in a northerly, easterly, southernly and westerly direction around the F24 (main noise source), with a setback distance radius of 1.2 metres from the centre of the machine. Measurements were taken as 5-second samples around the source and sampled 3 times to derive at an average value for each of the four positions.

Using 5-second sample measurements provided a good representation of the steady state noise emissions when the F24 was in a full throttle idle state, as the noise climate of the F24 during this state did not vary significantly.

The height of the microphone for each measurement was 1 metre from the ground due to the low height level of the source and at least 3.5 metres from any reflective surface to satisfy free-field conditions.

The results of both the attended measurement scenarios can be seen in Section 5.1.

The data sheet used to derive at the sound power level which is to be used in the noise model along with an illustration depicting the measurement locations around the source can be seen in Appendix D.

4.2 Survey Details – Unattended Baseline Noise Survey

For the unattended baseline noise survey, positions were selected by considering the site constraints, security and accessibility of the monitoring equipment to quantify noise from surrounding sources such as the contribution from the school itself and local road traffic. Observations made during installation and collection determined that the noise environment at the monitoring positions was indeed consistent with that witnessed at the nearest NSR locations (to the monitoring position).

Descriptions of the measurement positions, including the NSRs represented by each position, are provided in Table 3 below:

Reference	WhatThreeWords	NSRs Represented
UL1	Travel.parkway.quitter	NSR4 NSR5 NSR6 NSR7
UL2	Informs.intrigued.exonerate	NSR1 NSR2 NSR3

Table 3 Unattended Monitoring Measurement Locations

The locations of UL1 and UL2 are shown below in Figure 2.

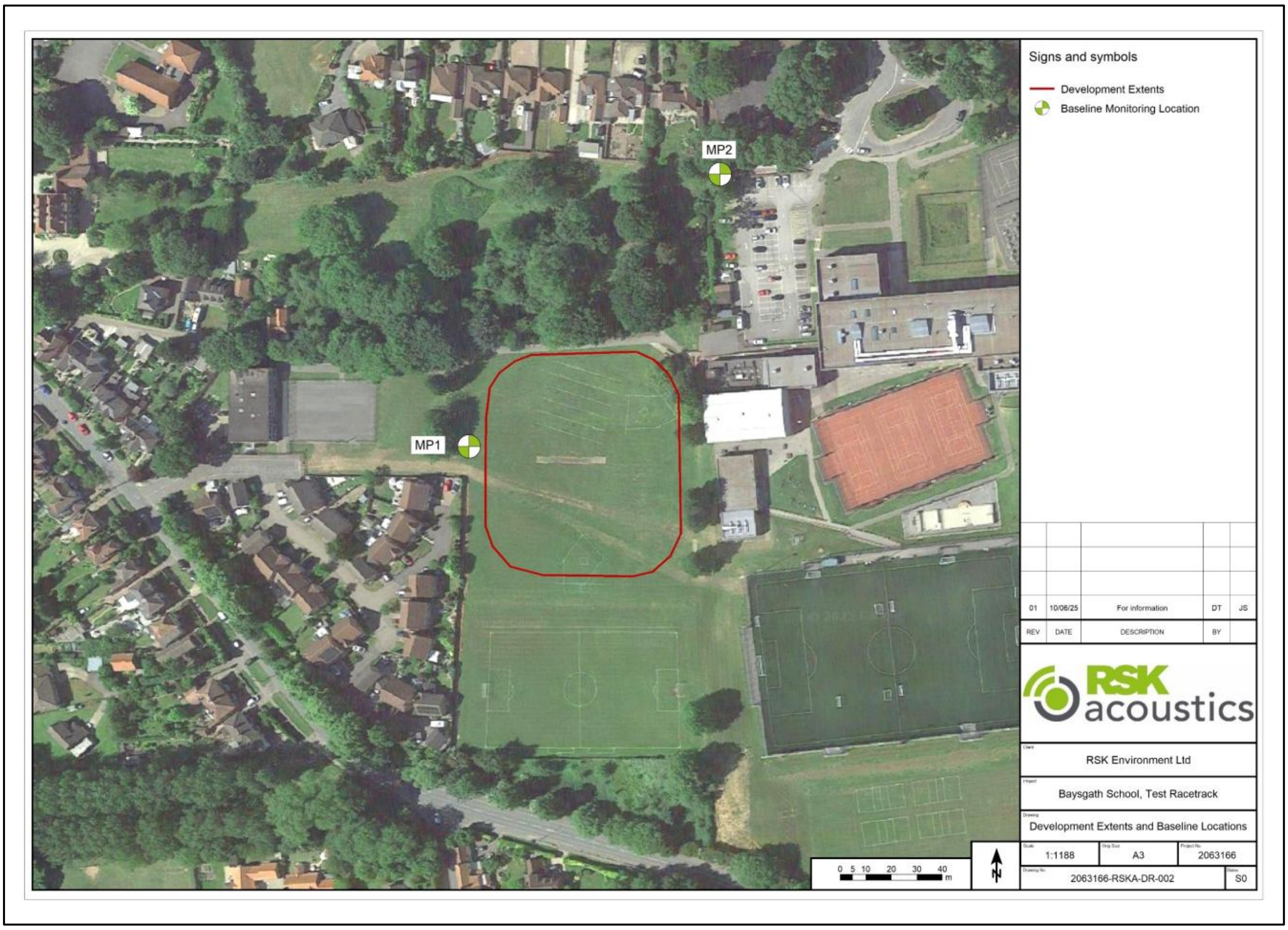

Figure 2 Development Extents and Baseline Monitoring Locations

4.3 Survey Observations

The acoustic environment across the site was observed to comprise the following:

Unattended Survey

- Road traffic noise from surrounding road networks, mainly A1077;
- Noise from children moving between classrooms / breaktime;
- Occasional vehicle movements in car park; and
- Intermittent wind noise through trees and fence panels.

Attended Survey

- Direct noise from the idling and movement of the F24 test kit car;
- Noise from children moving between classrooms / breaktime; and
- Occasional vehicle movements on the side road as part of the school.

4.4 Survey Equipment

The equipment used to carry out both noise surveys is presented in Table 4.

Equipment	Type	Serial Number	Calibration Expiry
Sound level meter	01dB Fusion	12079	18/11/2025
	01dB Fusion	14920	19/10/2025
	Svantek 971A	121061	13/05/2026
Acoustic calibrator	Rion NC-75	34524126	24/09/2025

Table 4 Monitoring equipment

The sound level meters conformed to the Class 1 requirements of BS EN 61672-1:2013. The calibrator used conformed to the Class 1 requirements of BS EN IEC 60942:2018.

The equipment used has a calibration history that is traceable to a certified calibration institution. Calibration certificates are available on request.

The calibration of the sound level meter was field checked prior to commencing measurements and prior to removing the equipment from site upon completion; no significant calibration drift was observed i.e., within a +/- 0.5 dB tolerance.

4.5 Weather Conditions

Unattended Survey

The weather data collected was from Weather Underground (wunderground.com) using the weather station with reference IBARTO16, which is situated 1.3km east from the school grounds. A summary can be seen in Table 5 overleaf.

Date	Temperature (°C)		Wind Speed Average (m/s)	Wind Direction	Precipitation Rate (mm)
	High	Low			
28/03/25	13	5	1.2	NNW	0
29/03/25	14	4	1	WSW	0
30/03/25	16	7	1.4	WSW	0
31/03/25	17	5	0.5	SW	0
01/03/25	13	3	0.7	ESE	0
02/03/25	14	4	0.6	SSE	0
03/03/25	14	6	0.6	W	0

Table 5 Summarised weather data during monitoring period

From Table 5, no periods of rain or high wind speeds (above 5 m/s in a 15-minute period) were noted during the period of the unattended measurements, as such all-noise data is considered suitable for inclusion in the assessment.

Attended Survey

The weather during the attended session on Thursday 05 June 2025 consisted mainly of overcast clouds with some intermittent sunny spells and expected periods of rain. The temperature varied between 16-17 degrees Celsius with a wind speed varying between $0ms^{-1}$ and $0.8ms^{-1}$ in a southerly direction providing appropriate weather conditions for noise measurements.

5 Noise Survey Results

5.1 Measurement Summary – Attended Survey, Wednesday 05 June 2025

5.1.1 Noise Measurement Results – F24 Kit Car in Action

A summary of the measured noise levels as 1-second L_{Aeq} values capturing pass-by noise when the F24 kit car is in operation around the tennis court arena is shown in Table 6. Noise measurements were taken 1 metre from source during the four pass-by events.

Event no.	Time of Event (hh:mm:ss)	Noise Monitoring Results, dB(A)
		$L_{Aeq,T}$
1	14:52:28	67
2	14:53:11	71
3	14:53:33	72
4	14:53:58	69

Table 6 Summary Measurement Data, F24 Kit Car in Action

Table 8 shows that the highest pass-by noise event value recorded is 72 dB L_{Aeq} with the F24 averaging a speed of approximately 22-24 MPH. This recorded value will be used for assessment purposes.

5.1.2 Noise Measurement Results – F24 Kit Car, Idle, Full Throttle

A summary of the measured noise levels when the F24 is idle with full throttle capacity is shown in Table 7. Noise measurements were taken 1.2 metres from the centre of the source for each measurement location.

The data sheet used for the sound power level measurements along with an illustration depicting the measurement locations can be seen in Appendix D.

Measurement location	Results dB(A)				
	1	2	3	Average	Sound Power Level
	L_{Aeq}	L_{Aeq}	L_{Aeq}	L_{Aeq}	L_{AW}
1 - Front	60.0	60.3	60.2	60.2	
2 - Side (E)	66.8	67.0	66.8	66.9	
3 - Rear	68.7	68.7	68.6	68.7	
4 -Side (W)	66.5	66.5	66.3	66.4	
Background	(measure one location without car operating)			50.8	
	Average (all locations)			**66.4**	**76**

Table 7 Summary Measurement Data, F24 Kit Car, Idle, Full Throttle

The results from Table 8 show that the rear of the F24 recorded the greatest magnitude of sound pressure level out of the four positions measured. This is due to the F24 having a rear-mounted engine, housing the motor and battery packs.

It should be noted that it was observed that during a typical race day, the rear mounted section comprising the engine compartment will be covered. During the attended source measurements of the F24, the engine compartment was exposed. Therefore, with the engine compartment covered, lower sound pressure levels could be expected.

5.2 Measurement Summary – Unattended Survey

To display a summarised dataset within this section, the following methods have been used:

- Ambient levels, dB $L_{Aeq,T}$, are calculated via logarithmic average of contiguous 15-minute records across the assessment periods;
- Statistical values, dB $L_{A10,T}$ and $L_{A90,T}$, are calculated via arithmetic average of contiguous 15-minute records across the assessment periods;
- Maximum levels, dB L_{AFmax}, are summarised as the highest individual $L_{AFmax,15min}$ recorded across each assessment period; and
- All values have been rounded to the nearest decibel.

5.2.1 Noise Measurement Results – UL1

A summary of the measured noise levels at UL1 are presented in Table 8.

Start Date	Time period	Noise Monitoring Results, dB(A)			
		$L_{Aeq,T}$	$L_{Amax,T}$	$L_{A10,T}$	$L_{A90,T}$
28/03/2025	13:00 – 23:00[(a)]	53	75	52	44
	23:00 – 07:00	42	70	42	37
29/03/2025	07:00 – 23:00	52	78	52	43
	23:00 – 07:00	51	76	51	39
30/03/2025	07:00 – 23:00	51	76	50	42
	23:00 – 07:00	47	76	40	34
31/03/2025	07:00 – 23:00	46	79	46	40
	23:00 – 07:00	43	64	41	35
01/04/2025	07:00 – 23:00	49	76	50	43
	23:00 – 07:00	44	68	42	36
02/04/2025	07:00 – 23:00	50	79	51	44
	23:00 – 07:00	43	63	41	36
03/04/2025	07:00 – 09:00[(a)]	48	71	50	45
(a) Measurements not obtained throughout full 16hr period					

Table 8 Summary Measurement Data, UL1

5.2.2 Noise Measurement Results – UL2

A summary of the measured noise levels at UL2 are presented in Table 9.

Start Date	Time period	Noise Monitoring Results, dB(A)			
		$L_{Aeq,T}$	$L_{Amax,T}$	$L_{A10,T}$	$L_{A90,T}$
28/03/2025	13:00 – 23:00[(a)]	57	82	55	48
	23:00 – 07:00	48	69	48	38
29/03/2025	07:00 – 23:00	51	83	53	47
	23:00 – 07:00	49	83	49	40

Start Date	Time period	Noise Monitoring Results, dB(A)			
		$L_{Aeq,T}$	$L_{Amax,T}$	$L_{A10,T}$	$L_{A90,T}$
30/03/2025	07:00 – 23:00	51	76	53	45
	23:00 – 07:00	50	78	46	36
31/03/2025	07:00 – 23:00	56	93	54	46
	23:00 – 07:00	52	91	47	37
01/04/2025	07:00 – 23:00	60	90	57	47
	23:00 – 07:00	50	73	48	38
02/04/2025	07:00 – 23:00	59	91	57	48
	23:00 – 07:00	50	73	47	38
03/04/2025	07:00 – 09:00[(a)]	73	92	59	51
(a) Measurements not obtained throughout full 16hr period					

Table 9 Summary Measurement Data, UL2

Baseline noise monitoring graphs illustrating the recorded data for both measurement locations are provided in Appendix F. More detailed statistical analysis of the background sound levels, for use within this assessment, is presented in the following section.

5.3 Derivation of Background Sound Levels

The development plans to operate during daytime periods only. Therefore, the representative background sound levels are provided for the daytime period (07:00 – 23:00). The methodology detailed in BS 4142: 2014+A1: 2019 provides an example of statistical analysis to determine the representative background sound level during the daytime ($L_{A90,\ 1h}$).

The analysis adopts the methodologies applied within the aforementioned standard to the receptors below; graphs of the statistical analysis are shown in Appendix F:

Receptor	Measurement location	Representative Background Sound Level
		Daytime dB $L_{A90,1h\ (0700\text{-}2300)}$
NSR1	UL2	40
NSR2		
NSR3		
NSR4	UL1	37
NSR5		
NSR6		
NSR7		

Table 10 Representative Background Sound Levels at NSRs

6 Noise Prediction Model

6.1 Modelling Methodology

The predicted noise levels likely to be generated during the operation and full throttle idling scenarios of the F24 kit car have been calculated using a noise prediction model. These predictions realise the noise propagation of any source noise in isolation at the nearest sensitive receptors to the site, taking terrain and local topographical features into consideration.

The noise predictions (specific sound levels at noise sensitive receptors) are based on International Standard ISO 9613-2:2024 ‘Attenuation of sound during propagation outdoors’. ISO 9613 provides a method for the prediction of noise levels in the community from sources of known sound emission.

The ISO 9613-2 method predicts noise levels under meteorological conditions favourable to noise propagation from the sound source to the receiver, such as downwind propagation, or equivalently, propagation under a moderate ground-based temperature inversion as commonly occurs at night. Unless otherwise indicated, all noise predictions presented in this report have been carried out using SoundPLAN v9.1.

The noise prediction method described in ISO 9613 is suitable for a wide range of engineering applications where the noise level outdoors is of interest. The noise source(s) may be moving or stationary and the method considers the following major mechanisms of noise attenuation:

- Geometrical divergence (also known as distance loss or geometric damping);
- Atmospheric absorption;
- Ground effect;
- Reflection from surfaces; and
- Screening by obstacles, barriers, and buildings.

6.2 Modelling Parameters

An overview of the modelling parameters is given in Table 11.

Item	Setting
Algorithm	International Standard: ISO 9613-2:2024
Ground absorption	The ground absorption across the development site has been set with an absorption coefficient of 0.7 to represent the soft ground that is predominantly relevant throughout the development area.
Façade Correction	Predictions are at 1 m from a given façade, but are free-field, as per BS 4142 requirements
Meteorological Conditions	10 degrees Celsius; 70 % humidity; and Wind from source to receiver.
Receptor height	Ground Floor level set at 1.5 m above external ground level. First Floor level set at 4 m above external ground level.
Site layout	Development layout according to received drawings (Track GA 21m) provided by Baysgarth School. See Appendix C.
Source modelling	For both operational and idle, full throttle scenarios, a line source concept has been adopted within the noise model, as a race car, particularly over a significant distance can be seen as a source that emits noise continuously along a line rather than at a single location. See also Section 3.2.1.
Terrain	Surrounding terrain (beyond site boundary) has been derived from NextMap Britain 2m_Contours.

Table 11 Modelling parameters

7 Assessment

7.1 Acoustic Correction

According to BS 4142:2014+A1: 2019, where certain features of the specific noise level can increase the significance of impact of a sound level, a character correction is applied to provide a 'Rating Level'. The characteristics of a sound that are likely to cause an increase in the significance of impact are tonality, impulsivity, intermittency or other characteristic features such as an identifiable 'hiss'.

BS 4142 includes the addition of rating penalties (to the specific noise) as a factor of 'perceptibility', where the prominence of tonal or impulsive sound from a source can be readily distinguishable over the residual sound. For the purposes of the assessment, the addition of rating penalties considers the numerical comparison of the specific noise from operational sources against the baseline residual sound level at each receptor in order to determine perceptibility.

7.1.1 Tonality

To determine if on-site noise conditions such as tonality would be present at the nearest receptors, the objective method from BS 4142 was performed with analysis of the 1/3 octave frequency data undertaken for both in action and idle, full throttle race scenarios. This analysis is presented in Figures H-1 and H-2 shown in Appendix H.

The test for the presence of a prominent, discrete-frequency spectral component (tone) typically compares the $L_{Zeq,T}$ sound pressure level averaged over the time when the tone is present in a one-third-octave band with the time-average linear sound pressure levels in the adjacent one-third-octave bands. For a prominent, discrete tone to be identified as present, the time-averaged sound pressure level in the one-third-octave band of interest is required to exceed the time-averaged sound pressure levels of both adjacent one-third-octave bands by some constant level difference. The level differences between adjacent one-third-octave bands that identify a tone are:

- 15 dB in the low-frequency one-third-octave bands (25 Hz to 125 Hz);
- 8 dB in the middle-frequency one-third-octave bands (160 Hz to 400 Hz); and
- 5 dB in the high-frequency one-third-octave bands (500 Hz to 10 000 Hz)

From analysis of Figures H-1 and H-2, and by using the 1/3 octave method for assessing the audibility of tones described in Annex C from BS 4142, the attended on-site data for both race car scenarios does not depict the presence of discrete tones emanating from the source location. Therefore, no acoustic correction will be applied for the presence of tonal components.

7.1.2 Impulsivity and Intermittency

From near-field observations made during the attended measurements (1-metre away), a 'clear' impulsivity effect was experienced by the surveyor due to the mere nature of the idle full throttle from resting state scenario. However, due to distance propagation of sound, and with the nearest receptor potentially 40 metres from site, it is likely that any impulsivity effect would be of a magnitude that is negligible. It is therefore considered unnecessary to apply a correction due to impulsive or intermittent components.

7.1.3 Readily Distinctive Characteristics

It is thought that the operation of the test track would not significantly change the acoustic environment observed by our on-site consultant during the attended measurement survey due to the observed nature of noise emissions experienced in the near-field from the electric kit car while in attendance. On this basis, it is considered that the sound from the new racetrack will not be readily distinctive from the current environment and therefore no penalty has been applied to account for this.

7.1.4 Summary

Based on the information provided above, no acoustic corrections are deemed necessary when assessing the proposed test track development. Therefore, the rating level as described hereafter is noted to be equal to the specific sound level for this assessment.

7.2 Assessment

7.2.1 Initial Quantitative Assessment – F24 Kit Car, Operational

An assessment of the predicted rating level, against the representative background sound level at the closest residential receptors when the F24 kit car is in action, is summarised in Table 12. Operational noise contours (specific sound levels) for this scenario are provided in Appendix G.

NSR	Background Sound Level, dB $L_{A90,1h}$	Specific Sound Level, dB $L_{AS,1h}$	Character Corrections, dB	Rating Level, dB $L_{Ar,Tr}$	Excess of Rating Level Over Background, dB
NSR1	40	22	0	22	-18
NSR2	40	23	0	23	-17
NSR3	40	23	0	23	-17
NSR4	37	35	0	35	-2
NSR5	37	33	0	33	-4
NSR6	37	22	0	22	-18
NSR7	37	25	0	25	-12

Table 12 Assessment of Daytime Noise Impact – (BS 4142), F24 Kit Car in Operation

7.2.2 Initial Quantitative Assessment - Race Kit Car, Idle, Full Throttle

An assessment of the predicted rating level, against the representative background sound level at the closest residential receptors when the race kit car is idle with full throttle, is summarised in Table 13. Operational noise contours (specific sound levels) for this scenario are provided in Appendix G.

NSR	Background Sound Level, dB $L_{A90,1h}$	Specific Sound Level, dB $L_{AS,1h}$	Character Corrections, dB	Rating Level, dB $L_{Ar,Tr}$	Excess of Rating Level Over Background, dB
NSR1	40	18	0	18	-22
NSR2	40	19	0	19	-21
NSR3	40	19	0	19	-21
NSR4	37	31	0	31	-6
NSR5	37	29	0	29	-8
NSR6	37	18	0	18	-19
NSR7	37	21	0	21	-16

Table 13 Assessment of Daytime Noise Impact – (BS 4142), F24 Kit Car, Idle, Full Throttle

The results from Tables 12 and 13 indicate that the rating level of the noise source for both modelled scenarios is below the background noise level at all noise-sensitive locations used for assessment. This indicates that the development will have a low impact.

BS 4142 states:

"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."

7.3 Discussion

Although the noise model uses ground elevation, ground absorption and feature 3D representations of receptor buildings, the noise model has not considered any screening effects between source and receiver that are currently present across the development site, i.e. walls, fences, trees, shrubland and any bunds. It has also not considered the planned fencing that would be sited along the western boundary of the test track which would further reduce noise levels. Therefore, the levels predicted assumes a direct line of sight from source to receiver.

The source measurements of the kit car were undertaken with the engine compartment of the F24 fully exposed. In reality, the kit car will have a compartment cover fitted, therefore further reducing noise emissions during use.

The kit car used on the day of the source measurements utilised 'kojak' wheels, which are tread-less and reduces the tyre / surface noise interaction. The Baygarth design team plan on using this technique on all the kit cars tested on the track going forward.

As stated in Section 3.2.1, the exact frequency of use for the test track is currently unknown but it is not expected to be in constant operation. Additionally, the idle, full throttle capacity scenario is not likely to be experienced every time the test track is in use and has therefore been applied to provide a conservative, worst-case situation for assessment.

8 Uncertainty

BS 4142:2014+A1: 2019 requires that the assessment considers the level of uncertainty in the data and associated calculations. Consideration of the uncertainty can enable a more informed decision regarding the likely significance of impact, within the context of assessment.

It is accepted that uncertainty may arise from all levels of measurement and assessment and reasonably practicable steps have been made at all stages with the aim of reducing uncertainty. These are discussed below:

- Background sound level measurements have been obtained over a duration of six days to characterise the existing residual environment during the intended operational hours of the proposed development, and to capture the potential variability over different days of the week;
- Background sound level measurements have been taken at positions within the development land boundary considered to be most representative of the properties assessed while accounting for logistical challenges and security risks during the survey.
- Class 1 monitoring equipment has been used in accordance with Section 5 of BS 4142: 2014+A1: 2019;
- Measurement procedures have been followed in accordance with Section 6 of BS 4142: 2014+A1: 2019 with precautions taken to minimise interference;
- Specific sound levels have been calculated to the requirements of ISO 9613-2: 2024, which is the widely accepted procedure for the calculation of sound propagation (including favourable wind conditions from source to receiver).

9 Conclusions

RSKA has been instructed by RSK Environment Ltd on behalf of Baysgarth School to undertake a noise impact assessment to evaluate the operational noise impact of a proposed racetrack planned on the grounds of Baysgarth School, Barton-Upon-Humber.

A baseline noise survey undertaken over a six-day period has been used to determine representative background sound levels, through statistical analysis, at the closest NSR to the test track site.

Attended source measurements have been conducted to capture the noise emissions generated from a typical kit car expected to be operational on the test track. The measurements recorded two scenarios that were projected to give rise to the greatest magnitude of noise during the use of the test track; race kit car in action and a race kit car idle with full throttle capacity.

A computer noise model has been developed which incorporates the results of the two operational scenarios that are likely to emit the greatest noise.

The noise levels represent the most exposed façades of the NSRs and it is considered that noise levels incident on the other façades at each NSR are lower. Where multiple properties are used to represent a single NSR, the noise level incident upon the most exposed façade of the most exposed property is considered.

All rating levels across the daytime period are below the respective representative background sound levels.

When considering the context within which this assessment is taking place, the proposed racetrack is situated within a high-activity educational environment with a well-established existing acoustic baseline. Therefore, the following pre-existing noise sources should be considered as part of the greater ambient environment:

- **Existing Community & Athletics Use:** The site currently hosts athletics groups and community activities throughout the year until approximately 8:00 PM. This establishes the racetrack environment as a long-standing source of existing recreational noise.

- **Extensive 3G Pitch Operations:** The surrounding football pitches (particularly the 3G pitches) operate at high capacity from the start of the school day potentially up until 9:00 PM, including weekends. The noise generated by these pitches, characterised by whistle noise, shouting, and ball impacts, represents a significantly higher existing noise level than the proposed racetrack activities.

- **Routine Educational Activity:** The site is in continuous use during term time for curricular activities, as well as high-intensity noise periods during school break and lunch hours.

- **Existing Mitigation:** The site boundary already benefits from established wooden fencing and mature shrubbery, which provides a good degree of acoustic screening for neighbouring residential properties.

Given that the proposed racetrack will operate within the footprint of these existing noise sources, its cumulative contribution to the local soundscape is considered negligible. As the predicted noise levels do not exceed the current established background noise level, any additional attenuation factors are deemed unnecessary and disproportionate to the scale of the development.

Appendix A – References

British Standard 4142: 2014+A1:2019, 'Methods of rating industrial and commercial sound' British Standards Institution.

British Standard 7445-1: 2003, 'Description and measurement of environmental noise – Part 1: Guide to quantities and procedures'. British Standards Institution.

British Standard 3744: 2010, 'Acoustics. Determination of sound power levels of noise sources using sound pressure. Engineering method in an essentially free field over a reflecting plane.'

ISO 9613-2:2024 'Attenuation of sound during propagation'. International Organization for Standardization.

National Planning Policy Framework – Department for Communities and Local Government. March 2012 (as amended February 2019)

Noise Policy Statement for England (NPSE). DEFRA, 2010.

World Health Organization (WHO), 'Guidelines for Community Noise', 1999.

Appendix B – Glossary

Term	Definition
Ambient sound	The total sound at a given place, usually a composite of sounds from many sources near and far.
Background sound, $L_{A90,T}$	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval.
dB	Decibel. Scale for expressing sound pressure level. It is defined as 20 times the logarithm of the ratio between the root mean square pressure of the sound field and a reference pressure i.e. $2x10^{-5}$ Pascal.
dB(A)	A-weighted decibel. This provides a measure of the overall level of sound across the audible spectrum with a frequency weighting to compensate for the varying sensitivity of the human ear to sound at different frequencies. Example sound levels include: 140 dB(A) Threshold of pain 120 dB(A) Threshold of feeling 100 dB(A) Loud nightclub 80 dB(A) Traffic at busy roadside 60 dB(A) Normal speech level at 1m 40 dB(A) Quiet office 20 dB(A) Broadcasting studio 0 dB(A) Median hearing threshold (1000 Hz)
Frequency	The repetition rate of a sound wave. The subjective equivalent in music is pitch. The unit of frequency is the Hertz (Hz), which is identical to cycles per second. A thousand hertz is often denoted as kHz, e.g. 2 kHz = 2000 Hz. Human hearing ranges approximately from 20 Hz to 20kHz.
$L_{Aeq,T}$	This is defined as the notional steady sound level over a stated period of time (T), would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.
NR	Noise rating. A set of curves based on the sensitivity of the human ear. They are used to give a single-figure rating for a range of frequencies.
Rating level	Specific sound level of a source plus any adjustment for the characteristic features of the sound.
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.
Sound absorption	Process whereby sound energy is converted in to heat. Sound absorption properties is expressed as the sound absorption coefficient α or the sound absorption class (A-E).
Sound insulation	The reduction or attenuation of airborne sound by a solid element between source and receiver.
Specific sound	Sound pressure level produced by the source being assessed at the assessment location.

Appendix C – Development Masterplan

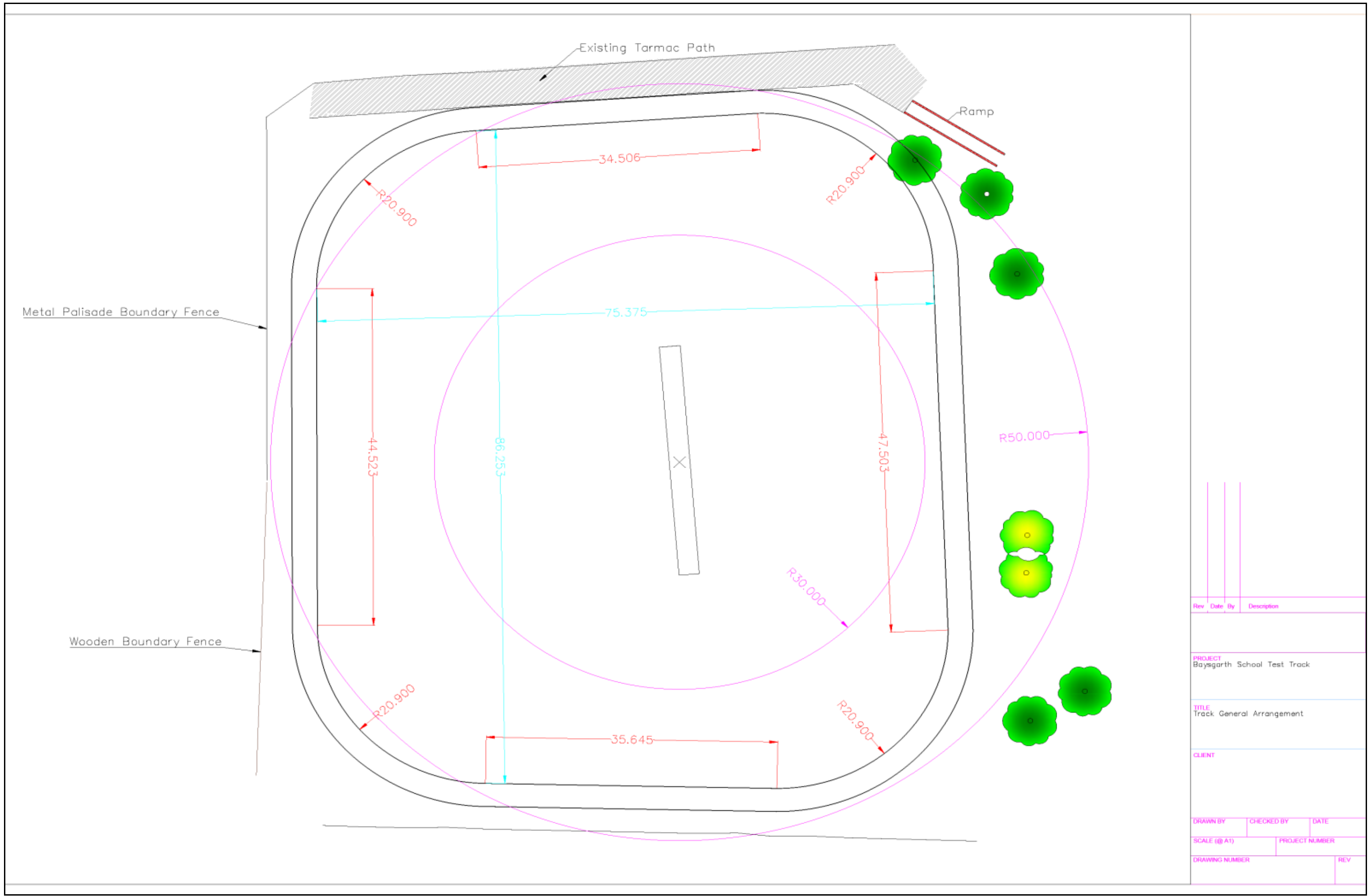

Figure C-1 Development Masterplan

Appendix D – Sound Power Data, F24, Idle, Full Throttle

Equipment noise measurement form

Rev 0

Machinery under test: Greenpower Formula F24 Kit Car
Machine manufactuer: Greenpower **Date of test:** 05/06/2025
Model number: F24 **ID** N/A **Person doing test:** Dan Taylor
Machine Rating: 24 volt DC motor powered by 2 x 12 volt batteries

Acoustic environment
Site surface: (tick which applies)
Hard (asphalt / concrete) ☑ **Sand** ☐ **Hard packed soil** ☐
Distance to nearest reflective surface (m) >50 from centre of machine
Air temperature 15.4oC **Wind speed (m/s)** Variable between 0m/s & 0.8m/s

Instrumentation

SLM	**Make**	Svantek	**Model**	971A	**Calibration Expiry**	13/05/2026
Calibrator	**Make**	Rion	**Model**	NC75	**Calibration date**	24/09/2025

Acoustical data
Fill in the green squares only. The yellow squares will be automatically calculated.

Measurement distance (hemisphere radius, r) 1.2 (from centerpoint of machine, see below)
Hemisphere surface area, S 9.05 m^2

Measurement location (see figure)	Results dB(A) 1 L_{Aeq}	2 L_{Aeq}	3 L_{Aeq}	Average L_{Aeq}	SWL L_{AW}
1 Front	60.0	60.3	60.2	60.2	
2 - Side (E)	66.8	67.0	66.8	66.9	
3 - Rear	68.7	68.7	68.6	68.7	
4 -Side (W)	66.5	66.5	66.3	66.4	
5					
6					
Background	(measure one location without equipment operating)			50.8	
	Average (all locations)			66.4	76

$$L_{Aeq,T} = 10\log\left[\frac{1}{N}\sum_{i=1}^{N}10^{0.1}L_{Aeq,Ti}\right]$$

$$L_{WA} = \left(\overline{L_{Aeq,T}} - K\right) + 10\log\frac{S}{S_0}$$

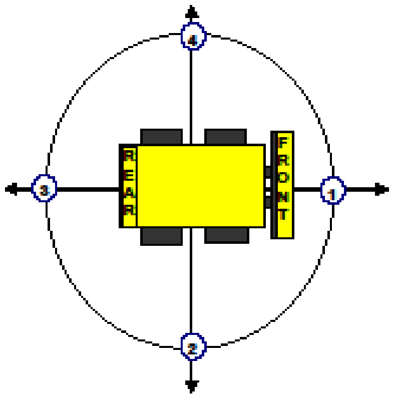

Figure D-1 Sound Power Level Measurement Field Sheet, F24, Idle, Full Throttle

Appendix E – Noise Monitoring Photographs

Ref	Location Reference (What3words)	Photograph		
UL1	travel.parkway.quitter			
UL2	identify.reset.defends			
Source	N/A			

Figure E-1 Noise Monitoring Photographs

Appendix F – Measured Noise Levels and Background Sound Level Graphs

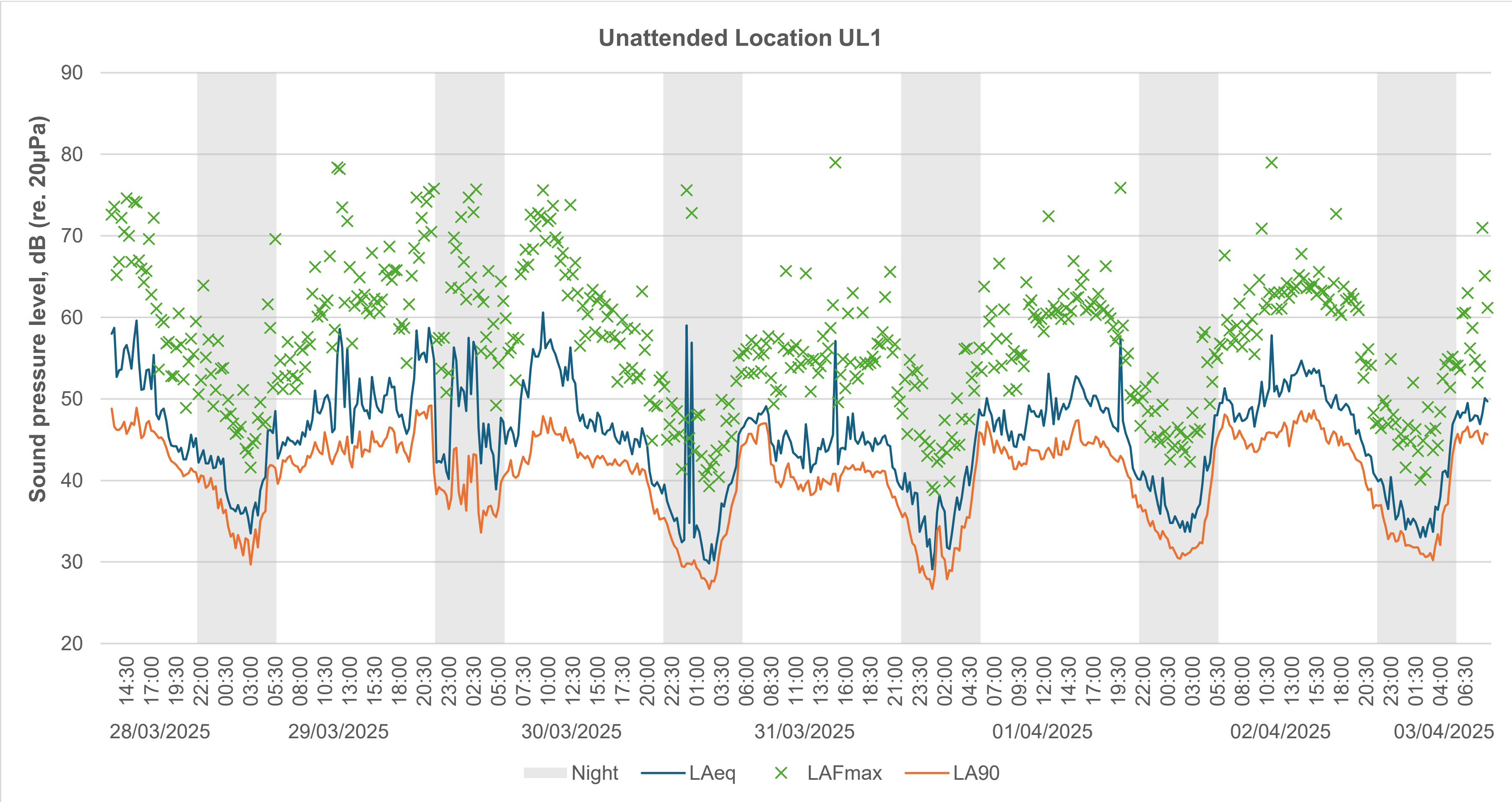

Figure F-1 Time History, Baseline Data at UL1, 28 March to 03 April 2025

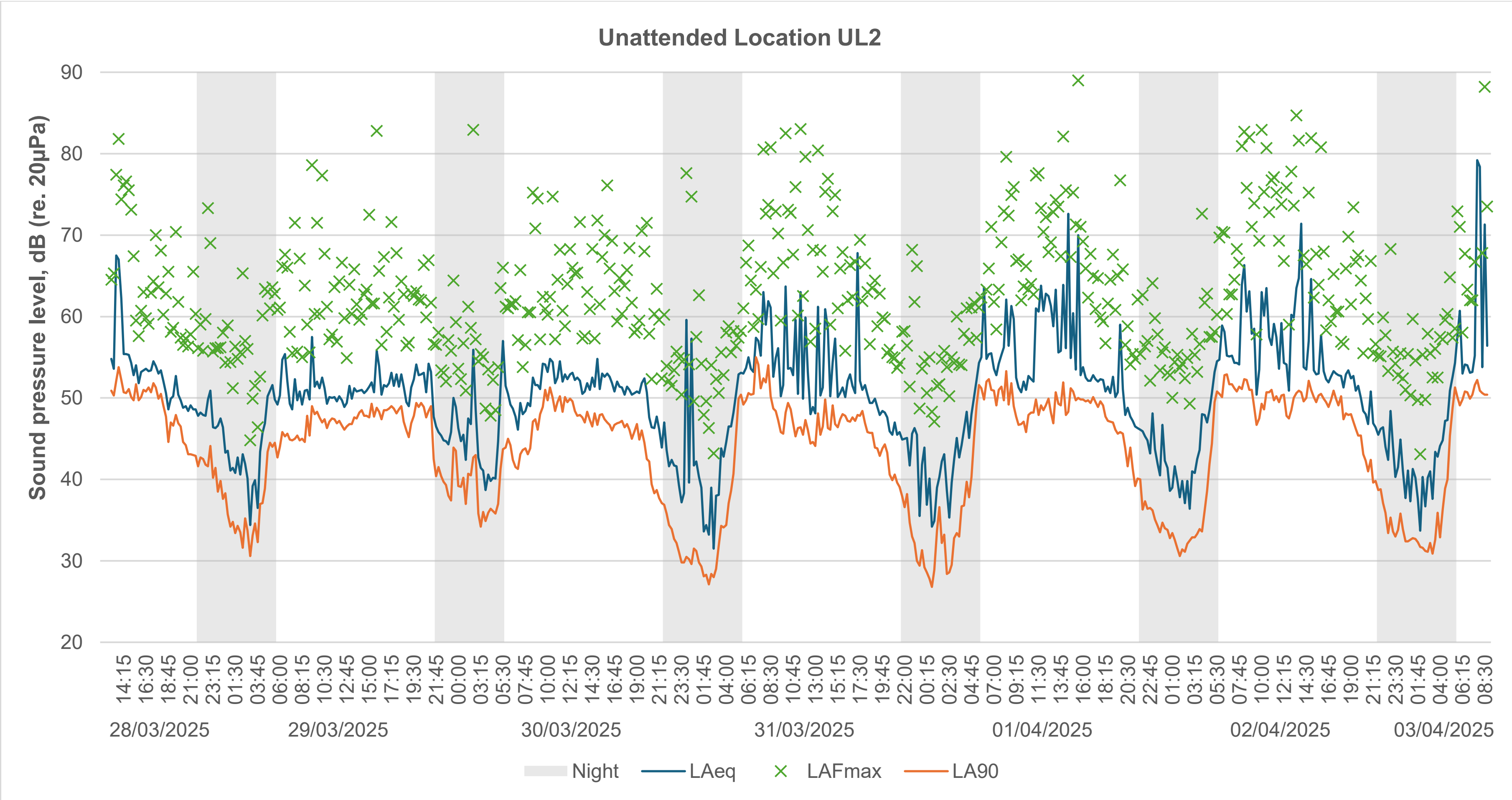

Figure F-2 Time History, Baseline Data at UL2, 28 March to 03 April 2025

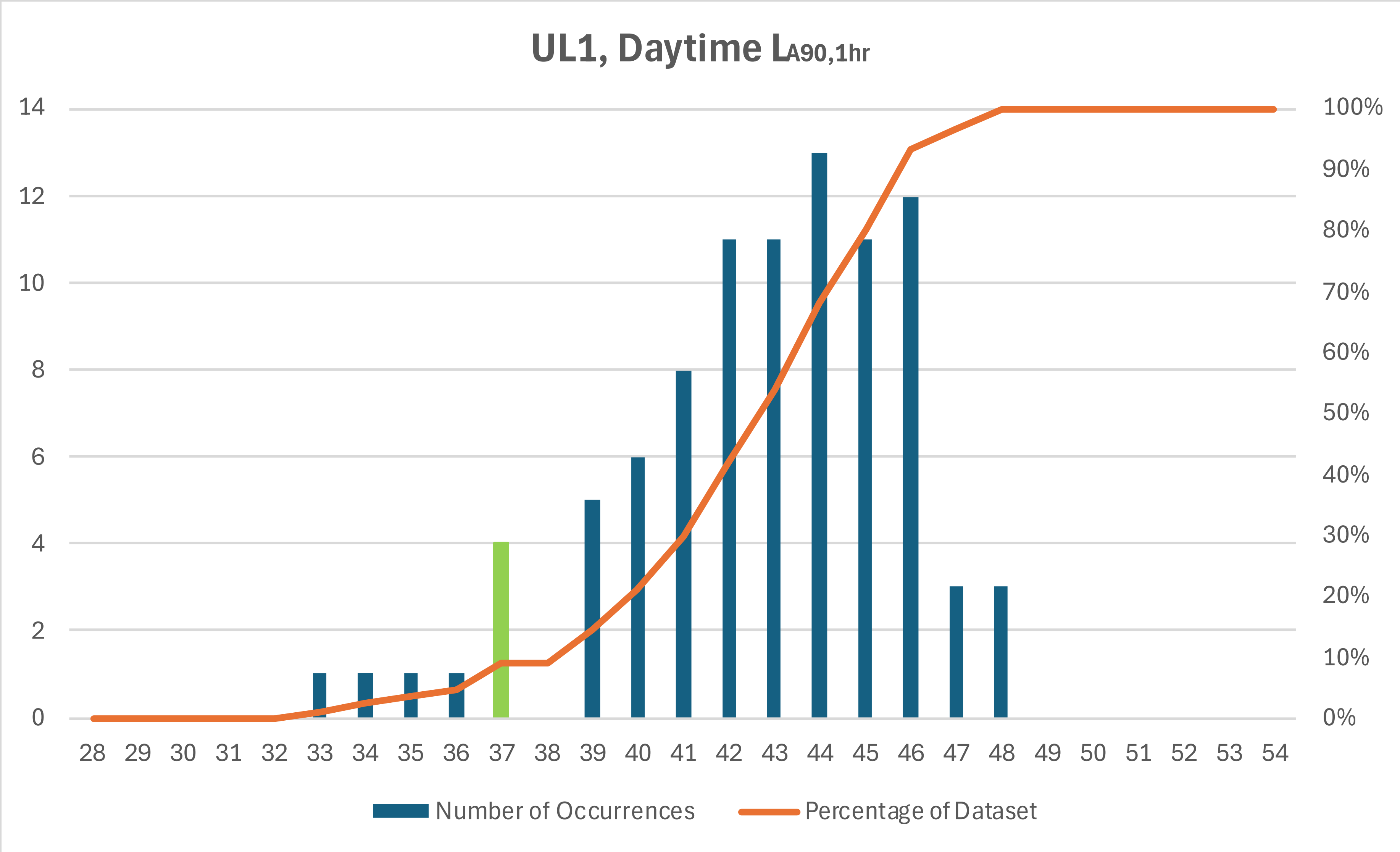

Figure F-3 Statistical Analysis of Background Noise Levels – UL1, Daytime (07:00-23:00)

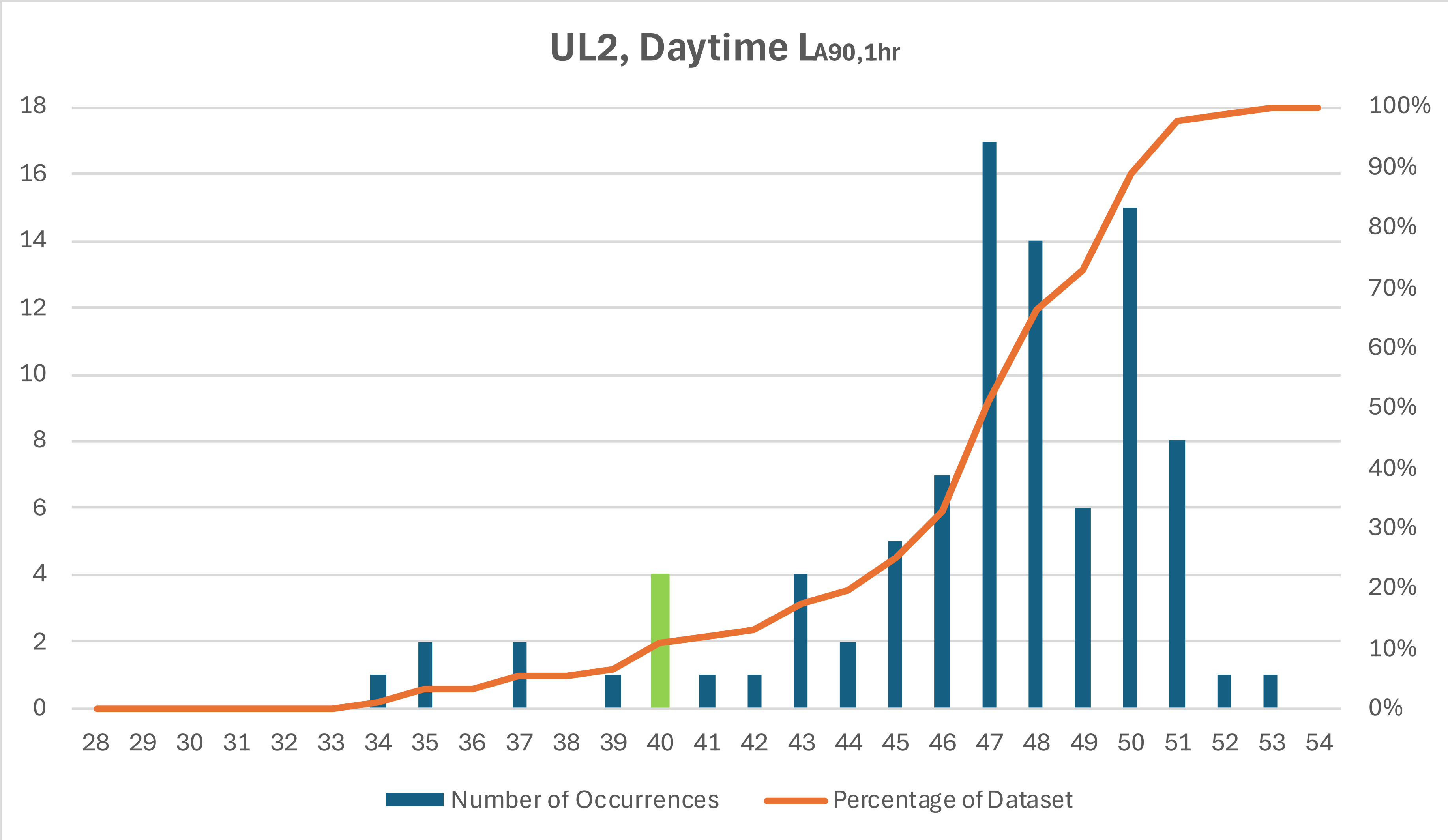

Figure F-4 Statistical Analysis of Background Noise Levels – UL2, Daytime (07:00-23:00)

Appendix G – Operational Noise Contour Maps

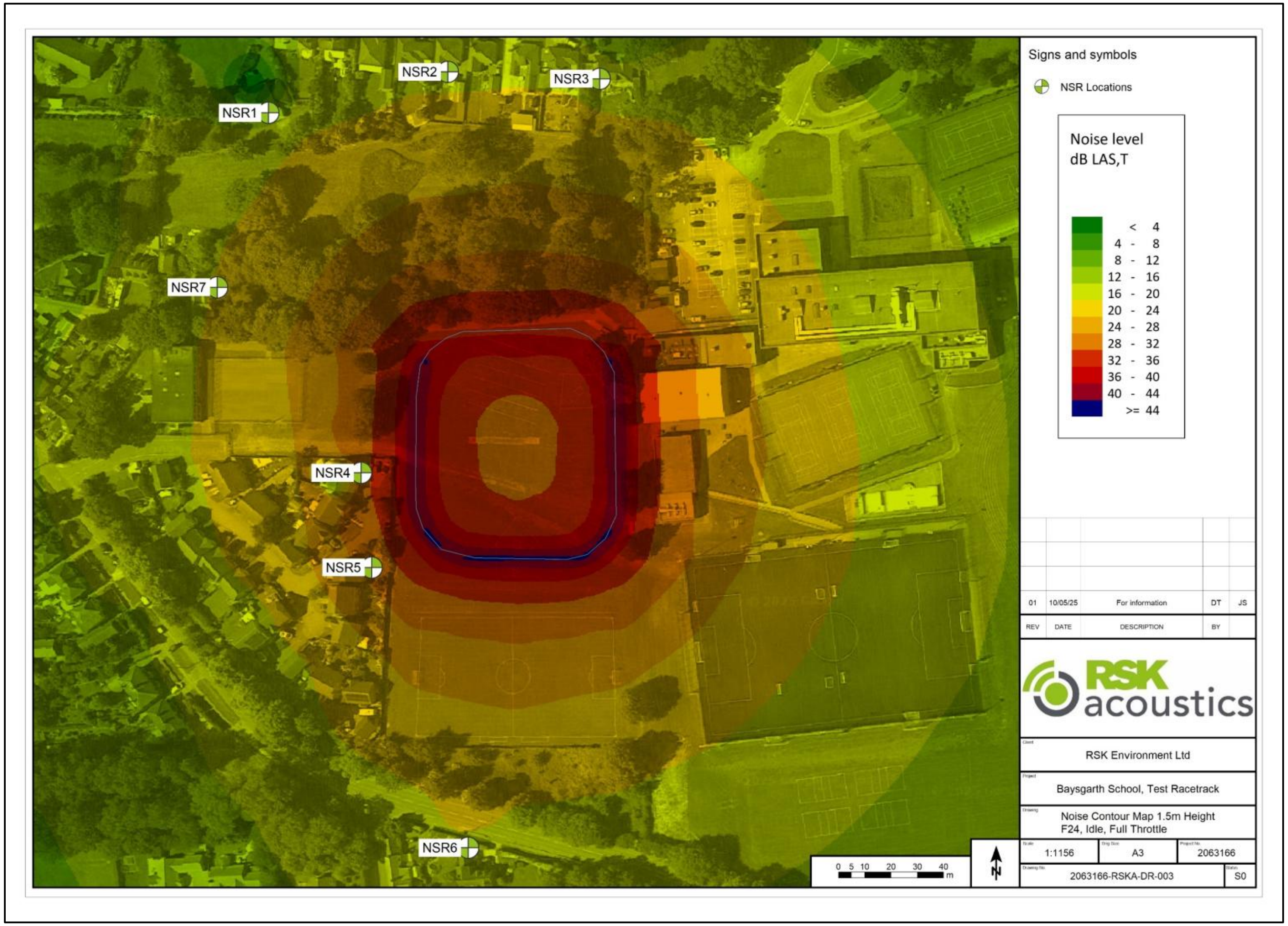

Figure G-1 Noise Contour Map @ 1.5 m, Daytime (07:00-23:00) – F24, Idle, Full Throttle

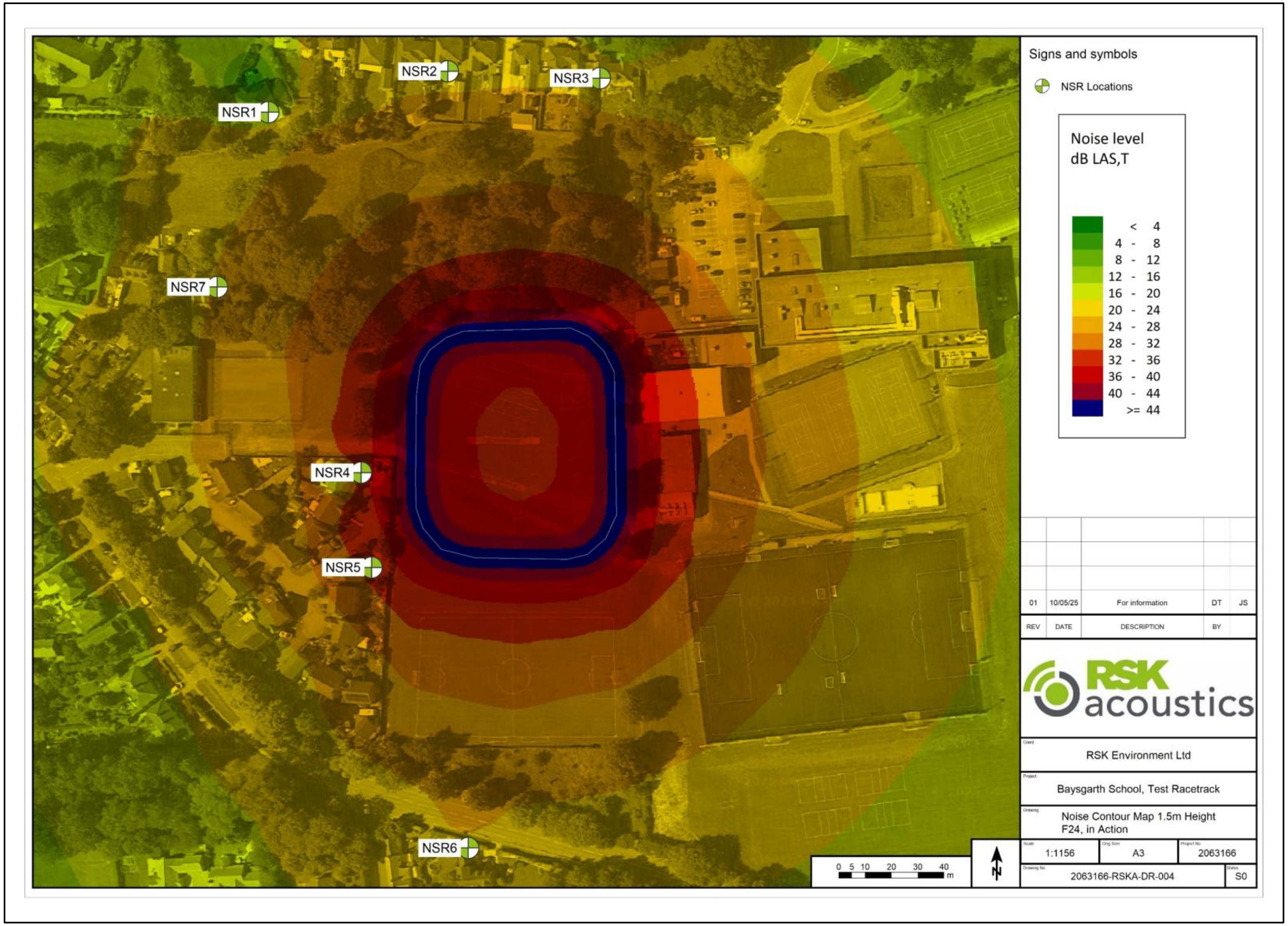

Figure G-2 Noise Contour Map @ 1.5 m, Daytime (07:00-23:00) – F24, In Action

Appendix H – 1/3 Octave Band Frequency Graphs

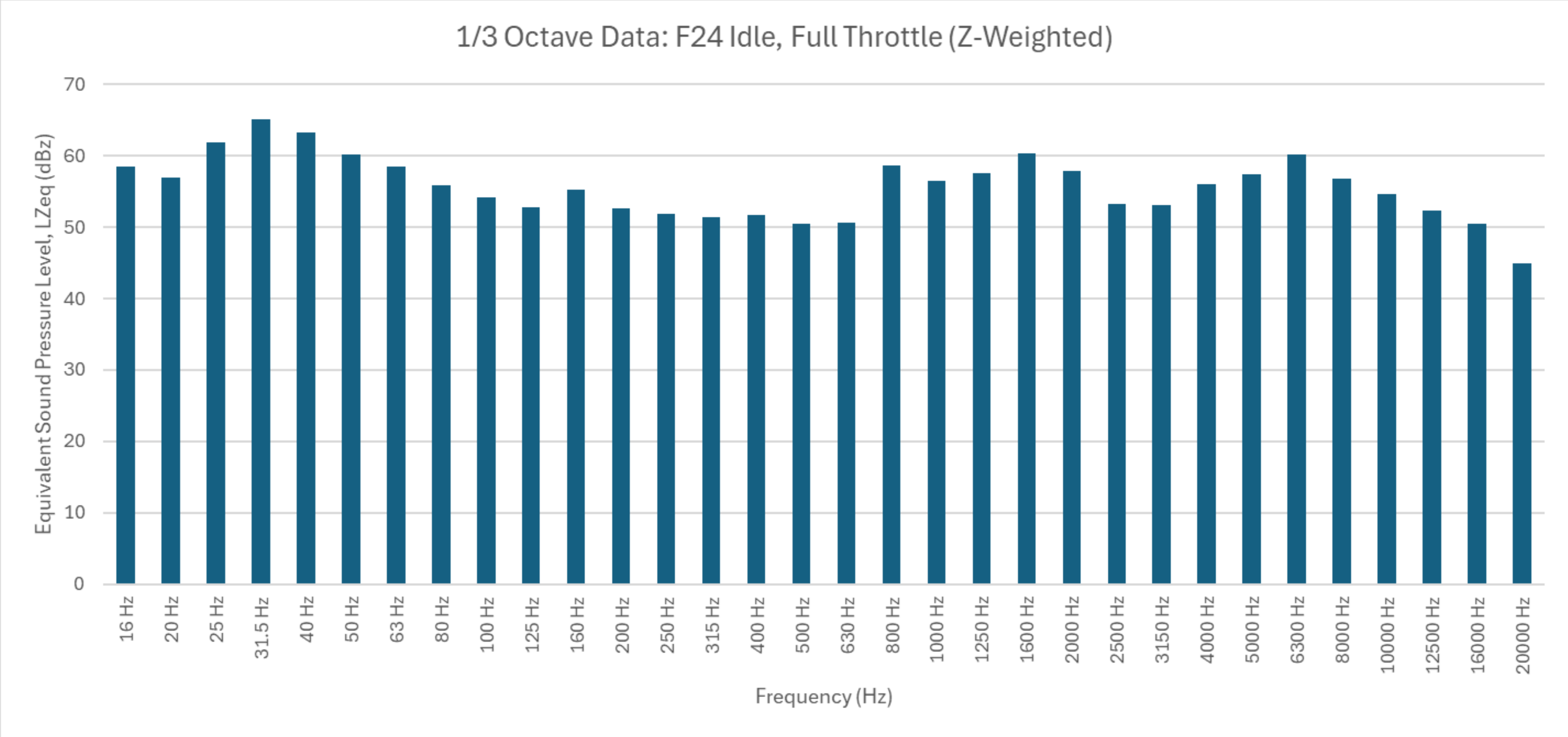

Figure H-1 1/3 Octave Band Frequency Data, F24, Idle, Full Throttle

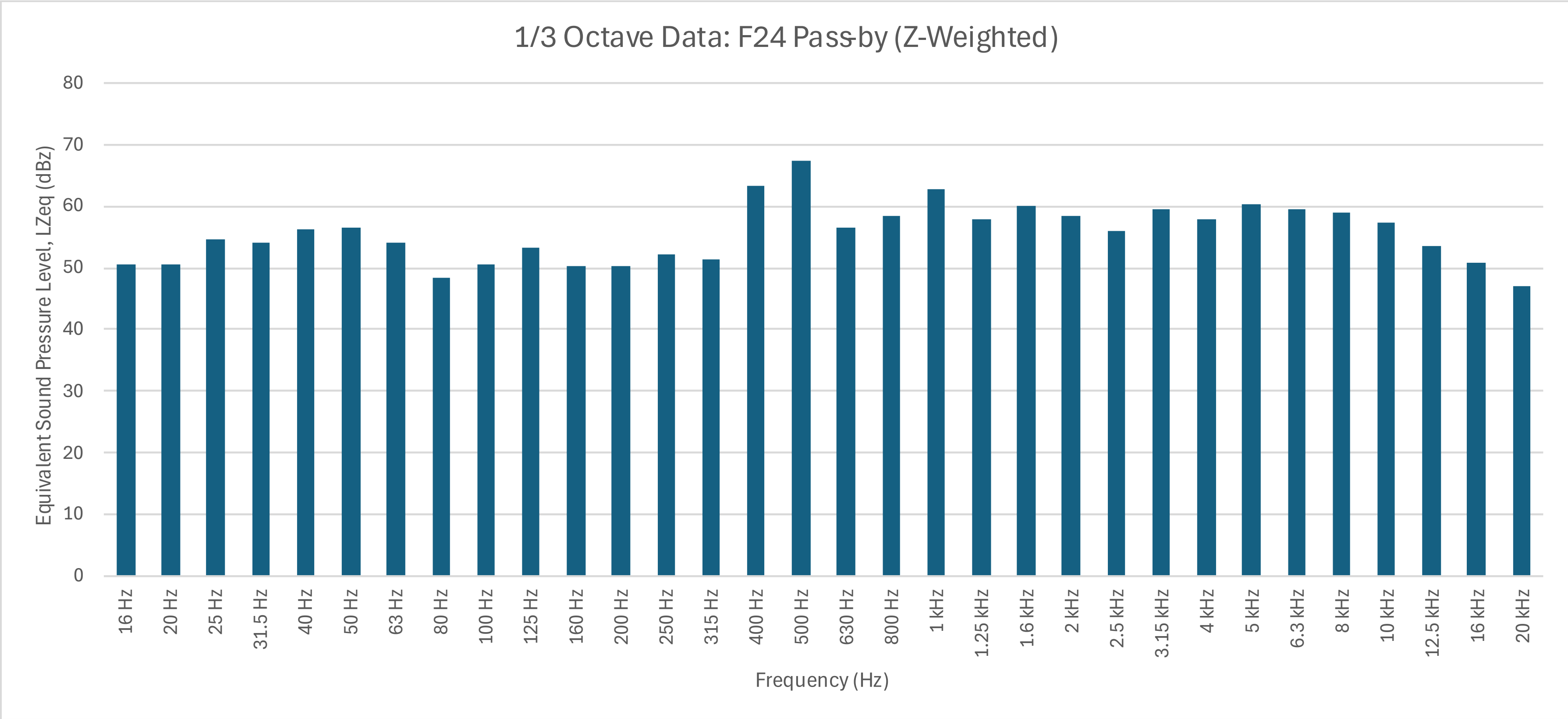

Figure H-2 1/3 Octave Band Frequency Data, F24 in Action

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bsi. ISO 14001 Environmental Management

bsi. ISO 45001 Occupational Health and Safety Management

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