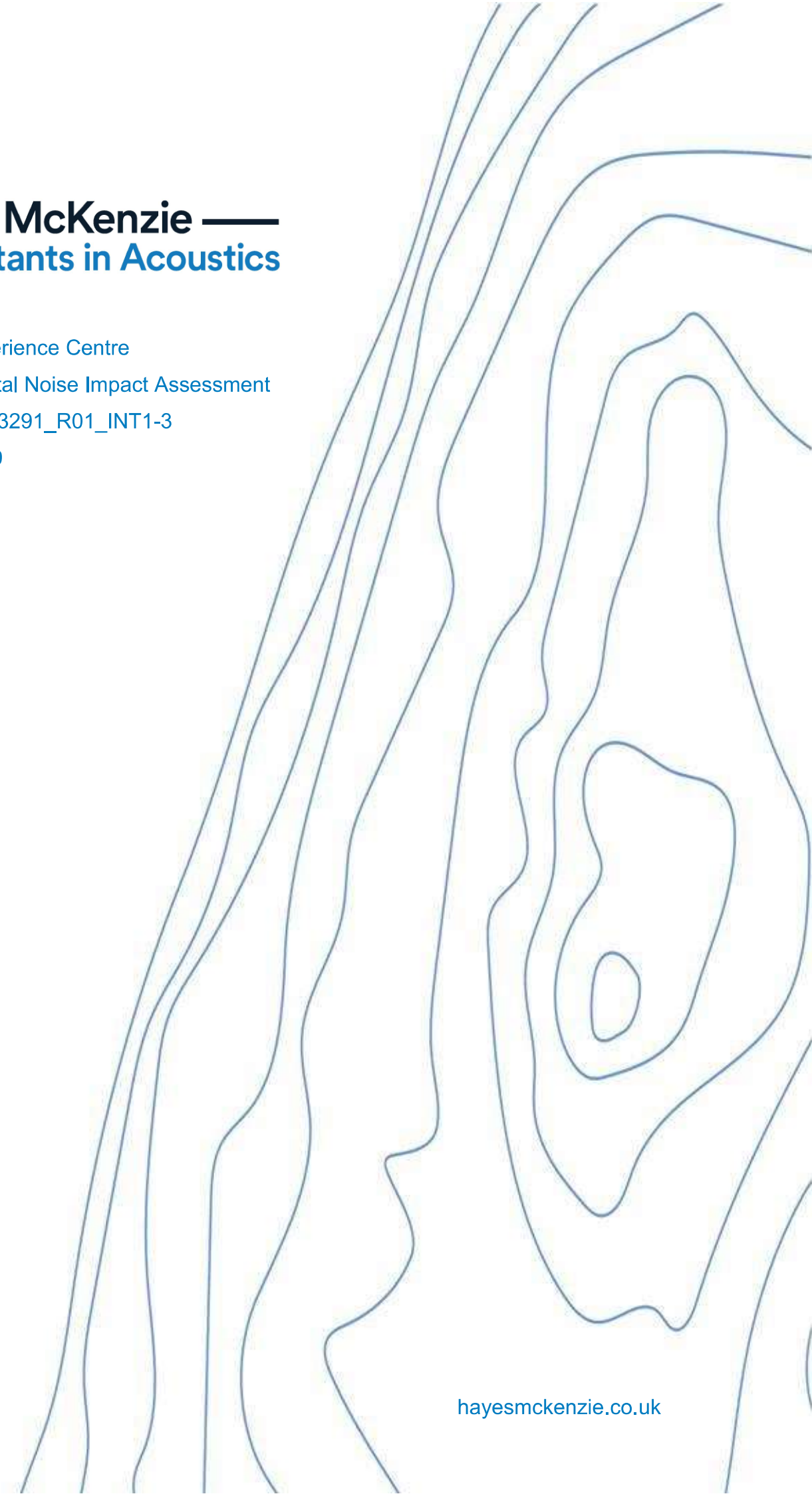
Hayes McKenzie
Consultants in Acoustics

Moto-x Experience Centre
Environmental Noise Impact Assessment

Report HM: 3291_R01_INT1-3

29 July 2019



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Moto-x Experience Centre
Environmental Noise Impact Assessment
Report HM: 3291_R01_INT1-3,
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Prepared for: Nightfly Limited
4 Larkhill Cottages
Larkhill Lane
Formby
L37 1PS

Report prepared by: Malcolm Hayes BSc, MIOA
Director and Principal Acoustic Consultant

Lodge Park, Tre'r Ddol, Machynlleth, Powys SY20 8PL, UK
+44 (0)1654 781400, machynlleth@hayesmckenzie.co.uk

1. INTRODUCTION

1.1 The Hayes McKenzie Partnership have been appointed to undertake a noise impact assessment of the proposed Moto-x Experience Centre with specific reference to the sound associated with the operation of the proposed Motocross/Enduro electric bikes.

1.2 The proposed site is approximately 5 km to the north-east of Builth Wells and is located within a small valley network.

1.3 The proposal is to operate a Moto-Experience Centre which will include the use of electric bikes for track activities. There currently exists a permitted use for the site where 4 stroke and 2 stroke motocross/Enduro bikes operate on Wednesday and Sundays. It is proposed that the electric bikes would operate on all days of the week between the hours of 09:00 – 17:00 in association with 2 Stroke Trials Bikes.

1.4 It is also proposed that a Trails Bike Obstacle Course would also operate separate from the Enduro/Moto-Cross Track within the valley to the east of the development site. Such activity is significantly different from the Track activity and is considered separately as a consequence.

1.5 This noise assessment compares the existing permitted operational noise levels associated with 2 and 4 stroke engines with the potential sound associated with the use of electric bikes and the pre-existing noise levels at the site and neighbouring properties.

2. PLANNING GUIDANCE

Planning Policy Wales Edition 10 December 2018

2.1 Planning Policy Wales Edition 10 December 2018[1] (PPW10) does not offer any specific guidance in relation to the issue of noise associated with motor sport activities. It does however provide some guidance to Local Authorities in relation to the issue of the introduction of sound into an existing environment.

2.2 In general, the guidance advises that consideration needs to be given to the potential

[1] Planning Policy Wales Edition 10 December 2018: https://gov.wales/planning-policy-wales-edition-10

soundscape associated with a new development and the effects of that development to positively or negatively affect the sound environment within which the development is located. PPW10 states at 6.7.5 & 6.7.6

6.7.5 In taking forward these broad objectives the key planning policy principle is to consider the effects which proposed developments may have on air or soundscape quality and the effects which existing air or soundscape quality may have on proposed developments.

6.7.6 In proposing new development, planning authorities and developers must, therefore:

- *address any implication arising as a result of its association with, or location within, air quality management areas, noise action planning priority areas or areas where there are sensitive receptors;*
- *not create areas of poor air quality or inappropriate soundscape; and*
- *seek to incorporate measures which reduce overall exposure to air and noise pollution and create appropriate soundscapes.*

Technical Advice Note 11: Noise

2.3 Guidance in relation to noise is set out within Technical Advice Note 11: Noise[2]. (TAN 11) where guidance is provided when assessing sound associated with new development. When considering the introduction of noise generating development TAN 11 stated the following:

Noise generating development

8. Local planning authorities must ensure that noise generating development does not cause an unacceptable degree of disturbance. They should also bear in mind that if subsequent intensification or change of use results in greater intrusion, consideration should be given to the use of appropriate conditions.

9. Noise characteristics and levels can vary substantially according to their source and the type of activity involved. In the case of industrial development, for example, the character of the noise should be taken into account as well as its level. Sudden impulses, irregular noise or noise which contains a distinguishable continuous tone will require special

[2] https://gov.wales/sites/default/files/publications/2018-09/tan11-noise.pdf

consideration. In addition to noise from aircraft landing and taking off, noise from aerodromes is likely to result from engine testing as well as ground movements. The impact of noise from sport, recreation and entertainment will depend to a large extent on frequency of use and the design of facilities. Advice on assessing noise and on factors to consider in relation to the major noise sources including roads, railways, airports, industrial and recreational noise and their measurement is given in Annex B.

2.4 Recreational noise is considered within TAN 11 at paragraph B21 where it is stated:

Noise from recreational and sporting activities

B21. For these activities the local planning authority will have to take account of how frequently the noise will be generated and how disturbing it will be, and balance the enjoyment of the participants against nuisance to other people. Partially open buildings such as stadia may not be in frequent use. Depending on local circumstances and public opinion, local planning authorities may consider it reasonable to permit higher noise emission levels than they would from industrial development, subject to a limit on the hours of use, and the control of noise emissions (including public address systems) during unsocial hours. A number of sports activities are the subject of Codes of Practice. Some noise generating activities enjoy permitted development rights granted by Part 4 of Schedule 2 to the Town and County Planning (General Permitted Development) Order 1995, and so may not require specific planning permission provided that they occur on a temporary basis. However, this permission may be withdrawn by making a direction under Article 4 of the Order.

2.5 When assessing the potential for the likelihood of complaints associated with noise from industrial development it is suggested that BS 4142:1990 (now superseded by BS 4142:2014) and can be indicated by:

"*the difference between the noise from the new development (expressed in terms of the rating level) and the existing background noise. The Standard states that, 'A difference of around 10 dB or higher indicates that complaints are likely. A difference of around 5 dB is of marginal significance'. Since background noise levels vary throughout a 24 hour period it will usually be necessary to assess the acceptability of noise levels for separate periods (e.g. day and night) chosen to suit the hours of operation of the proposed development. Similar considerations apply to developments that will emit significant noise at the weekend as well as during the week.*"

Guidance Notes on Noise Control at Motor Sport Circuits: 1996

2.6 When considering the issue of Motor Sports noise the most relevant guidance is contained

within the Guidance Notes on Noise Control at Motor Sports Circuits[3]. The adoption of electrically power bikes will significantly reduce the relevance of the guidance but it is of benefit to consider the advice that it contains.

2.7 The consultative document, Guidance Notes on Noise Control at Motor Sport Circuits, produced by The Association of Motor Racing Circuit Owners (AMRCO) in collaboration with The RAC Motor Sports Association (RACMSA) was issued in 1996. This consultative document was produced in association with a number of bodies that include:

- The Institute of Acoustics
- The Royal Environmental Health Institute Scotland
- The Chartered Institute of Environmental Health
- The Noise Council
- Environmental Health, Motor Sport Consortium
- The National Society for Clean Air and Environmental Protection
- Institute of Sound and Vibration Research, Southampton University
- The Motor Industry Research Association

2.8 The guidelines were prepared at the request of AMRCO and RACMSA who agreed to fund a joint initiative to investigate future requirements for controlling community noise from venues. Within the summary to the guidelines it is stated that:

> *The findings show that the governing bodies of the sport and each venue owner have a joint responsibility for the control of community noise levels. The governing bodies must continue to provide an effective National framework which assists owners or operators to manage the control of motor sport noise at their venues.*
>
> *The Guidelines provide the governing bodies and operators with advice on how they may address the control of noise from permanent motor sport venues. They are also intended to be of assistance to Local Authority departments involved*

[3] Guidance Notes on Noise Control at Motor Sport Circuits: 1996

with community noise and planning issues and any other persons with an interest in the subject.

The Guidelines are applicable to a wide variety of venues in different areas of the UK and this means that the advice is of a general nature. The Guidelines are comprehensive but cannot claim to provide a complete answer to individual local problems. ***They are intended to encourage venues to develop effective local plans, addressing the issues in the Guidelines which are relevant to their specific location.***

2.9 Within the discussion for the need for Guidelines, it is stated within paragraphs 2.1.3 that:

As environmental awareness and legislation increases, there is a need for Motor Sport to continue to improve the control of noise to ensure that it can continue to operate in harmony with the community. This is of particular importance to permanent motor sport venues which have to try and make the best use of their facilities for many types of track activity. The need to provide adequate off road facilities for driver training and other non-race activities means that there is a demand for track time outside of normal race events or other competitive motor sports days.

Most UK circuits have dealt with this situation by controlling their track activities to levels acceptable to the Local Authorities. This has been achieved by various methods ranging from voluntary agreement to imposed legal conditions. As such, some circuits have introduced other forms of noise control to supplement the UK regulations issued by governing bodies. These extra noise control measures are specific to the requirements of the individual circuits and vary according to local circumstances.

2.10 The continued improvement in the control of noise associated with Motor Sports is reflected within the reduction of the allowable noise emissions levels from competing vehicles. For example, a reduction of 5 dB from 110 dB(A) to 105 dB(A) for a Section A motor vehicle from 1996 to 2005.

2.11 The application of the guidelines is discussed within *Section 2.4 Application of the Guidelines* where the following is stated.

This document has been entitled "Guidance Notes" to distinguish it from a Code of Practice (CoP) at this stage. The intention is to review the document after a period of use and consider producing a CoP following further experience of using the Guidelines. For this reason, the Guidelines have been set out in the format of a CoP.

Noise Guidelines or CoP's do not have the force of Law, but seek to provide advice on the best practicable means of minimising noise to reduce public annoyance and disturbance.

The main purpose of these guidelines is to provide information to assist in controlling noise from all forms of motor sport at permanent circuits.

The guidelines are intended to be used by the governing bodies, venue owners, event organisers and operators to minimise noise intrusion into the community.

The information will also be of value to Local Authorities who have the responsibility for controlling community noise levels. The Environmental Protection Act 1990 (Sect 79) provides that CoPs, approved by the Secretary of State, shall be regarded as guidance to the use of best practicable means for noise control. (In Scotland, Section 72 of the Control of Pollution Act 1974, In N. Ireland, Section 51 of the Pollution Control and Local Government (N.I.) Order 1978).

The use of best practicable means to reduce noise is of importance in Magistrates Courts (Sheriff Courts in Scotland) and the Guidelines will have an application in these Courts.

The latest noise planning guidance (PPG24 Sept. 1994) suggest that CoPs be referred to in assessing the noise impact from leisure activities.

2.12 The guidelines continue by explaining that there are no clear cut standards available to operators or Local Authorities which may be used to determine the acceptability of noise levels associated from leisure activities. The varying nature of noise associated with motor sports makes assessment very difficult. The levels of noise vary considerably throughout one day of track use and this is further complicated by the fact that a circuit does not operate at the same level of activity every day.

2.13 When discussing community response to noise, the guidelines identify that they are intended to minimise noise impact in the community and that this necessitates addressing the levels of community noise and the reaction to these levels.

2.14 A number of factors have been identified which govern community response to noise and those that are important with regard to motor sport noise are:

- The character of the noise including its tonal content;
- Number of audible events in one day;
- Number of events or activity days;
- Average noise level over a period of time;
- Maximum noise levels of individual vehicles;
- Existing noise in the neighbourhood from other sources;
- Attitude towards motor sport in general and to the specific venue;
- The influence of other factors, unrelated to noise, such as traffic etc.

2.15 Consideration of all these factors makes the assessment of noise associated with motor sport activities a complex issue.

2.16 Clearly, for a noise to affect individuals, the noise from motor sport activity is required to be audible. This implies that the noise will be louder than the existing ambient or background noise environment or that it may contain a different character to the ambient levels. The likelihood of complaints will relate to a number of factors which include:

- The amount by which the existing noise is increased;
- The duration of the increase;
- The frequency of occurrence;
- The time of day
- The nature of the noise.

2.17 The Guidelines go on to indicate that when undertaking objective measurements of noise, that it is possible to express the noise increase due to a source by comparing the $L_{Aeq,T}$ of the source noise at the receptor location with the ambient or background noise at the location. If the source noise is higher than the background then the noise will be audible at times and complaints may occur. However, such measurements cannot determine the subjective reaction of individuals. There may be cases where a noise increase causing

compliant may not be substantiated by physical measurement and the real reason for compliant may not be the actual increase in noise levels.

2.18 Within the review undertaken for the Guidelines, the main sources of noise from a motor sport venue were associated with:

- Exhaust noise from individual vehicles
- Other vehicle noise, including tyre noise and mechanical noise
- Public address systems
- Noise from increased traffic to and from the venue

2.19 The venue studies indicated that public address systems and tyre squeal noise accounted for almost as many complaints as vehicle noise (exhaust). Noise from traffic was considered to be less important, however, the inconvenience rather than any noise increase was considered to be the main cause for such complaints.

2.20 In the case of the development site tyre noise is not expected to be relevant since there is no proposed tarmac surface for the generation of such noise.

2.21 The indicated intent of the development is for an experience of riding Electric Moto-X/Enduro bikes and 2 Stroke Petrol Trials bikes and Electric Trials and that it is not envisaged that racing will be undertaken[4]. However, source noise is not continuous and the levels vary from low levels during periods of no activity to short term high levels during event starts, it is not appropriate to use maximum or short period $L_{Aeq,T}$ levels to express the impact associated with a motor sport venue. The most reliable method of expressing the different impacts for different days of activity is to use the daily L_{Aeq} level which is the only way to represent the total amount of noise produced during the day.

2.22 The use of the $L_{Aeq,T}$ to describe the community noise impact enables the calculation of a daily dose noise level from activity at the development site. The daily $L_{Aeq,T}$ takes account of all the noise produced during the day including the maximum and the minimum noise levels. By comparing the daily noise levels associated with track activities and the ambient

[4] It should be noted that this does not limit the permitted development rights which already exists for the site for Wednesday and Sunday operations when events can currently be undertaken.

noise levels when no activity occurs will indicate the potential noise impact associated with a venue.

2.23 *Section 3.4 Aspects of Noise Control* within the Guidelines next considers the fact that UK research has indicated that there is also concern regarding the extent of circuit use, possible escalation of use and perceived lack of control over noisy activities. The research has shown, for dedicated motor sports circuits, that there was a fairly high tolerance to noise from scheduled race days but a strong adverse reaction to other venue events which appeared less controlled and an escalation of use. The Guidelines indicate that this means that there are two distinct reasons for complaints to occur:

- The levels of noise form the loudest sources,
- The overall use of the venue.

2.24 It considers that it is necessary to address both these issues and suggests that the Guidelines and current practice does take both of these factors into account.

2.25 Control of source noise levels through compliance with the requirements of the MSA and ACU should limit the maximum noise produced by individual vehicles while the operating conditions that may be in place for the venue will restrict track use. Both these issues are related in that a reduction in source noise levels will result in a reduced noise impact to neighbouring properties and thereby a potential increase of the usage of the venue whilst not increasing the perceived impact associated with the activity.

2.26 Section 4 Structure of the Guidelines discusses the structure of the guidelines to address the controls required to minimise the overall impact of noise in the community and also reduce the levels of complaints. The Guidelines deal with the following issues:

- Source Control
- Venue and Event Control
- Control of Noise Propagation
- Community Liaison
- Management Plans

Source Control

2.27 Source control for clubs affiliated to the MSA or ACU take the form of meeting noise levels for different classes of vehicle.

2.28 This source control requires that a sound test is undertaken of all vehicles before the start of an event. Such tests are detailed within the ACU and MSA competitors' handbooks and are, therefore, know to any competitor within an affiliated event. However, for events with no affiliation, it will be up to the event organiser or the circuit owner to ensure such testing is performed.

2.29 Pre-event testing at a venue should be carried out by a suitably trained person or persons and records kept of the test results. The records should include details of the following:

- The person carrying out the test;
- The instrumentation and settings used and the calibration details;
- The test location and conditions;
- The test method, including measurement distance and engine status;
- The vehicle identification;
- The results in dB(A);
- The action taken if vehicles have exceeded the maximum level.

2.30 It is suggested that a procedure should be prepared by each venue which should include:

- The test location/s in use at the venue;
- The test method and equipment used;
- The permitted maximum noise levels for each class of vehicle or event;
- The names of Noise test officials trained to carry out the tests;
- The procedure for keeping records.

2.31 The guidelines clearly indicate that for non-affiliated meetings, events will remain the responsibility of the venue and that the sound test may vary according to local conditions. However, any variations in the test procedures from those within the ACU/MSA should be noted within the venues procedures for noise control.

2.32 All persons who may use the track should be fully aware of any test procedure, the test location and the test conditions that are applicable to them before attending the circuit. On a busy day, the reporting time for a test might also be usefully provided.

2.33 It is also suggested that, apart from a static noise test in accordance with ACU/MSA requirements, a trackside measurement might be employed.

2.34 Such procedures might be applicable for larger facilities and events where unknown bikes and riders may appear for entering into an event. The proposal does not envisage such a situation arising since the bikes to be operated at the site will only be electrical or small petrol driven Trials bikes. As such, the need for any onsite monitoring is eliminated through the use of specific equipment which is related to the development.

2.35 Public address systems were identified within the UK survey as a cause of numerous complaints. Such issues should not occur for a site if the system has been designed and installed correctly. Paddock address systems should be restricted to the paddock area and ongoing commentary should be avoided during racing. The main source of complaints with a PA system are associated with the more constant noise which is designed to entertain and inform the public. The noise can be semi-continuous and needs to be at a high level to be audible above the track noise.

Venue and Event Control

2.36 This section of the Guidelines considers means by which the noise impact to the community may be reduced and controlled and provides suggestions to meet this aim. It advises that the overall impact to the community is cumulative and that controls will need to consider the individual impact of all noise producing events proposed at a venue. As each venue is specific, any controls will be venue specific. The degree and level of control will be related to the levels of the source noise and by the amount that they increase existing community noise.

2.37 Where the noise impact to the community is low, venue control may be a simple matter of ensuring that there is a sensible mix of quiet and noisier event days. The selection of some quieter events and the introduction of compulsory breaks in the programme helps to reduce

the impact of noisier days. Where the community impact is greater, then more detailed noise control measures may be required.

2.38 When assessing noise associated with the motor sport activities the Guidelines state the following:

> *Community noise impact is normally assessed by comparing the $L_{Aeq,T}$ levels of the source noise which reach noise sensitive locations with the existing ambient and / or background noise levels at these locations. To assess the impact of a venue it is necessary to examine the L_{eq} levels produced by all types of event, calculate their levels at the receiver and compare them to the existing noise levels at that location. As each venue is different, this requires individual noise impact assessments for each venue.*
>
> *The objective is to control the noise impact at specific locations and this requires a decision to be made regarding acceptable noise levels and their frequency of occurrence at these locations. This can mean that the Local Authority will set acceptable $L_{Aeq,T}$ levels for specific activities at specific locations.*

2.39 The Guidelines then discuss the means by which checks may be made and levels agreed to minimise the effects of venue noise upon the community. It is suggested that as monitoring at a receiver location may be difficult due to the presence of local noise sources affecting the noise measurements, trackside monitoring could be used to determine compliance by calculation of noise levels at the receiver location.

2.40 It is recognised that different parts of the tracks will make different levels of noise and therefore different noise impacts. For the development site the change in noise level depends upon the site conditions and the location of a bike on the track. If monitoring were to be required for determining compliance with any agreed noise levels, then rather than trackside measurements, locations at receiver positions could be used and a data logging sound level meter would be installed to log the complete days activities. The Guidelines suggest that such systems, operated over a period of time would allow the Local Authority with the venue operator to decide and agree the best possible mix of activities to minimise the potential noise impact associated with motor sport activities.

2.41 Forward planning of events and other track activities can ensure that there is consistency

of track operation which produces known operating hours and quiet periods. This consistency has been identified as being important to ensure that the community has confidence in the control of the venue.

2.42 Finally, the Guidelines indicate that venue controls should be introduced in co-operation with the Local Authority following the required research into the spread of noise from the circuit and its effect on the community.

Noise Propagation

2.43 The section on noise propagation provides some discussion as to the prediction of noise from a venue and the effects of various parameters will have on the derived noise levels at a receiver. It is indicated that such predictions will be venue specific. It is discussed that ground attenuation will affect the levels of noise that are experienced at a receiver location. Soft agricultural ground will provide a greater reduction in noise levels than hard tarmac. In fact, considerable work has been undertaken with respect to ground attenuation for traffic noise reduction for normal road networks and ploughed fields with the furrow running parallel to the road are the best ground conditions to reduce traffic noise propagation across flat land.

2.44 Weather conditions can make a significant difference to received noise levels at receiver locations positioned 500m or more from a track. The Guidelines indicate that at 500m, this difference may be as much as 10 dB(A) with higher variations at greater distances. This factor causes great problems as public perceive the variation in noise as a lack of control by the circuit or by the Local Authority. It is important to all venues that this misconception by the community is reduced.

2.45 The Guidelines then consider the potential use of noise barriers. In general, if the barrier is located far from either the source or the receiver, then their efficiency will be greatly reduced as noise will bend over the top of a barrier due to wind shear effects. Therefore, if barriers are to be a solution in reducing noise from motor sport activity they are required to be located close to the track side or close to the receiver. Trackside barriers will provide some protection when the noise source is close to the barrier.

Community Liaison

2.46 The Guidelines undertook research to consider what made people complain about noise from motor sport venues. This confirmed that complaints from the public are more likely if they feel that there is an escalation of track activities or that the noise is not properly controlled.

2.47 The Guidelines then state the following:

> *It is of prime importance to ensure that there is good communication with local residents. The community should understand the controls and management systems put in place for their protection and have an opportunity to be involved with their implementation.*
>
> *Once again, this is a very venue specific subject and general guidelines can not decide the best way to create an effective link with the community. It may be achieved by special liaison committees or by involvement with local residents groups and parish or community councils*
>
> *The information available to the community should include the following:*

- *Calendar of track activities*
- *Operating hours, including breaks*
- *Details of noise controls in use*
- *Circuit management plan*
- *Results of noise monitoring*

Management Plans

2.48 The Guidelines suggest that a venue should produce a Policy Statement addressing all aspects of the noise control procedures in use at their site. This Policy Statement should be the basis for the production of a more detailed management plan which describes the actions to be taken by the venue to minimise noise disturbance. It is suggested that some or all of the following should be included within such a plan:

- Policy Statement regarding noise control

- Management Plan for noise control
- Results of environment noise studies
- Details of improvements to venue to reduce community noise impact
- Noise control manual to be used by venue staff
- Staff training for noise awareness and control
- List of trained personnel or arrangements for their provision
- Details of any sound measurement equipment used at the venue
- Records of the results of vehicle noise measurements
- Records of the results of trackside or environmental measurements
- Records of any noise complaints
- Any other information relevant to the local situation

2.49 Finally, the following is stated within the Guidelines:

It is important that records are kept of the steps taken by a venue to exercise any environmental controls. Venues have benefited from keeping records when dealing with Local Authority regarding noise enforcement and planning issues.

BS 4142:2014 Methods for rating and assessing industrial and commercial Sound

2.50 BS 4142:2014[5] provides a means for the assessment of sound from industrial and commercial premises. It should be noted that within the scope of the document that:

The standard is not intended to be applied to the rating and assessment of sound from:

a) recreational activities, including all forms of motorsport;

2.51 Therefore, the use of this standard for the assessment of motor sport noise is considered outside the intent of the standard. However, the standard does provide guidance as to the means by which the existing noise environment may be assessed and provides an indication for the potential audibility of a sound within such an environment.

2.52 Section 8 of the Standard provides a guidance with regard to determining the background sound level. It states that:

The background sound level is an underlying level of sound over a period, T, and might in

[5] BS 4142: 2014: Methods for rating and assessing industrial and commercial Sound

part be an indication of relative quietness at a given location. It does not reflect the occurrence of transient and/or higher sound level events and is generally governed by continuous or semi-continuous sounds.

In using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods.

2.53 BS 4142 advises that the measurement time interval for undertaking this background sound level determination should be 15 minutes for each measurement period. BS 4142 also states that:

8.1.4 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.

2.54 To that end, it is appropriate to determine the background sound level through measurement of the sound environment over an extended period of time. Typical periods should cover a normal operating week for the development. The measurements should also include a weekend period since operations at site are expected to occur through weekend periods as well as normal weekday periods.

2.55 Whilst not being relevant for the assessment of motorsport noise, BS 4142 does provide a means to assess the acceptability of sound associated within industrial and commercial premises through Section 11 Assessment of Impacts. It is stated here that:

a) Typically, the greater this difference, the greater the magnitude of the impact.

b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

d) 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.

2.56 BS 4142 then sets out the need to modify an assessment due to context and take all pertinent factors into consideration including the following:

The absolute level of sound. 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 background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.

Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent which the specific sound source is likely to make those impacts worse.

2.57 Therefore, whilst the level difference between a new noise source and the existing background sound level may provide an indication of the potential noise impact associated with the new noise source, for situations where background sound levels and the new noise source are low then the absolute levels of that sound may be more relevant.

Additional Guidance on Noise

2.58 The Standard indicates that it is not appropriate for the assessment of motorsport noise. Therefore, it is also of value to consider guidance from elsewhere as to what may be considered acceptable levels of sound at receptor locations which may provide sufficient protection to neighbours to a development with regard to sound.

WHO Guidelines for Community Noise

2.59 The World Health Organisation document Guidelines for Community Noise[6] provide an indication of levels of sound which may give rise to moderate annoyance. It is stated that moderate annoyance may occur during daytime and evening periods when $L_{Aeq,\ 16\ Hour}$ levels exceed 50 dB. For the protection of persons asleep within a building with window open it is advised that external noise levels should not exceed an $L_{Aeq,\ 8\ hour}$ of 45 dB or an L_{Amax} noise level of 60 dB.

WHO Night Noise Guide Lines for Europe

[6] WHO Guidelines for Community Noise 1999: https://apps.who.int/iris/handle/10665/66217

2.60 The WHO Night Noise Guidelines for Europe[7] set out what are considered noise limits for the protection of sleep of neighbours to sources of noise. In general this refers to traffic, aircraft, train and industrial noise. The suggested policy aim of the document is that to minimise the risk of any negative effects associated with noise to the health of a sleeping person that external noise levels should not exceed 40 dB $L_{night,outside}$. This is a limit based upon the yearly average night time noise levels measured over an 8 hour period. The levels which are indicated relate specifically to night time sleep protection but it may be assumed that noise levels of this level during the day will have no adverse health impacts to persons subjected to such levels nor, as a consequence, are unlikely to significantly result in adverse comment especially if the pre-existing ambient (L_{Aeq}) sound level at a receptor is of a similar level.

WHO Environmental Noise Guidelines for the European Region

2.61 WHO Environmental Noise Guidelines for the European Region[8] provide the most recent research into the potential effects of sound upon human health and proposes a number of limits for the protection of health. The sources considered do not included sound from sports events but do provide an indication of the general levels which may be considered safe from any source.

Sound associated with traffic is considered to have no adverse effects upon health of levels are controlled below 53 dB L_{den}[9]. This is equivalent to around a fixed level of approximately 46 dB L_{Aeq}.

Policy Conclusions

2.62 Specific guidance as to the means to control noise associated with a source like the proposed Moto-x Experience Centre is not considered in detail within PPW10. Guidance within TAN 11 is limited although it is indicated that relevant Codes of Practice should be used when assessing noise associated with sport. Whilst no Code of Practice exists for Motor Sport Noise Sources some guidance does exist within the Guidance Notes on Noise Control at Motor Sport Circuits the difference being that a Motor Sports Circuit will operate high performance vehicles in a race situation whereas the intent of the proposal is to provide a Moto-X experience in a non-competitive environment. The guidance notes relate,

[7] WHO Night Noise Guidelines for Europe: 2009: http://www.euro.who.int/__data/assets/pdf_file/0017/43316/E92845.pdf
[8] WHO Environmental Noise Guidelines for the European Region : 2018: http://www.euro.who.int/en/health-topics/environment-and-health/noise/publications/2018/environmental-noise-guidelines-for-the-european-region-2018
[9] Lden = Day – evening-night level which biases the level of noise for evening and night-time periods by 5 and 10 dB respectively to take account of the greater sensitive of receptors during these periods of relaxation. The L_{den} is a yearly average level.

in general, to large facilities and to vehicles which use a petrol engine as the source of power for driving the vehicle. Such sources are considerably noisier than the proposed electrically powered Motocross/Enduro and Two Stroke Trials bikes which are proposed for use at the site. Therefore, whilst the general discussion is relevant to the determination of acceptability of the proposal, the significantly lower source noise levels associated with electrically power bikes makes the guidance, to a degree, superfluous to the operation of the site.

2.63 Reference has been made, within TAN 11, to BS 4142 for the determination of the potential for complaints from an industrial noise source. The Guidance Notes on Noise Control at Motor Sport Circuits have indicated that an assessment of the potential impacts associated with Motor Sport noise may be assessed by comparing the long term $L_{Aeq, T}$ noise levels associated with the source with the pre-existing ambient noise levels.

2.64 On the basis of the guidance outlined above, we propose to assess the potential noise impacts associated with the operation of the proposal through measurement of operational noise levels for 2 & 4-Stroke Petrol Driven Bikes, 2 Stroke Trials Bike and an Electrically Powered MotoX/Enduro and Trials Bikes. Predicted noise levels at neighbouring noise sensitive receptors will be determined and compared with the pre-existing noise environment to determine the potential level of disturbance associated with the operation of the proposed site.

3. SOURCE NOISE LEVELS

3.1 To determine the level of noise associated with the operation of the proposed development a number of tests were undertaken to bikes operating on the existing track at the site. Three different bikes were used to provide an indication of sound levels associated with existing activities on site (2 & 4 stroke petrol) and the proposed electrical bikes for operation.

3.2 Appendix A details the calibration of the sound level equipment used for undertaking these measurements and Appendix B provides a site plan which details the locations at which the sound levels were undertaken. Photographs of the measurement positions are also provided.

3.3 To obtain different sound levels for different parts of the track due to different load conditions, i.e. acceleration out of corners was found to produce the highest levels of sound from the petrol drive engines, a number of drive by tests were undertaken of each bikes for each test drive-by location. 5 drive-bys per bike were undertaken for each location and the average sound pressure level measured was then used for determination of a source noise level for that section of the track/load condition. Measurement locations were 1.5 metres

above ground level and the distance from the centre line of each of the set of 5 pass-bys is stated within the tables.

3.4 Tables 3.1 – 3.6 details the measured noise levels associated for each bike type and the load conditions which were measured.

Table 3.1: 4 Stroke Petrol Engine Source Noise Levels: dB $L_{eq, 15\ seconds}$

	Octave Band Centre Frequency (Hz)											
	31	63	125	250	500	1k	2k	4k	8k	16k	Lin	dB(A)
Long Hill Climb @ 6.7m	66.6	84.3	88.0	89.4	82.1	82.7	79.4	74.5	67.2	54.8	93.5	87.4
Flat Jump @ 6.8 m	70.8	79.6	85.3	84.3	74.4	78.8	74.1	69.1	62.4	51.0	89.3	82.5
Acceleration out of Corner @ 8m	63.2	85.0	90.3	89.6	83.4	84.6	83.7	78.3	71.3	59.3	95.0	89.7
Hill Climb and Drop Down @6.4m	71.5	76.9	79.9	77.4	70.8	72.8	68.5	62.9	55.3	40.1	84.1	76.6

Table 3.2: 2 Stroke Petrol Engine Source Noise Levels: dB $L_{eq, 15\ seconds}$

	Octave Band Centre Frequency (Hz)											
	31	63	125	250	500	1k	2k	4k	8k	16k	Lin	dB(A)
Long Hill Climb @ 6.7 m	59.7	68.2	74.7	77.9	74.8	70.4	68.6	66.7	62.2	51.7	81.9	77.1
Flat Jump @ 6.8 m	58.1	65.5	66.2	68.7	66.1	63.1	62.5	59.3	55.8	49.5	74.0	69.4
Acceleration out of Corner @ 8 m	60.0	60.9	79.2	80.7	83.2	75.6	75.5	74.5	70.7	62.0	87.2	84.0
Hill Climb and Drop Down@6.4 m	56.7	63.2	65.8	65.7	66.3	60.5	59.1	56.1	50.5	37.1	72.3	67.4

Table 3.3: Trials Electric Bike Source Noise Levels: dB $L_{eq, 15\ seconds}$

	Octave Band Centre Frequency (Hz)											
	31	63	125	250	500	1k	2k	4k	8k	16k	Lin	dB(A)
Long Hill Climb @ 6.7 m	52.8	54.8	57.7	58.3	55.3	60.3	65.1	61.8	58.5	46.4	69.4	69.1
Flat Jump @ 6.8 m	55.5	53.9	58.0	60.5	59.8	63.4	66.4	65.1	61.1	50.6	71.6	71.4
Acceleration out of Corner @ 8 m	53.7	52.3	54.0	56.4	58.0	59.2	64.8	62.9	59.6	49.2	69.3	69.2
Hill Climb and Drop Down@6.4 m	49.5	52.4	50.9	48.7	47.5	50.6	55.1	53.5	49.9	34.6	61.1	59.8

Table 3.4: Enduro Electric Bike Source Noise Levels: dB $L_{eq, 15\ seconds}$

	Octave Band Centre Frequency (Hz)											
	31	63	125	250	500	1k	2k	4k	8k	16k	Lin	dB(A)
Long Hill Climb @ 4.5 m	61.7	64.1	61.1	60.9	59.4	61.2	64.3	63.2			71.3	69.0
Flat Jump @ 4 m	58.3	63.6	60.9	63.3	64.5	64.1	67.3	68.0			73.7	72.8
Acceleration out of Corner @ 4 m	59.3	61.8	65.4	65.0	67.0	66.8	70.3	71.3			76.3	75.8
Hill Climb and Drop Down@4 m	55.9	67.5	55.7	53.9	52.2	59.4	62.1	60.2			70.1	66.4

Table 3.5: Trials 2 Stroke Bike Moto-X Track Source Noise Levels: dB $L_{eq, 15\ seconds}$												
	Octave Band Centre Frequency (Hz)											
	31	63	125	250	500	1k	2k	4k	8k	16k	Lin	dB(A)
Long Hill Climb @ 4.5 m	61.9	70.9	75.5	74.7	69.3	64.0	64.7	58.9			79.7	72.1
Flat Jump @ 4 m	58.2	73.1	77.5	76.0	73.0	66.5	67.2	63.1			81.7	74.8
Acceleration out of Corner @ 4 m	57.4	73.1	76.6	76.6	72.4	67.4	68.2	63.3			81.6	75.1
Hill Climb and Drop Down@4 m	57.4	73.2	71.6	74.2	68.7	63.6	64.4	56.6			78.8	71.4

Table 3.6: Trials 2 Stroke Bike Source Noise Levels: dB $L_{eq, 15\ seconds}$												
	Octave Band Centre Frequency (Hz)											
	31	63	125	250	500	1k	2k	4k	8k	16k	Lin	dB(A)
Log Hop @ 3 m	70.7	72.1	75.4	71.8	65.5	59.8	59.6	53.0			79.2	68.4
Tyre Hop @ 3 m	65.8	69.1	69.4	66.9	62.6	56.9	56.8	50.4			74.5	64.8
Hill Climb @ 3 m	65.0	75.4	76.8	78.5	75.9	67.3	68.1	60.5			83.2	76.5
Hill Descend @ 3 m	65.2	68.4	69.1	70.7	62.2	55.3	56.7	52.0			75.1	65.6

3.5 The clear difference between the five bikes is that the electric bikes have no exhaust noise. This may be seen from the peak in the spectrum for the 4-Stroke engine in the 125 – 250 Hz region and the 250 Hz region for the 2-stroke bikes. The electric bikes, whilst having a similar A-weighted overall sound level to the 2 stroke bikes, all the acoustic energy is concentrated in the higher frequency regions of 1 – 4 kHz.

3.6 When listening to the drive by tests it was apparent that little or no drive noise from the electrical motor was audible and that a majority of the sound was associated with chain slap as the chain passed through the drive sprockets to the drive wheel at the rear of the bike.

3.7 This was a very different sound to that heard from the petrol engine bikes which were dominated by high level lower frequency exhaust noise. Chain slap was barely audible as the vehicles passed the measurement locations.

4. ACOUSTIC MODELLING

4.1 The data collected from the pass-by noise tests has been used to derive a source sound power level for each of the four operating conditions of the bikes. Each sample has been modelled as a moving point source. A moving point source is representative of the passage of the source along the path described by a bike. The track has been divided into separate bike paths depending upon the expected load on the engine which represents the various operating conditions for bikes as they traverse around the track. Therefore, multiple moving point sources have been modelled representing a different section of the track.

Measurement of site operations undertaken by riders with thorough knowledge of the track layout indicates the typical quickest circuit times are around 2 minutes. On this basis, it would be expected that one rider would circulate around the track a maximum of 30 times in any one hour. The number of riders using the track at any one time is expected to be between 10 – 12 riders. For the purpose of our calculations we have adopted 15 riders using the track at the same time, all riding near the maximum speed that might be expected, i.e. a circuit every 2 minutes.

4.2 Activities in the Trials Obstacle Course Arena are associated with bikes undertaking low speed tricks and technique training. This activity is generally associated with low speed control and therefore results in significantly less noise than Moto-X Track activities. It has been assumed for the predictions of noise from these activities that 14 users will be on the track/course at any one time.

4.3 It is proposed that the Moto-X Track and the Tricks/technique Course will operate at the same time. Therefore we have undertaken predictions for each source separately and then provided a predicted combined level for the site being operated at full capacity. We have also considered the potential effects of running a combination of electric powered bikes and 2 stroke trials bikes on the Moto-X Track which would be the only bikes to operate outside the existing permitted development usage.

4.4 A topographical model of the site has been provided which provides a detailed map of the ground profiles across the site within the site boundary. At locations external to the site boundary, the standard OS height 50m grid has been used to determine the ground profiles. These profiles have been used to determine any ground barrier attenuations associated with barriers, fences and hills.

4.5 A mixed ground condition has been adopted for determination of the ground absorption. The ground within the boundary is generally grass with leaves covering the surface. The track is either hard earth or mud but as the bikes are located on the track this harder ground conditions has minimal effect upon the ground absorption and propagation to a receptor.

4.6 The source height assumed for the noise predictions was 0.5 m above ground level (agl) and the receptor height assumed was 4 m agl which is equivalent to the first floor window of a two storey dwelling house.

4.7 Predictions were undertaken assuming a continuous use of the track, i.e. there are no breaks between change overs of bikes/riders. The predicted levels are therefore indicative of the $L_{Aeq,\ 1\ hour}$ noise levels which would be experienced at trackside or at receptor locations.

4.8 Receptor locations were identified from OS mapping and through site visit and Google Earth Streetview. On the basis of the visit the following locations were identified as being sufficiently close to the proposed development as to warrant prediction of operational noise levels. Table 4.1 details the receptor locations.

Table 4.1: Receptor Locations

	Easting	Northing	AOD (m)
Cefnmawr	305170	256469	251
Maesgwynne	306241	256487	253
Maesgwynne Farm	306359	256432	255
Trecord Farm	306023	255926	251
Rhyd-Blawd	305788	255973	240
Cwmamliw	306092	255663	269
Property	305001	256414	252
Pentre	305395	256895	259
Brynrhydd	305820	256888	247

4.9 For each location a prediction of site activity was undertaken for the 4-Stroke, 2-Stroke (Trials and Enduro) and Electric bike (Trials and Enduro) respectively. Table 4.2 details the predicted $L_{Aeq,\ 1\ hour}$ for each of the identified properties for the three bike types.

Table 4.2: Prediction Noise Levels for Moto-X Track Operation: dB $L_{Aeq,\ 1\ Hour}$

	4-Stroke Enduro	2-Stroke Motor-X	Electric-Trials	2-Stroke Trials	Electric - Enduro
Cefnmawr	51.2	43.5	31.5	34.5	33.3
Maesgwynne	50.3	41.8	32.0	32.9	33.4
Maesgwynne Farm	43.5	36.2	22.3	27.1	24.5
Trecord Farm	51.1	42.4	32.8	34.0	34.1
Rhyd-Blawd	50.0	42.1	31.0	34.0	32.5
Cwmamliw	47.4	38.8	28.0	30.0	29.6
Property	49.8	41.7	30.6	32.8	32.3
Pentre	47.6	39.7	28.4	31.6	29.9
Brynrhydd	43.6	35.8	23.7	28.2	25.2

4.10 The predictions indicate the sound levels at receptor locations for the petrol driven vehicles (Enduro 4 Stroke and 2 Stroke) result in noise levels at receptor properties which range between 51 and 44 dB L_{Aeq}. The electric bike predictions indicate noise levels at receptor locations of between 34 – 24 dB L_{Aeq}. The 2 stroke Trials bike gives a range of operational noise levels between 35 – 27 dB L_{Aeq}. In general, operational noise levels associated with electric bike operations are around 10 – 20 dB lower than Enduro/Moto-X 4 and 2 Stroke petrol driven bikes. This is equivalent to a reduction in sound levels of a half to a quarter

the loudness of petrol driven bikes. The 2 Stroke Trials Bike is significantly smaller in size when compared to the Enduro/Moto-X Petrol driven bikes such that the operational noise levels site between the electrically driven bikes and the petrol driven Enduro/Moto-X bikes.

4.11 In terms of a rating level, i.e. the predicted sound level with any corrections for character, the sound which was audible during the electric bike pass-by measurements did not contain a prominent tonal character or an impulsive character. As such the predicted level associated with the operation of the electric bikes does not require a correction and the predicted L_{Aeq} can be assessed as the rated level, $L_{Aeq,r}$

4.12 Appendix D provides contour plots of the predicted noise levels associated with the five bike types which have been considered and provides the location of the receptors neighbouring the proposed development.

4.13 It is also envisaged that operation of the Moto-X track may include a mixture of Electric and 2 Stroke Trials Bikes. In such circumstances, the higher levels associated with the 2 Stroke Trials bike would be indicative of the levels for this mixed use condition.

4.14 Predictions of the Trials Course are set out in Table 4.3 below. It has been assumed that there will be two hill climbs on either side of the valley with a number of low speed obstacles in the form of tyres/log piles and rock/stone piles. In total 14 such areas have been modelled and it is assumed that each of these areas will be used simultaneously.

Table 4.3: Prediction Noise Levels for Moto-X Track Operation: dB $L_{Aeq, 1\ Hour}$

	Electric-Trials	2-Stroke Trials	Mix Electric/2 Stroke Trials: 50:50
Cefnmawr	19.4	27.6	25.2
Maesgwynne	34.4	36.4	35.5
Maesgwynne Farm	18.7	27.4	24.9
Trecord Farm	29.8	34.3	32.6
Rhyd-Blawd	30.1	36.0	34.0
Cwmamliw	28.2	31.7	30.3
Property	19.8	27.6	25.3
Pentre	19.7	27.4	25.1
Brynrhydd	24.7	30.8	28.8

4.15 To assess the potential noise impacts associated with the operation of the bikes, it is necessary to determine the existing ambient noise levels in the vicinity of the proposal.

5. ENVIRONMENTAL NOISE SURVEY

5.1 BS 4142:2014 indicates that to determine the prevailing background noise levels it is necessary to consider that sound will fluctuate in level over the normal 24 hour period and that any noise measurements and derived background noise level should reflect this. BS 4142 states at 8.1.4 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.

5.2 To determine the prevailing background noise level is the locale of the proposed development, a noise survey was undertaken for a 7 day period. This survey undertook measurements of the $L_{A90,\ 10\ minute}$ for each 10 minute period of the week measurement period. These data have then been used to determine the prevailing noise levels.

5.3 As there are no major noise sources in the vicinity of the proposed site, i.e. major roads or industrial installations, and the area is rural in nature it was considered appropriate to undertake these measurements at a single location to represent the noise environment at all neighbouring receptor locations.

5.4 The measurement location was at the proposed development site and located towards the southern end of the site. The location was selected to be out of earshot of the stream which runs through the site and away from overhanging trees. This is identified in Appendix B.

5.5 Measurements were undertaken using a RION NC-52 Sound Level Meter (Serial Number: 01032450) which was calibrated prior to installation and on removal of the equipment using a B&K 4321 Sound Level Calibrator (Serial Number: 1807700). The calibrated level for the sound level meter was noted to have changed by 0.1 dB which is considered acceptable for the purpose of sound level measurements.

5.6 The microphone was placed upon a tripod and located 1.4 metres above ground level. It was located within a double skinned wind shield to minimise the influence of the wind upon the measuring system throughout the survey. A rain gauge was located close to the sound level meter to determine periods of rainfall during the survey which can result in increased noise levels associated with train drops of the wind screen surface. No significant rainfall was noted during the survey.

5.7 Measurements were undertaken between 25th October 2018 and 1st November 2018. During this period the $L_{Aeq,\ 10\ minute}$ and $L_{A90,\ 10\ minute}$ levels were logged. Appendix C details

the sound levels which occurred during the survey period. The expected operational period when bike activities will occur on site is between 09:00 – 17:00 hrs. Therefore, the relevant period of background noise which requires derivation of a prevailing background noise is data which is collected between these ours during the daytime period. Since it is expected that operations will occur during the weekends, weekend measurements have been included within the analysis. Figure 1 below details the cumulative distribution of the background noise levels.

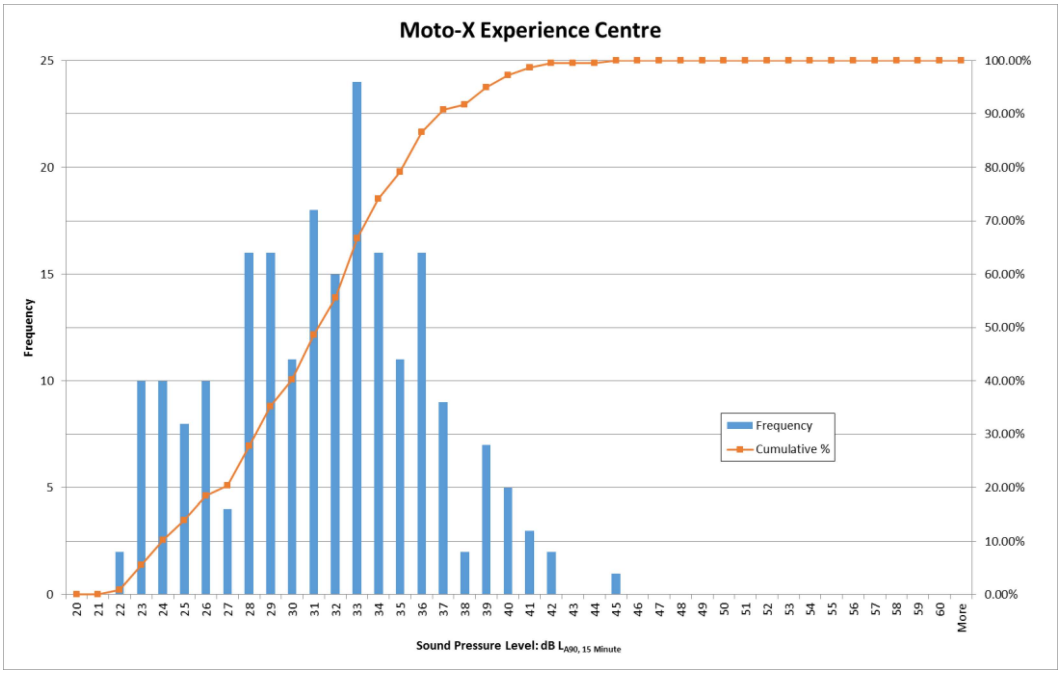


Figure 1: Cumulative Distribution of Background Noise Levels

5.8 The derived prevailing background noise level for the assessment location has been determined as 32 dB $L_{A90,\ 15\ minute}$.

Assessment

5.9 In accordance with the guidance within TAN 11 and BS 4142, the predicted operational noise associated with the motocross bikes have been compared with the derived prevailing background noise levels. Table 5.1 - 5 below detail the predicted levels, the background noise levels and the predicted level difference for a range of operational conditions for different bike types and operations on the Moto-X Track and Trials Tricks Track..

Table 5.1: Assessment of Effects: Electric Enduro Bike Operations Moto-X Track Operation					
	Predicted $L_{Aeq,r}$	Derived Background L_{A90}	$\Delta Lp=L_{Aeq,r}-L_{A90}$	Derived Ambient L_{Aeq}	$\Delta Lp=L_{Aeq,r}-L_{Aeq\ Ambient}$

Cefnmawr	33.3	32	1.3	38	-4.7
Maesgwynne	33.4	32	1.4	38	-4.6
Maesgwynne Farm	24.5	32	-7.5	38	-13.5
Trecord Farm	34.1	32	2.1	38	-3.9
Rhyd-Blawd	32.5	32	0.5	38	-5.5
Cwmamliw	29.6	32	-2.4	38	-8.4
Property	32.3	32	0.3	38	-5.7
Pentre	29.9	32	-2.1	38	-8.1
Brynrhydd	25.2	32	-6.8	38	-12.8

Table 5.2: Assessment of Effects: 2 Stroke Trials Bike Moto-X Track Operation

	Predicted $L_{Aeq,r}$	Derived Background L_{A90}	$\Delta Lp=L_{Aeq,r}-L_{A90}$	Derived Ambient L_{Aeq}	$\Delta Lp=L_{Aeq,r}-L_{Aeq\ Ambient}$
Cefnmawr	34.5	32	2.5	38	-3.5
Maesgwynne	32.9	32	0.9	38	-5.1
Maesgwynne Farm	27.1	32	-4.9	38	-10.9
Trecord Farm	34.0	32	2.0	38	-4.0
Rhyd-Blawd	34.0	32	2.0	38	-4.0
Cwmamliw	30.0	32	-2.0	38	-8.0
Property	32.8	32	0.8	38	-5.2
Pentre	31.6	32	-0.4	38	-6.4
Brynrhydd	28.2	32	-3.8	38	-9.8

Table 5.3: Assessment of Effects: 2 Stroke Trials Bike: Tricks and Trials Track Operation

	Predicted $L_{Aeq,r}$	Derived Background L_{A90}	$\Delta Lp=L_{Aeq,r}-L_{A90}$	Derived Ambient L_{Aeq}	$\Delta Lp=L_{Aeq,r}-L_{Aeq\ Ambient}$
Cefnmawr	27.6	32	-4.4	38	-10.4
Maesgwynne	36.4	32	4.4	38	-1.6
Maesgwynne Farm	27.4	32	-4.6	38	-10.6
Trecord Farm	34.3	32	2.3	38	-3.7
Rhyd-Blawd	36.0	32	4.0	38	-2.0
Cwmamliw	31.7	32	-0.3	38	-6.3
Property	27.6	32	-4.4	38	-10.4
Pentre	27.4	32	-4.6	38	-10.6
Brynrhydd	30.8	32	-1.2	38	-7.2

Table 5.4: Assessment of Effects: Electric Trials Bike: Tricks and Trials Track Operation

	Predicted $L_{Aeq,r}$	Derived Background L_{A90}	$\Delta Lp=L_{Aeq,r}-L_{A90}$	Derived Ambient L_{Aeq}	$\Delta Lp=L_{Aeq,r}-L_{Aeq\ Ambient}$
Cefnmawr	19.4	32	-12.6	38	-18.6

Table 5.4: Assessment of Effects: Electric Trials Bike: Tricks and Trials Track Operation					
	Predicted $L_{Aeq,r}$	Derived Background L_{A90}	$\Delta Lp=L_{Aeq,r}-L_{A90}$	Derived Ambient L_{Aeq}	$\Delta Lp=L_{Aeq,r}-L_{Aeq\ Ambient}$
Maesgwynne	34.4	32	2.4	38	-3.6
Maesgwynne Farm	18.7	32	-13.3	38	-19.3
Trecord Farm	29.8	32	-2.2	38	-8.2
Rhyd-Blawd	30.1	32	-1.9	38	-7.9
Cwmamliw	28.2	32	-3.8	38	-9.8
Property	19.8	32	-12.2	38	-18.2
Pentre	19.7	32	-12.3	38	-18.3
Brynrhydd	24.7	32	-7.3	38	-13.3

Table 5.5: Assessment of Effects: Combined Operation: Electric Trials and 2Stroke Trials Bikes: Tricks and Trials Track Operation					
	Predicted $L_{Aeq,r}$	Derived Background L_{A90}	$\Delta Lp=L_{Aeq,r}-L_{A90}$	Derived Ambient L_{Aeq}	$\Delta Lp=L_{Aeq,r}-L_{Aeq\ Ambient}$
Cefnmawr	25.2	32	-6.8	38	-12.8
Maesgwynne	35.5	32	3.5	38	-2.5
Maesgwynne Farm	24.9	32	-7.1	38	-13.1
Trecord Farm	32.6	32	0.6	38	-5.4
Rhyd-Blawd	34.0	32	2.0	38	-4.0
Cwmamliw	30.3	32	-1.7	38	-7.7
Property	25.3	32	-6.7	38	-12.7
Pentre	25.1	32	-6.9	38	-12.9
Brynrhydd	28.8	32	-3.2	38	-9.2

Table 5.6: Assessment of Effects: Combined Operation: Electric Enduro Moto-X Track and 2Stroke Trials Bikes: Tricks and Trials Track Operation					
	Predicted $L_{Aeq,r}$	Derived Background L_{A90}	$\Delta Lp=L_{Aeq,r}-L_{A90}$	Derived Ambient L_{Aeq}	$\Delta Lp=L_{Aeq,r}-L_{Aeq\ Ambient}$
Cefnmawr	34.3	32	2.3	38	-3.7
Maesgwynne	38.2	32	6.2	38	0.2
Maesgwynne Farm	29.2	32	-2.8	38	-8.8
Trecord Farm	37.2	32	5.2	38	-0.8
Rhyd-Blawd	37.6	32	5.6	38	-0.4
Cwmamliw	33.8	32	1.8	38	-4.2
Property	33.6	32	1.6	38	-4.4
Pentre	31.8	32	-0.2	38	-6.2
Brynrhydd	31.9	32	-0.1	38	-6.1

Table 5.7: Assessment of Effects: Combined Operation: 2 Stroke Trials Bike Moto-X Track and 2Stroke Trials Bikes: Tricks and Trials Track Operation					
	Predicted $L_{Aeq,r}$	Derived Background L_{A90}	$\Delta Lp=L_{Aeq,r}-L_{A90}$	Derived Ambient L_{Aeq}	$\Delta Lp=L_{Aeq,r}-L_{Aeq\ Ambient}$
Cefnmawr	34.3	32	2.3	38	-3.7
Maesgwynne	35.3	32	3.3	38	-2.7
Maesgwynne Farm	38.0	32	6.0	38	0.0
Trecord Farm	30.3	32	-1.7	38	-7.7
Rhyd-Blawd	37.2	32	5.2	38	-0.8
Cwmamliw	38.1	32	6.1	38	0.1
Property	33.9	32	1.9	38	-4.1
Pentre	33.9	32	1.9	38	-4.1
Brynrhydd	33.0	32	1.0	38	-5.0

Table 5.8: Assessment of Effects: Combined Operation: Enduro Electric Bike Moto-X Track and Electric Trials Bikes: Tricks and Trials Track Operation					
	Predicted $L_{Aeq,r}$	Derived Background L_{A90}	$\Delta Lp=L_{Aeq,r}-L_{A90}$	Derived Ambient L_{Aeq}	$\Delta Lp=L_{Aeq,r}-L_{Aeq\ Ambient}$
Cefnmawr	33.5	32	1.5	38	-4.5
Maesgwynne	36.9	32	4.9	38	-1.1
Maesgwynne Farm	25.5	32	-6.5	38	-12.5
Trecord Farm	35.5	32	3.5	38	-2.5
Rhyd-Blawd	34.5	32	2.5	38	-3.5
Cwmamliw	32.0	32	0.0	38	-6.0
Property	32.5	32	0.5	38	-5.5
Pentre	30.3	32	-1.7	38	-7.7
Brynrhydd	28.0	32	-4.0	38	-10.0

5.10 TAN 11 indicates that a level difference of 5 dB is of "*marginal significance*" and a level difference of more than 10 dB is "*complaints likely*". Therefore, for the properties which have been identified as having the greatest impact from electric Enduro bikes and Two Stroke Trials (Table 5.1) the assessed level difference is a maximum of 2.1 dB, i.e. below marginal significance. It should be noted that current permitted operations would generally result in all locations experiencing levels above 10 dB and therefore the proposal would be significantly better than currently exists through permitted development.

- Operation of 2 Stroke Trials Bikes on the Moto-X Track (Table 5.2) will result in level differences of between 2.0 – 2.5 dB, i.e. below marginal significance.

- Operation of 2 Stroke Trials Bikes on the Tricks and Trials Track (Table 5.3)

indicate a maximum level difference of 4.4 dB, i.e. below marginal significance.

- Operation of Electric Trials Bikes at Tricks and Trials Track (Table 5.4) give rise to a maximum level difference of 2.4 dB, i.e. below marginal significance.

- Operation of Electric and 2 Stroke Trials Bikes on Trick and Trials Track (Table 5.5) gives rise to a maximum level difference of 3.5 dB, i.e. below marginal significance.

- Operation of the Electric Enduro Bike on Moto-X Track in combination with 2 Stroke Trials Bikes on the Tricks and Trials track (Table 5.6) gives rise to a maximum level difference of 6.2 dB. This would be assessed as marginal significance, but incident noise levels are around the existing ambient L_{Aeq} sound levels with a maximum $L_{Aeq,\ 1\ hour}$ of 38.2 dB which is below normal levels expected to result in moderate annoyance (WHO Community Guidelines) and potential sleep disturbance (WHO Community Guidelines and WHO NNGL).

- Operation of the 2 Stroke Trials on Moto-X Track in combination with 2 Stroke Trials Bikes on the Tricks and Trials track (Table 5.7) gives rise to a maximum level difference of 6.1 dB. This would be assessed as marginal significance, but incident noise levels are around the existing ambient L_{Aeq} sound levels with a maximum $L_{Aeq,\ 1\ hour}$ of 38.1 dB which is below normal levels expected to result in moderate annoyance (WHO Community Guidelines) and potential sleep disturbance (WHO Community Guidelines and WHO NNGL).

- Operation of the Electric Enduro Bike on Moto-X Track in combination with a mixture of electric and 2 Stroke Trials Bikes on the Tricks and Trials track (Table 5.8) gives rise to a maximum level difference of 4.9 dB. This would be assessed as marginal significance.

5.11 When operational noise levels are considered with respect to the ambient noise environment, then operational noise levels are generally of the same level or below existing ambient levels. This indicates that the proposal would result in just audible sound at some neighbouring properties when bike activities are underway but that the levels are no greater than those from existing activities such a distant traffic, bird song or stock noise.

5.12 The predicted levels of sound are below 39 dB L_{Aeq}. This is below the WHO *Guidelines for Community Noise* guidance levels for the onset of annoyance, set at 50 dB L_{Aeq} for moderate annoyance during the daytime and evening. The levels are also below the WHO

Night Noise Guideline values for external areas to dwelling houses to protect sleep of 40 dB $L_{Outside}$ and also below the recent WHO *Environmental Noise Guidelines for the European Region* which propose a level of 40 - 45 dB L_{night} to protect from adverse effects of noise from aircraft or traffic respectively.

5.13 Therefore, on the basis that the levels associated with the proposed activities at the site are relatively low whilst at the same time exceeding the prevailing background noise by no more than 6 dB for the worst affected property, we consider that the operational noise levels associated with Moto-X Experience are acceptable with respect to noise.

6. CONCLUSION

6.1 A noise impact assessment has been undertaken to assess the potential effects of the proposed Moto-X Experience Centre proposed at XX. This assessment has undertaken measurements of a range of potential Enduro and Trials Bikes that may be used at the site with specific reference to electrically powered bikes and smaller two stroke petrol driven Trials bikes.

6.2 On the basis of modelling of the potential noise associated with these activities and through measurement of the existing sound environment at site, which is considered representative of the sound environment at neighbouring properties, an assessment of the potential impact of sound generated by the development has been undertaken.

6.3 Our findings are that:

- Operation of electric Enduro bikes and Two Stroke Trials (Table 5.1) results in an assessed level difference is a maximum of 2.1 dB, i.e. below marginal significance. It should be noted that current permitted operations would generally result in all locations experiencing levels above 10 dB and therefore the proposal would be significantly better than currently exists through permitted development.

- Operation of 2 Stroke Trials Bikes on the Moto-X Track (Table 5.2) will result in level differences of between 2.0 – 2.5 dB, i.e. below marginal significance.

- Operation of 2 Stroke Trials Bikes on the Tricks and Trials Track (Table 5.3) indicate a maximum level difference of 4.4 dB, i.e. below marginal significance.

- Operation of Electric Trials Bikes at Tricks and Trials Track (Table 5.4) give rise to a maximum level difference of 2.4 dB, i.e. below marginal significance.

- Operation of Electric and 2 Stroke Trials Bikes on Trick and Trials Track (Table

5.5) gives rise to a maximum level difference of 3.5 dB, i.e. below marginal significance.

- Operation of the Electric Enduro Bike on Moto-X Track in combination with 2 Stroke Trials Bikes on the Tricks and Trials track (Table 5.6) gives rise to a maximum level difference of 6.2 dB. This would be assessed as marginal significance, but incident noise levels are around the existing ambient L_{Aeq} sound levels with a maximum $L_{Aeq, 1\ hour}$ of 38.2 dB which is below normal levels expected to result in moderate annoyance (WHO Community Guidelines) and potential sleep disturbance (WHO Community Guidelines and WHO NNGL).

- Operation of the 2 Stroke Trials on Moto-X Track in combination with 2 Stroke Trials Bikes on the Tricks and Trials track (Table 5.7) gives rise to a maximum level difference of 6.1 dB. This would be assessed as marginal significance, but incident noise levels are around the existing ambient L_{Aeq} sound levels with a maximum $L_{Aeq, 1\ hour}$ of 38.1 dB which is below normal levels expected to result in moderate annoyance (WHO Community Guidelines) and potential sleep disturbance (WHO Community Guidelines and WHO NNGL).

- Operation of the Electric Enduro Bike on Moto-X Track in combination with a mixture of electric and 2 Stroke Trials Bikes on the Tricks and Trials track (Table 5.8) gives rise to a maximum level difference of 4.9 dB. This would be assessed as marginal significance.

6.4 Whilst it is not considered necessary when considering the potential impact of the development on neighbouring properties, the development of a Policy Statement addressing all aspects of the noise control procedures in use at their site would provide additional control of sound from the operation of the development, 2.48.

APPENDIX A – SOUND EQUIPMENT CALIBRATION

ANV MEASUREMENT SYSTEMS

CERTIFICATE OF CALIBRATION

UKAS CALIBRATION 0653

Date of Issue: 19 March 2019

Certificate Number: UCRT19/1336

Issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Page 1 of 2 Pages

Approved Signatory

K. Mistry

Customer	Hayes McKenzie Partnership Ltd Lodge Park Tre'r-ddol Machynlleth Powys SY20 8PL			
Order No.	1001/166			
Test Procedure	Procedure TP 1 Calibration of Sound Calibrators			
Description	Acoustic Calibrator			
Identification	*Manufacturer*	*Instrument*	*Model*	*Serial No.*
	Brüel & Kjær	Calibrator	4231	1807700

The calibrator has been tested as specified in Annex B of IEC 60942:2003. As public evidence was available from a testing organisation (PTB) responsible for approving the results of pattern evaluation tests, to demonstrate that the model of sound calibrator fully conformed to the requirements for pattern evaluation described in Annex A of IEC 60942:2003, the sound calibrator tested is considered to conform to all the class 1 requirements of IEC 60942:2003.

ANV Job No.	UKAS19/03183	
Date Received	18 March 2019	
Date Calibrated	19 March 2019	
Previous Certificate	*Dated*	27 February 2018
	Certificate No.	UCRT18/1225
	Laboratory	0653

CERTIFICATE OF CALIBRATION	Certificate Number UCRT19/1336
UKAS Accredited Calibration Laboratory No. 0653	Page 2 of 2 Pages

Measurements

The sound pressure level generated by the calibrator in its WS2 configuration was measured five times by the Insert Voltage Method using a microphone as detailed below. The mean of the results obtained is shown below. It is corrected to the standard atmospheric pressure of 101.3 kPa (1013 mBar) using original manufacturers information.

Test Microphone	*Manufacturer*	*Type*
	Brüel & Kjær	4134

Results

The level of the calibrator output under the conditions outlined above was

94.03 ± 0.10 dB rel 20 µPa

Functional Tests and Observations

The frequency of the sound produced was	999.82 Hz	±	0.13 Hz
The total distortion was	0.39 %	±	8.8 % of Reading

During the measurements environmental conditions were

Temperature	22	to	23	°C
Relative Humidity	35	to	42	%
Barometric Pressure	101.5	to	101.6	kPa

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

The uncertainties refer to the measured values only with no account being taken of the ability of the instrument to maintain its calibration.

A small correction factor may need to be applied to the sound pressure level quoted above if the device is used to calibrate a sound level meter which is fitted with a free-field response microphone. See manufacturers handbook for details.

..... END .....

Note:

Calibrator adjusted prior to calibration?	NO	
Initial Level	N/A	dB
Initial Frequency	N/A	Hz

Additional Comments

None

Calibrated by: B. Bogdan R 2

ANV MEASUREMENT SYSTEMS

CERTIFICATE OF CALIBRATION

UKAS CALIBRATION
0653

Date of Issue: 27 February 2018

Certificate Number: UCRT18/1225

Issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Page 1 of 2 Pages

Approved Signatory

K. Mistry

Customer	Hayes McKenzie Partnership Ltd Lodge Park Tre'r-ddol Machynlleth Powys SY20 8PL
Order No.	1001/140
Test Procedure	Procedure TP 1 Calibration of Sound Calibrators
Description	Acoustic Calibrator

Identification

Manufacturer	*Instrument*	*Model*	*Serial No.*
Brüel & Kjær	Calibrator	4231	1807700

The calibrator has been tested as specified in Annex B of IEC 60942:2003. As public evidence was available from a testing organisation (PTB) responsible for approving the results of pattern evaluation tests, to demonstrate that the model of sound calibrator fully conformed to the requirements for pattern evaluation described in Annex A of IEC 60942:2003, the sound calibrator tested is considered to conform to all the class 1 requirements of IEC 60942:2003.

ANV Job No.	UKAS18/02131
Date Received	26 February 2018
Date Calibrated	27 February 2018
Previous Certificate	*Dated* 16 February 2017 *Certificate No.* UCRT17/1064 *Laboratory* 7623

CERTIFICATE OF CALIBRATION	Certificate Number UCRT18/1225
UKAS Accredited Calibration Laboratory No. 0653	Page 2 of 2 Pages

Measurements

The sound pressure level generated by the calibrator in its WS2 configuration was measured five times by the Insert Voltage Method using a microphone as detailed below. The mean of the results obtained is shown below. It is corrected to the standard atmospheric pressure of 101.3 kPa (1013 mBar) using original manufacturers information.

Test Microphone	*Manufacturer*	*Type*
	Brüel & Kjær	4134

Results

The level of the calibrator output under the conditions outlined above was

94.02 ± 0.10 dB rel 20 µPa

Functional Tests and Observations

The frequency of the sound produced was	999.82 Hz	±	0.13 Hz
The total distortion was	0.36 %	±	9.0 % of Reading

During the measurements environmental conditions were

Temperature	22	to	22	°C
Relative Humidity	29	to	39	%
Barometric Pressure	101.4	to	101.5	kPa

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

The uncertainties refer to the measured values only with no account being taken of the ability of the instrument to maintain its calibration.

A small correction factor may need to be applied to the sound pressure level quoted above if the device is used to calibrate a sound level meter which is fitted with a free-field response microphone. See manufacturers handbook for details.

..... END .....

Note:

Calibrator adjusted prior to calibration?	NO	
Initial Level	N/A	dB
Initial Frequency	N/A	Hz

Additional Comments

None

Calibrated by: B. Bogdan R 2

HMP 54

ANV MEASUREMENT SYSTEMS

CERTIFICATE OF CALIBRATION

Date of Issue: 06 February 2018 **Certificate Number: TCRT18/1118**

Issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Page 1 of 2 Pages

Approved Signatory

K. Mistry

Customer	Hayes McKenzie Partnership Ltd Unit 3 Oakridge Office Park Whaddon Salisbury SP5 3HT
Order No.	1001/139
Description	Sound Level Meter / Pre-amp / Microphone / Associated Calibrator

Identification

Manufacturer	*Instrument*	*Type*	*Serial No. / Version*
Rion	Sound Level Meter	NL-52	01032450
Rion	Firmware		1.8
Rion	Pre Amplifier	NH-25	32478
Rion	Microphone	UC-59	05841
Rion	Calibrator	NC-74	34536109
	Calibrator adaptor type if applicable		NC-74-002

Performance Class 1

Test Procedure TP 2.SLM 61672-3 TPS-49

Procedures from IEC 61672-3:2006 were used to perform the periodic tests.

Type Approved to IEC 61672-1:2002 YES Approval Number 21.21 / 13.02

If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2003

Date Received 05 February 2018 ANV Job No. TRAC18/02063

Date Calibrated 06 February 2018

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Previous Certificate	*Dated*	*Certificate No.*	*Laboratory*
	17 February 2016	1602089	AV Calibration

CERTIFICATE OF CALIBRATION

Certificate Number
TCRT18/1118

Page 2 of 2 Pages

Sound Level Meter Instruction manual and data used to adjust the sound levels indicated.

SLM instruction manual title	Sound Level Meter	NL-42 / NL-52	
SLM instruction manual ref / issue		11-03	
SLM instruction manual source		Manufacturer	
Internet download date if applicable		N/A	
Case corrections available		Yes	
Uncertainties of case corrections		Yes	
Source of case data		Manufacturer	
Wind screen corrections available		Yes	
Uncertainties of wind screen corrections		Yes	
Source of wind screen data		Manufacturer	
Mic pressure to free field corrections		Yes	
Uncertainties of Mic to F.F. corrections		Yes	
Source of Mic to F.F. corrections		Manufacturer	
Total expanded uncertainties within the requirements of IEC 61672-1:2002		Yes	
Specified or equivalent Calibrator		Specified	
Customer or Lab Calibrator		Lab Calibrator	
Calibrator adaptor type if applicable		NC-74-002	
Calibrator cal. date		08 January 2018	
Calibrator cert. number		UCRT18/1018	
Calibrator cal cert issued by		0653	
Calibrator SPL @ STP		94.03 dB	Calibration reference sound pressure level
Calibrator frequency		1001.94 Hz	Calibration check frequency
Reference level range		25 - 130 dB	

Accessories used or corrected for during calibration - Extension Cable (No Wind Shield)
Note - if a pre-amp extension cable is listed then it was used between the SLM and the pre-amp.

Environmental conditions during tests	Start	End	
Temperature	22.73	23.10	± 0.30 °C
Humidity	33.2	35.8	± 3.00 %RH
Ambient Pressure	100.68	100.64	± 0.03 kPa

Response to associated Calibrator at the environmental conditions above.

Initial indicated level	94.5 dB		Adjusted indicated level	94.0 dB	
The uncertainty of the associated calibrator supplied with the sound level meter ±				0.10 dB	

Self Generated Noise	This test is currently not performed by this Lab.		
Microphone installed (if requested by customer) = Less Than		N/A dB	A Weighting
Uncertainty of the microphone installed self generated noise ±		N/A dB	

Microphone replaced with electrical input device - UR = Under Range indicated

Weighting	A			C			Z		
	12.4	dB	UR	17.0	dB	UR	22.7	dB	UR
Uncertainty of the electrical self generated noise ±							0.12	dB	

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with the Guide to the Expression of Uncertainty in Measurement published by ISO.

For the test of the frequency weightings as per paragraph 12. of IEC 61672-3:2006 the actual microphone free field response was used.

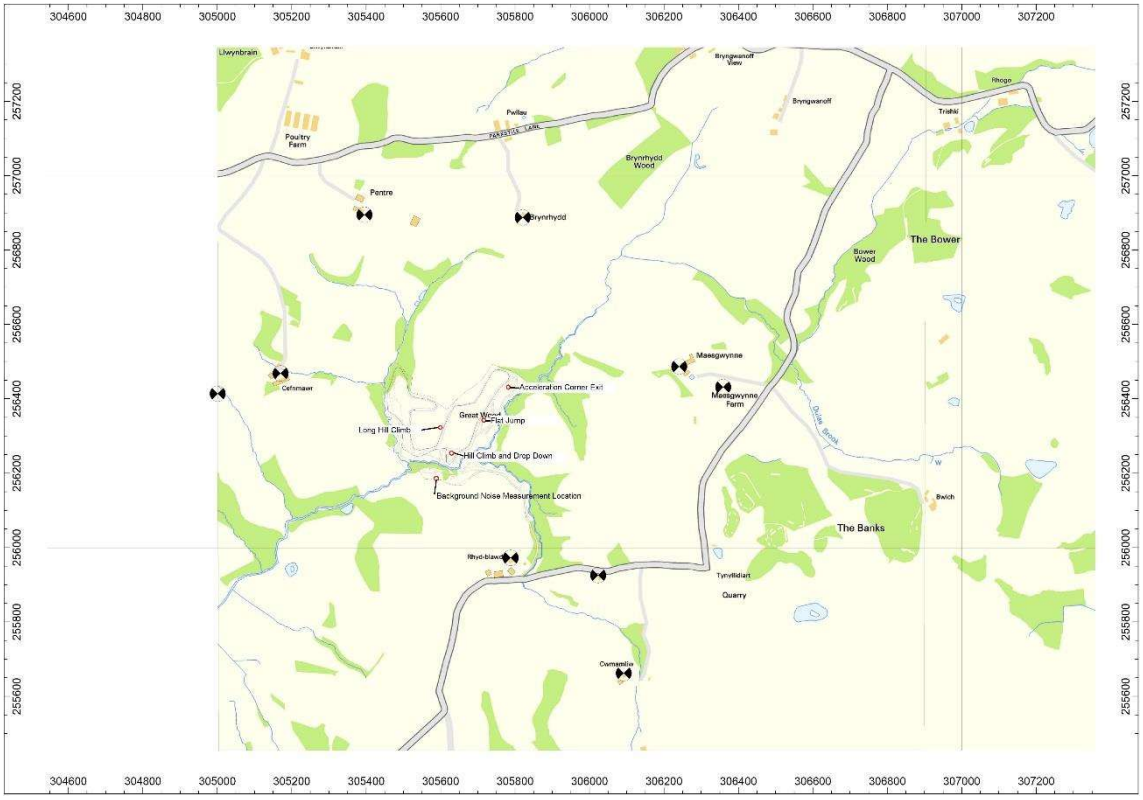
The acoustical frequency tests of a frequency weighting as per paragraph 11 of IEC 61672-3:2006 were carried out using an electrostatic actuator.

..... END .....

Calibrated by: A Patel R 1

Additional Comments
None

APPENDIX B – MEASUREMENT LOCATIONS



Site Plan with Measurement Locations

Top Long Hill Climb

Flat Jump

Acceleration out of Corner 1

Acceleration out of Corner 2

Hill Climb and Drop Down

Logs and Tyre Jumps: Trials Track

Trials Tyres

Trials: Logs

Hill Climb: Trials

Trials Track Start Area

Background Noise Survey Location

Background Noise Survey Location

Background Noise Survey Location

APPENDIX C – BACKGROUND NOISE SURVEY TIME HISTORY

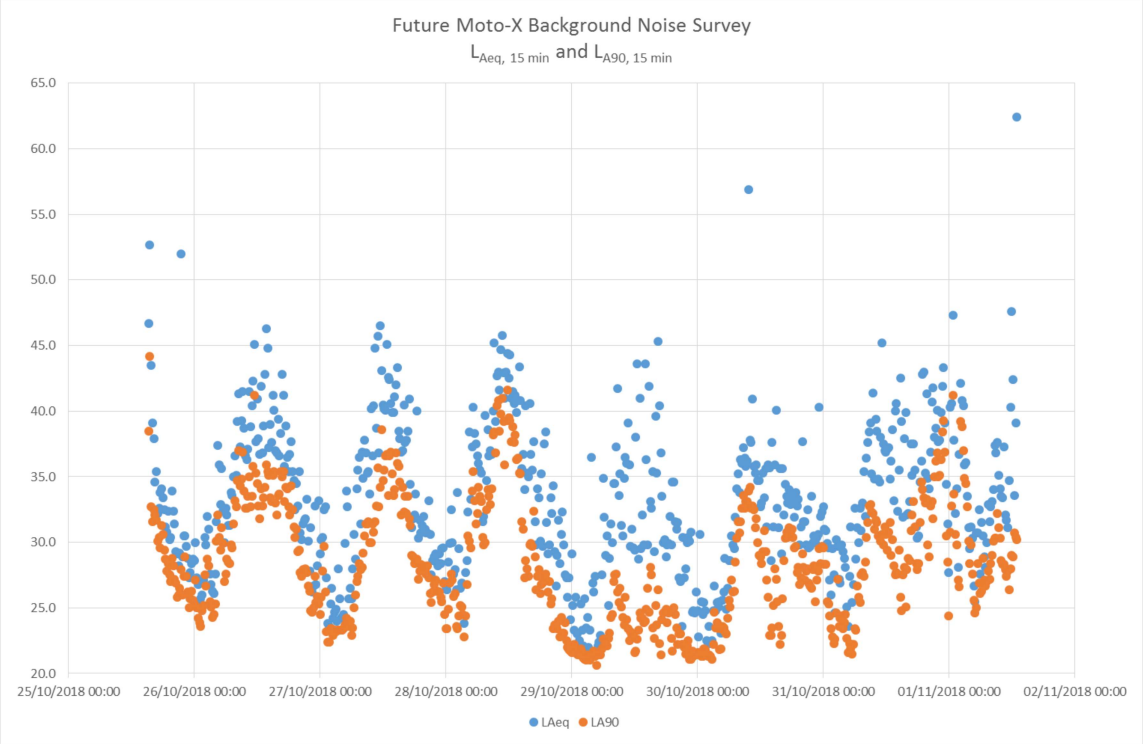


Figure Detailing Measured Noise Data at Background Measurement Location.

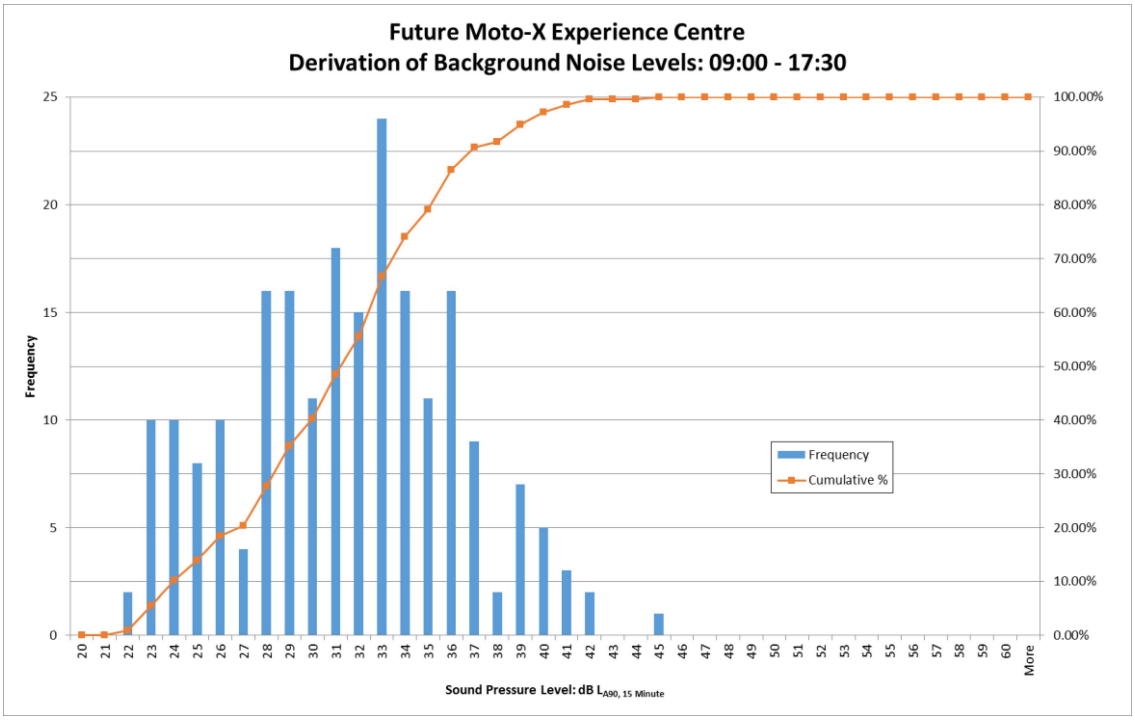
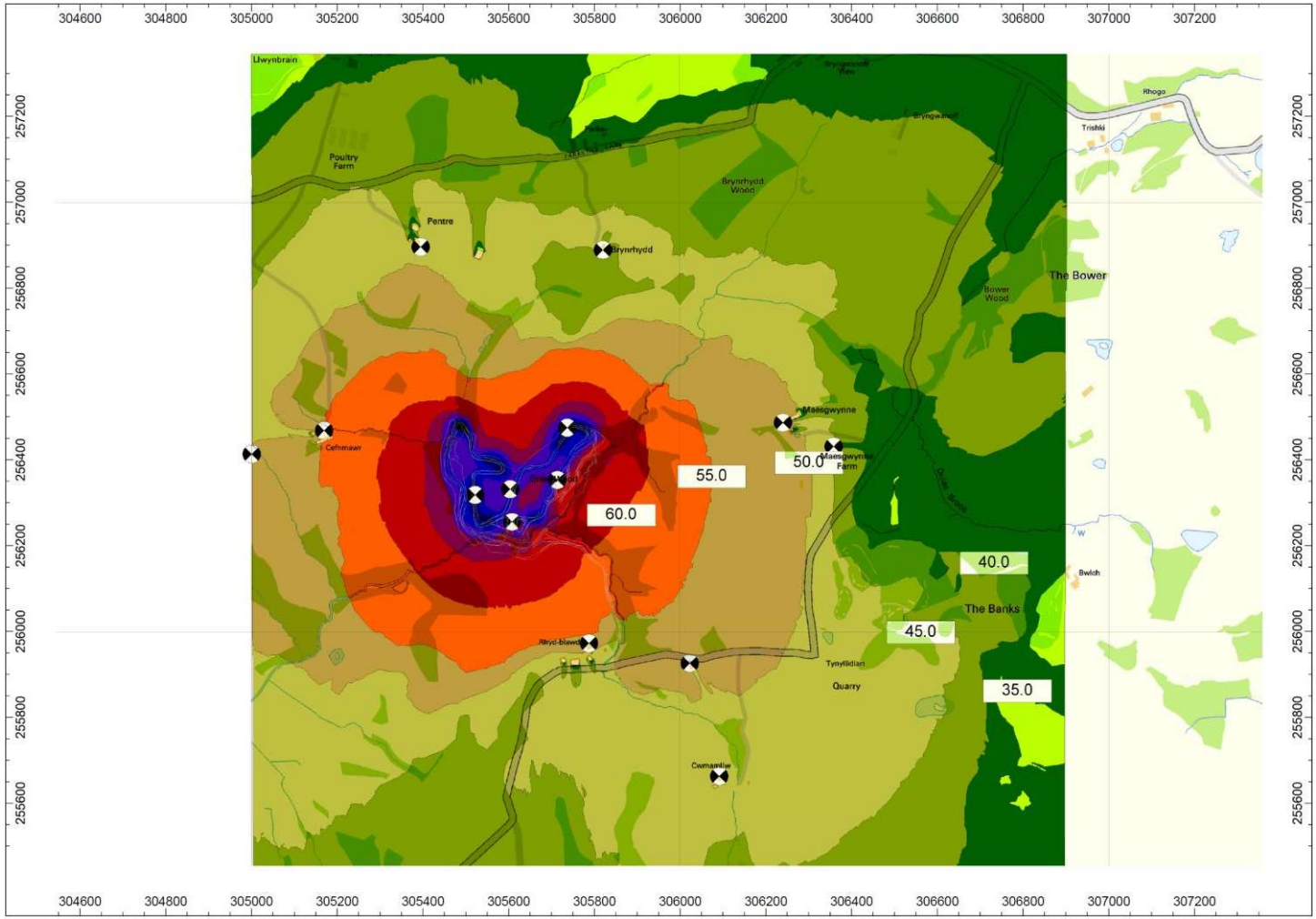
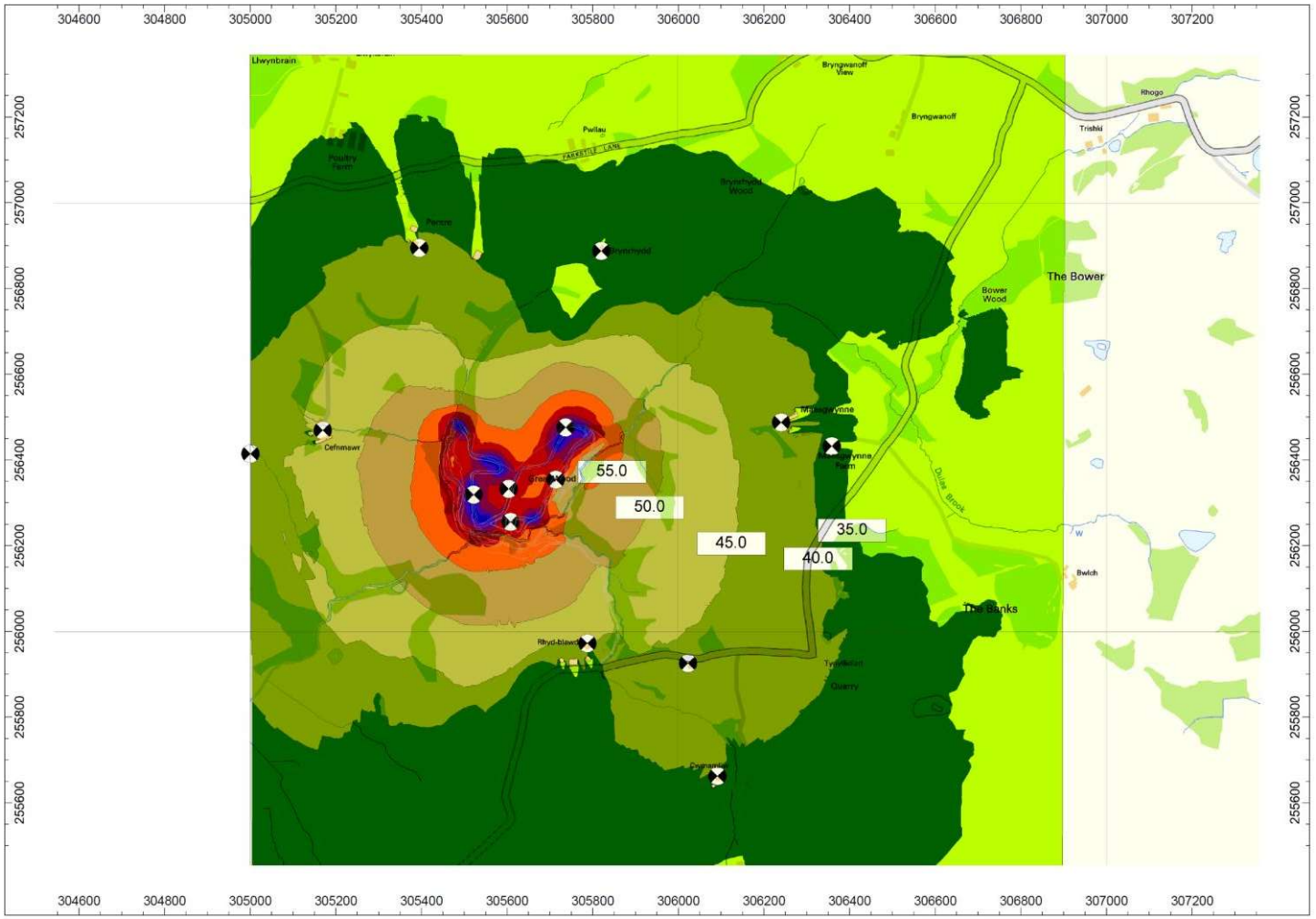


Figure Detailing Derivation of Background Noise Level

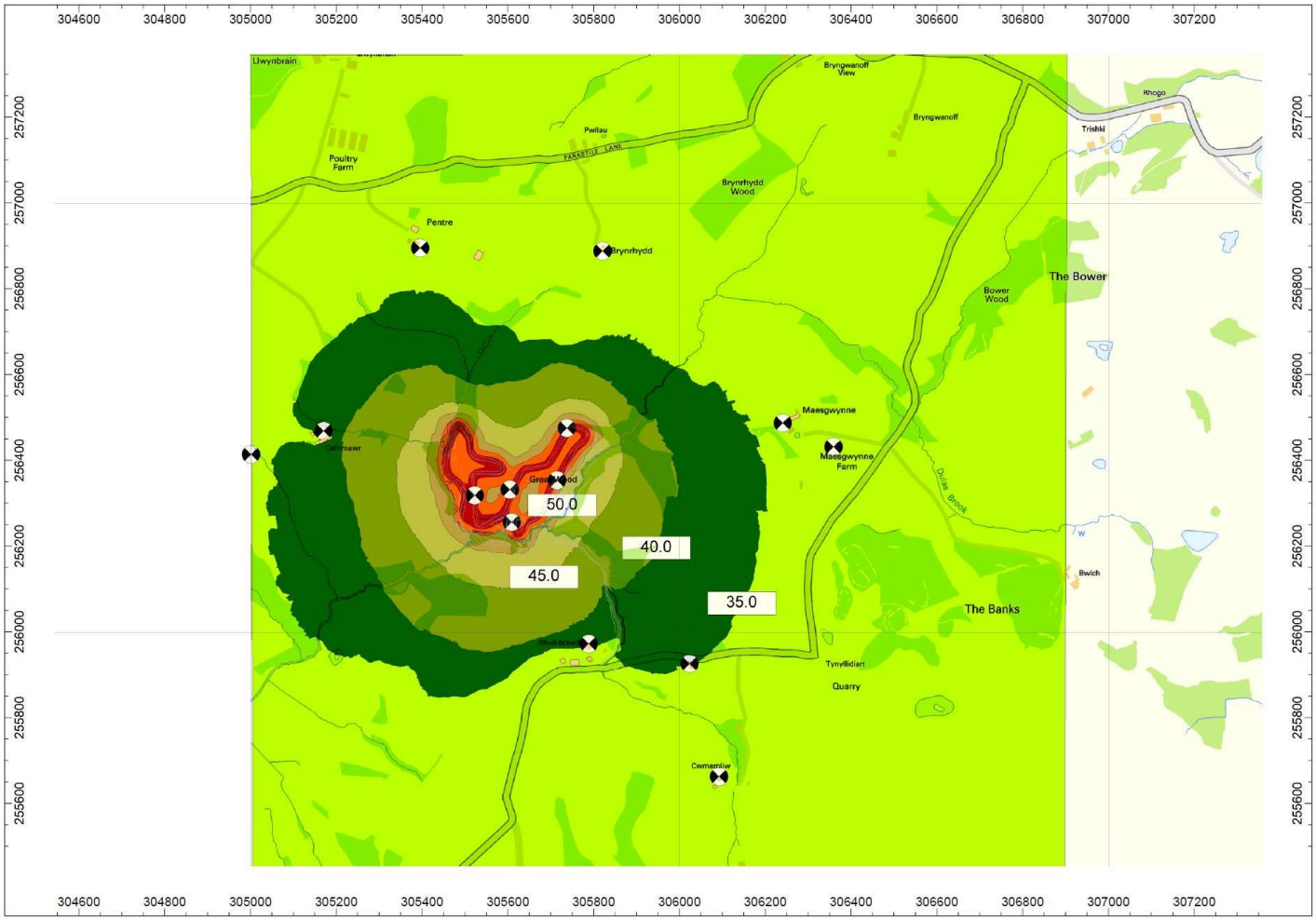
APPENDIX D – OPERATIONAL NOISE CONTOUR PLOTS



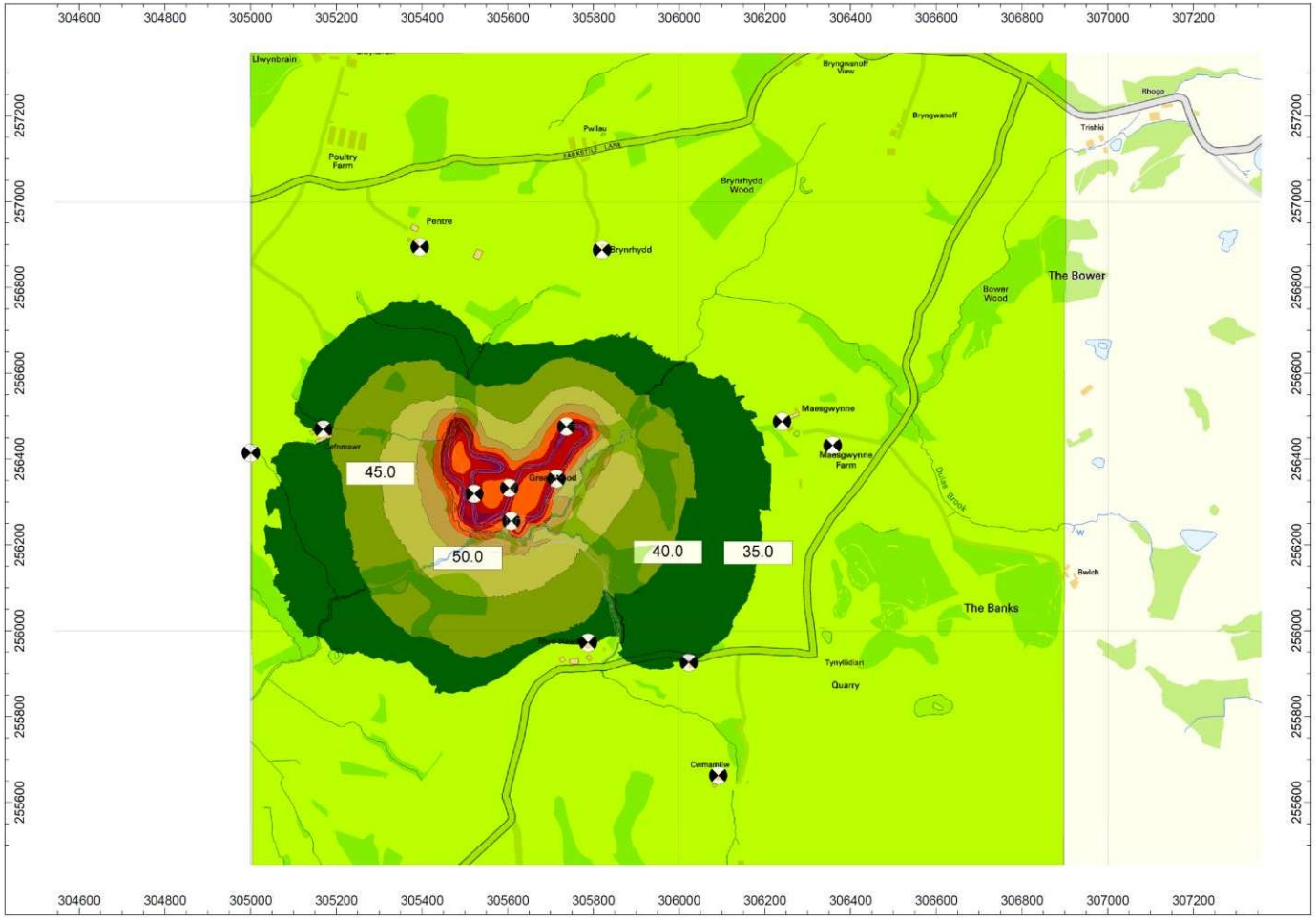
Four Stroke Moto-X Track Use Noise Prediction



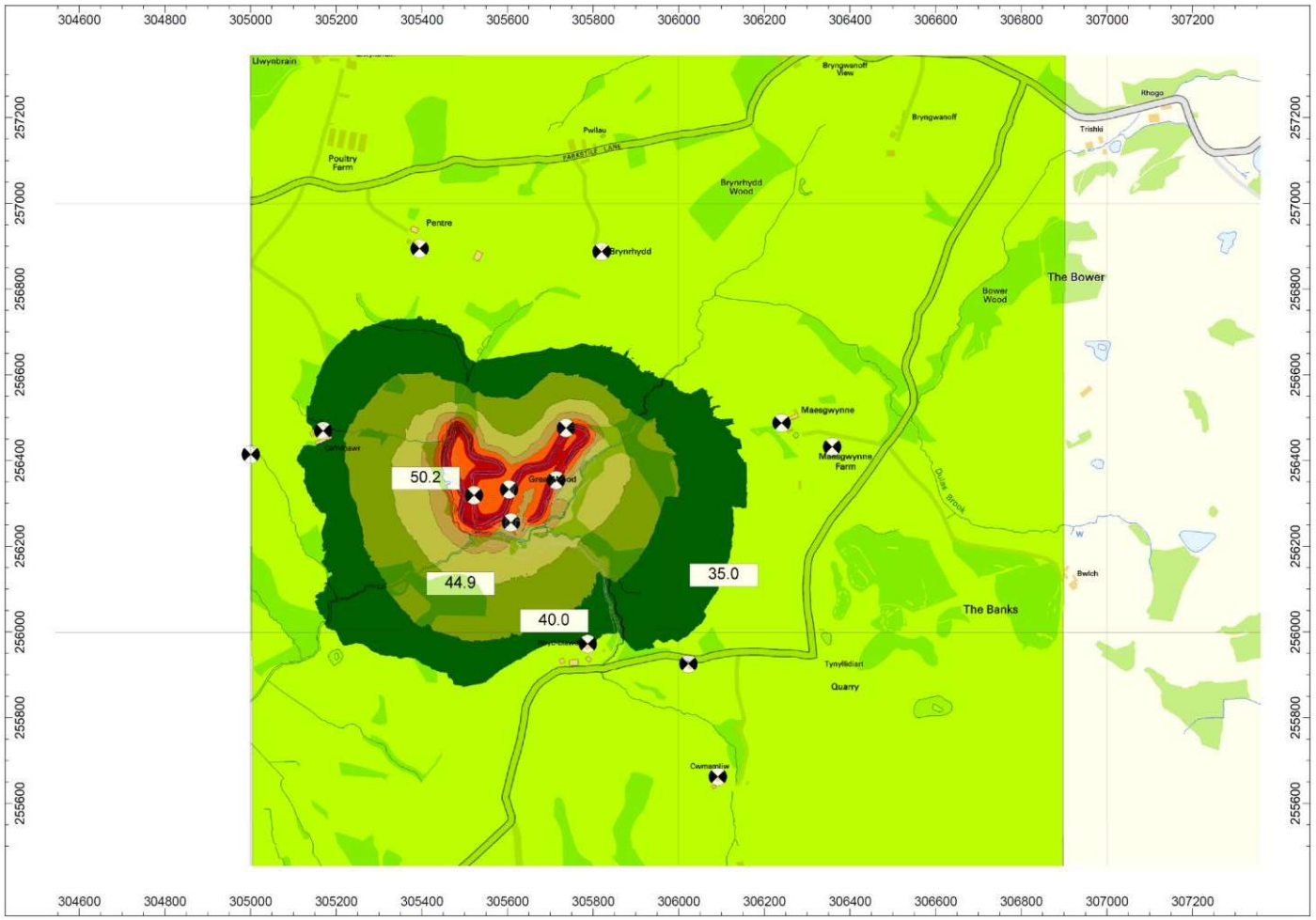
Two Stroke Moto-X Track Use Noise Prediction



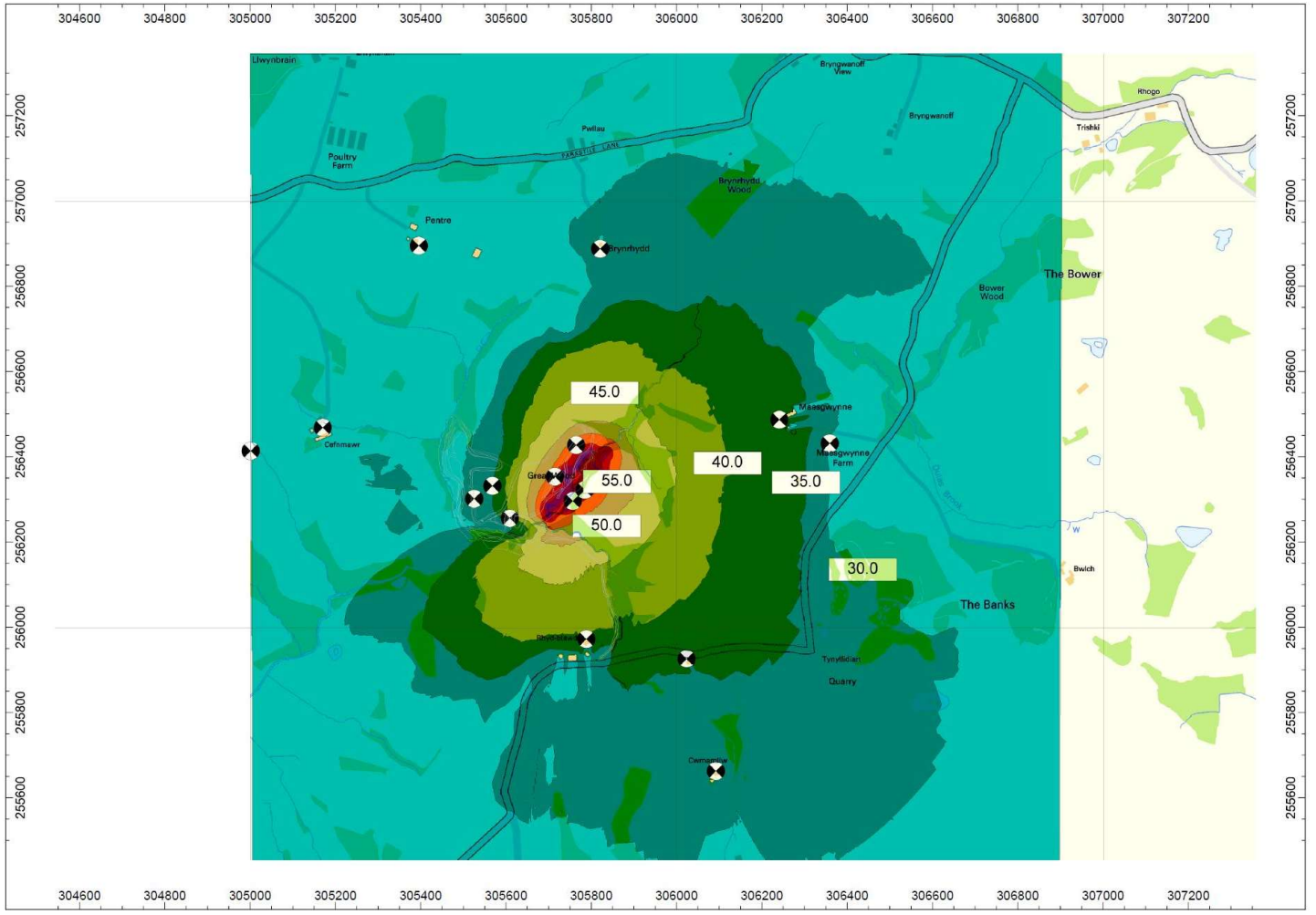
Two Stroke Trials Moto-X Track Use Noise Prediction



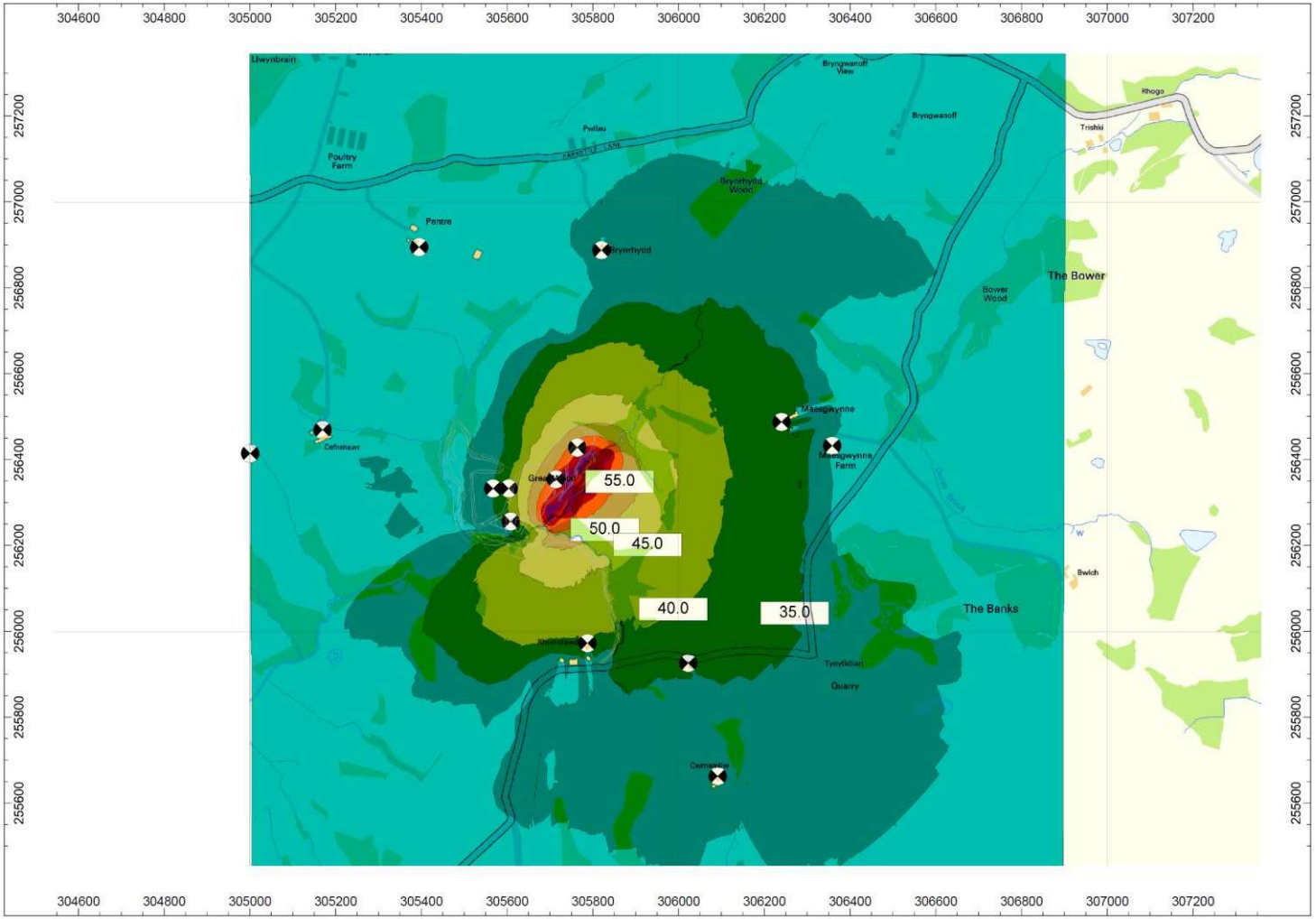
Electric Enduro Moto-X Track Use Noise Prediction



Electric Trials Moto-X Track Use Noise Prediction



2 Stroke Trials Bike on Trials and Tricks Track Noise Prediction



Electric Trials Bike on Trials and Tricks Track Noise Prediction