TERMS OF REFERENCE[1]

FOR THE PREPARATION OF A

STUDY ON THE NOISE IMPACT FROM DEVELOPMENT

NOSIE IMPACT FROM DEVELOPMENT

Introduction:

Increase in noise levels will doubtlessly adversely affect the environment, particularly due to increased noise levels from operations of the motorsport activities and the increase in traffic generation. The aim of these terms of reference is to provide guidance to consultants on the estimation of the impacts of the increase in operations and traffic flows due to a development on noise.

For ease of use these terms of reference deal with the estimation of the impact on noise levels from the motorsports activities and the increase in traffic leading to the site.

The consultant is free to provide the methodology for the purpose of the report and source of noise under consideration through the submission of a method statement.

TERMS OF REFERENCE FOR NOISE STUDY

The objective of these TORs is to ensure that environmental noise impact studies are consistently of high quality and meet the expected standards. The proposed methodology could be applied, with appropriate modification, to a range of activities, both enclosed and open-air, which produce noise. It is intended that such TORs be applied to development and industrial permit proposals submitted to ERA through development and land-based industrial operations. The key components of noise assessment; the stages involved in identifying sources; quantifying emissions; and assessing control requirements are described below.

1. Accreditation

Noise monitoring and collection of baseline data consists of the on-field monitoring of background noise at the proposed site of development. Such noise monitoring is required to establish the current noise exposure at the nearest noise sensitive locations around the site of the proposed development.

Where a noise impact study is required, it must be undertaken by a suitable qualified and competent person who has the necessary qualifications and accreditation as per the below requirements in section i) and ii) for the respective phase of the report. ERA will expect noise impact study report to be commissioned by a competent person who must possess a combination of technical knowledge, experience and skills, and must be able to demonstrate, as a minimum:

- Good comprehension and experience of relevant acoustical standards, e.g. ISO 1996, BS4142, BS 5228 and ISO 9613.
- Familiarity with acoustical monitoring equipment and with a range of noise indices including: LAeq, LA90, LA10, LAmax, LAr,T
- Practical knowledge and experience of spectrum analysis – octave band and 1/3 octave band analysis and ability to assess tonal, intermittent and impulsive elements
- Familiarity with acoustics software such as that used for their analysis of survey data and noise modelling
- An ability to analyse, interpret and explain results
- An ability to perform necessary acoustic calculations and predictions, where appropriate
- An ability to recognise when more specialist expertise may be needed

(i) Noise Impact Study:

The Noise Impact Study is to be supervised, prepared and certified, on behalf of the developer, by a consultant that is either an accredited Acoustic expert or a qualified Professional Engineer and is approved by ERA on the basis of one of the following requirements:

(a) Bachelors degree in Acoustics, or

(b) Bachelors degree in any of the following: Physics, Architecture, Civil Engineering or Engineering, Environmental Health, Environmental Science/Management, Occupational Health and Safety, and an MQF Level 7 specialisation in Acoustics, or

(c) Bachelors degree in any of the following: Physics, Architecture, Civil Engineering or Engineering, Environmental Health, Environmental Science/Management, Occupational Health and Safety and in addition the consultant must be at least an associate member of the Institute of Acoustics or be employed by an organization who are members of the Association of Noise Consultants or equivalent grade of Membership of a professional body for those working in acoustics and noise in any one of the EU member states or any other reputable professional body to the satisfaction of ERA, or

(d) Certification for the collection of data, such as "Certificate of Competence in Environmental Noise Measurement" issued by the Institute of Acoustics (IoA) or any other equivalent qualification issued by a comparable Professional Association dealing with acoustics in any one of the EU and EEA Member States or any qualifications issued by an educational institution to the satisfaction of ERA and five (5) years experience in noise measurements and assessments.

(ii) Noise Monitoring Report and collection of Baseline Data:

People carrying out noise monitoring report in connection with noise studies shall as a minimum have the following qualifications and certification for the collection of data:
"Certificate of Competence in Environmental Noise Measurement" issued by the Institute of Acoustics (IoA) or any other equivalent qualification issued by a comparable Professional Association dealing with acoustics in any one of the EU and EEA Member States or any qualifications issued by an educational institution to the satisfaction of ERA.

In assessing the suitability of training courses submitted as evidence of technical competence ERA would require that the course shall cover the following topics as a minimum:

(a) Basic Concepts and Noise Units: Tones, octave and third octave analysis (general, no need for calculations). Sound pressure and sound pressure level; decibel scale; A-weighted scale; LAeq, LAE and statistical levels; Annoyance.
(b) Instrumentation for Environmental Noise Measurement: Types of sound level meters including integrating sound level meters. The use of sound level meters in environmental noise analysis for LA10 and LA90 measurements and frequency analysis; time weighting; frequency weighting (A, C and linear) and peak level measurements. Different Classes of instruments; calibration (field and lab), recording & presentation of time-varying noise levels; ensuring the accuracy of the instruments.
(c) Environmental Noise Measurement Theory: Methodology for the measurement of noise from: road transport, industry and construction sites according to BS 7445. The use of Part-1:2003 in the measurement of environmental noise and the acquisition of data according to Part-2:1991. Noise indices, rating and assessment methods for Industrial noise (BS 4142:2014), Noise measurements & Planning, Calculation of Road Traffic Noise (CRTN) and LA10 measurements. Noise from construction sites as per BS 5228-1:2009 and Noise Nuisance.
(d) Environmental Noise Measurement Practice: Practical involving the use of sound level meters including weather and environmental conditions affecting measurement accuracy, measurement uncertainty, choice of sampling periods for averaging LAeq, LA10 and LA90. Accuracy and Tolerance limits and uncertainties. Noise climate monitoring. Report Preparation. Screening and reflection. The use of windshields.

(e) Noise Propagation: Point, line and area sources. Effects of distance, reflection, absorption by air, ground effects, wind and temperature gradients, attenuation by barriers including vegetation and earth banks.

The report submitted should set out all the required information in a format which is logical and understandable as specified in the Terms of Reference.

2. Applicability

Operational Motorsports Activities

a) In order to determine whether the proposed development shall give rise to an increase in noise levels on the sensitive receptor sites in proximity to the proposed development, the potential increase in noise levels from motorsport activities and racing events is to be projected and compared to the existing baseline noise levels at site.

Operational Traffic

a) In order to determine whether the proposed development shall give rise to an increase in noise level due to operational traffic at the relevant sensitive receptors, the potential increase in peak traffic needs to be identified (Peak Traffic Forecast).

b) The increase in traffic will have an influence on the existing noise climate. Typically, a halving or doubling of flow produces a 3dB change in noise levels, (The Institute of Environmental Management and Assessment UK, IEMA, Guidance Notes No I, Guidelines for the Environmental Assessment of Rod Traffic).

3. Introduction to the Noise Assessment

Baseline Noise Monitoring Study

The below methodology which is submitted as part of the method statement prior to undertaking the study, should be agreed between the developers, for development proposals, and the operators, for industrial permit proposals and ERA, on all relevant noise generating sources and noise sensitive receptors (NSRs).

The collection of baseline data in order to determine the ambient noise level at the proposed area of development are determined via noise monitoring, in accordance with current ISO Standards and British Standards[2] such as:

ISO 1996-1:2016 Acoustics -- Description, measurement and assessment of environmental noise -- Part 1: Basic quantities and assessment procedures

ISO 1996-2:2017 Acoustics -- Description, measurement and assessment of environmental noise -- Part 2: Determination of sound pressure levels

BS 4142:2014 -- Methods for rating and assessing industrial and commercial sound

CRTN – Calculation of Road Traffic Noise, Department of Transport (UK), 1988

[2] In the case that the consultant proposes to use equivalent standards (ex: European or ISO) that are not outlined in this document, the assessment methodology to be adopted is to be proposed for the approval of ERA together with the Method Statement, which is to be submitted as defined in section 3ii.

IEC 61672 -- 2013 Electroacoustics - sound level meters Parts 1, 2 and 3
IEC 61260 -- Ed. 1.0 (1995-08) plus Amendment 1 (2001-09), 1/1 and 1/3-octave Bands (octave-band and fractional-octave-band filters)
IEC 60942:2018 Electroacoustics - Sound calibrators

Development Proposals Methodology

The noise monitoring report shall include details of the standards used for monitoring, equipment used including calibration details and calibration certificates, resultant monitoring data, assessment methods and significance scale. The study should include baseline noise survey of sensitive receptor sites, noise impact on site sensitive receptors including day and night background levels. It is important that the data being compiled both for day and night is a good representation of the context of the noise source and of what is happening at all receptor points.

The baseline noise monitoring study, as proposed by the commissioned consultant should address the following issues:

Maintenance and field calibration checks

1. The monitoring shall be performed exclusively using a calibrated and accredited type 1 sound level meter, conforming to BS6698/IEC 61672 Class 1. The use of type 2 sound level meters or less is not considered acceptable and will not be considered.

2. Prior to the initial data collection and at the end of the monitoring day, all acoustic instrumentation system such as the sound level meters are calibrated, and checked immediately before and after each series of monitoring readings. Results must be within ±1.0dB, otherwise discarded and read again.

Measurement location

3. The location for monitoring of ambient noise levels should be between:
    a. 1.2 and 1.5m above the ground for a single storey development and;
    b. Between 1.2 to 1.5m above the proposed internal floor level for each additional storey

    For noise mapping the following microphone heights must be used:
    a. 4.0 ± 0.2 m in residential areas with multistorey buildings
    b. 1.2 ± 0.1m or 1.5 ± 0.1 in residential areas with one floor buildings and recreational areas.

4. To minimize the influence of reflections, the monitoring should either be taken under free-field conditions (more than 3.5m from any reflecting surface) or at 1m from the façade of a building and results treated accordingly. When a noise source is incident on a façade, the effect of reflected noise from the façade is generally to increase the "façade level" measured at 1m by 3 dB. For road traffic, generally the microphone is at 10m away from the carriageway edge (not less than 4m and not more than 15m) and microphone should be pointing vertically upwards (grazing incidence).

Measurement settings

5. The recommended time periods over a twenty-four hour period are categorized in terms of daytime, from 07:00-23:00 ($L_{Aeq,[16h]}$) and night-time from 23:00-07:00 ($L_{Aeq,[8h]}$).

6. A number of different noise indices are used due to the variation of different noise levels and frequency content over time in accordance to BS 4142:2014 and any revision thereof. Equivalent continuous noise level over a period of time index, $L_{Aeq,T}$ is to be used for measuring the specific sound and the residual sound. For traffic noise, $L_{A10,18h}$ (L_{A10} measurements each hour from 0600 – 2400) is more widely used and $L_{A90,T}$ is an appropriate noise metric to measure background noise at the noise sensitive receptor or location.

7. When monitoring for a specific noise level at assessment location it should be adjusted over reference time intervals such as a period of 1 hour during the day, $L_{Aeq,1hour}$ and 15min during the night, $L_{Aeq,15min}$.

8. The measurement time interval should be sufficient enough to obtain a representative value of a typical background when the specific noise source will be operating.

9. All noise monitoring results and any derived averages should be rounded to the nearest whole integer, with 0.5 being rounded up.

10. All meteorological conditions and weather effects such as wind speed and direction, temperature gradient, relative humidity and cloud cover, are to be documented in the beginning of each monitoring period and monitoring point location. Ideally it is carried out under dry conditions and in the case of road traffic when the road surface is dry. A suitable condition is having light wind at a velocity of up to $2ms^{-1}$ from source to receiver as this will enhance the noise level by up to 2dB(A) when compared to still conditions. Monitoring should not be performed if wind speed exceeds $5ms^{-1}$ or wind gusts exceed $10ms^{-1}$ or if it is raining as stipulate in ISO standard.

Background Measurement

11. The background noise measurements shall be accompanied by a critical listening of all the other noise sources present in the background.

Adjustments

12. Due to certain acoustic features such as tonality, impulsivity and intermittency the inclusion of specific noise level plus any adjustment for the different noise characteristic features, the rating level, $L_{Ar,Tr}$ should be reported in accordance with BS 4142:2014 and any revision thereof, depending on the subjective assessment made while taking the readings.

Reporting

13. A description of the surrounding areas – this shall include identification of the types of activities, whether residential or commercial, roads and other amenities. These shall be location-specific taking into account their location with respect to the site.

14. Identification of the main sources of noise– this shall include all processes on site, including aspects such as transport noise on site, plant equipment, mechanical operations, etc (amongst others) and their times of operation.

15. Identification of the closest noise sensitive receptors – this shall be carried out after assessing the noise levels in the plant's perimeter and in the other locations identified in point 14 above under normal operating conditions of the plant. The various measurement points shall be identified with a unique code and an analyses of the ambient noise to which each monitoring point is subjected to.

16. Impact assessment of noise events on noise sensitive receptor site – this shall include an assessment according to standards BS 4142:2014, ISO1996, ISO 8297: 1994, ISO 3744:2010 and ISO 3746:2010; and any revision thereof. A summary of the data obtained after the survey has been commissioned in relation to the noise sensitive receptors identified above shall be submitted. The consultant, in collaboration with ERA, may, where applicable, need to consult and seek advice from the Local Council during the selection of the sensitive receptors and to identify existing local sources of noise.

17. A noise map maybe required both for baseline studies and for prediction showing the sensitive receptor exposure to noise. The maps will be generated using the above highlighted standards.

Impact Assessment

Environmental Noise Impact Study shall demonstrate that the operational noise sources have been fully understood and quantified and impact on all noise sensitive receptors has been established with reference to the agreed acceptability criteria as illustrated below. Once the magnitude of noise impact has been described the level of significance of impact is determined based on the sensitivity of the existing or proposed noise receptors.
The impact assessment methodology set out below is used after potential noise impacts, which are likely to arise as a result of the proposed project, have been identified.

Traffic Noise Impact prediction

a) The baseline and future noise levels shall be estimated using the procedures set out in the Calculation of Road Traffic Noise (CRTN). These use the L_{A10} noise index, which corresponds to the arithmetic mean of the noise level exceeded for 10% of the time; typically one hour or 18hours (18 sets of measured $L_{A10,(1hr)}$ and $L_{Aeq,(1hr)}$ over the course of 18 hour period).

b) Road traffic noise may require two separate considerations: day-time: $L_{Aeq,16hrs(0700-2300)}$ and night-time noise: $L_{Aeq,8hrs(2300-0700)}$.

c) For the noise levels to be in terms of L_{Aeq} over a 16 hour period, an approximate conversion between L_{Aeq} and L_{A10} as estimated from CRTN is given by:

$L_{Aeq,16hr(0700-2300)} \approx L_{A10,18hr(0600-2400)} - 2dB$
And; $L_{A10(1hr)} = L_{Aeq(1hr)} + 3dB$

d) For heavy traffic flow roads, it is usually the case that $L_{A10,1hr}$ is 1dB higher than an average 18hr value, however this depends on the nature of the traffic**.**

Significance Impact

The level of significance is determined in relation to the magnitude of impact together with the sensitivity of the receptor. Different Noise Sensitive Receptors (NSR) can be classified in three levels of sensitivity: High, Medium and Low.

Sensitivity	Description of Sensitive Receptors
HIGH	**Receptors where people or operations are vulnerable to noise,** *such as: Residential, Recreational Areas, Educational Institutions, Hospitals, Homes for the elderly, Places of worship.*
MEDIUM	**Receptors are moderately sensitive to noise, if it causes some distraction or disturbance,** *such as: Offices, Bars/Cafes/Restaurant.*
LOW	**Receptors where distraction or disturbance from noise is minimal**, *such as: Night Clubs, Sports Ground, Factories.*

TABLE 1: LEVEL OF SENSITIVITY ASSOCIATED WITH VARIOUS NSRS

After all noise sensitive receptors have been identified and prioritised according to their level of sensitivity as identified in the table above, the magnitude of the impact is classified as none/negligible, minor, moderate or major according to the noise monitoring study.

Noise Source		Noise level [dB]	Magnitude of Adverse Impact
		Noise level [dB]	Magnitude of Adverse Impact
Traffic Noise (Change in Noise level)			
Target Levels	Forecast – Existing Traffic Noise level	>5	Major
	< 3dB	≤5 but ≥3	Moderate
		<3 but ≥1	Minor
	Day Time: $L_{Aeq[16hrs(07:00-23:00)]}$	<1 but ≥0	Negligible
	Night Time: $L_{Aeq[8hrs(23:00-07:00)]}$	0	No Change
Operational Noise			
Target Levels	Rating Level – Background Noise level	>10	Major
		≤10 but ≥5	Moderate
	(L_{Ar})-(L_{A90}) < 5dB	<5 but ≥3	Minor
		<3 but ≥0	Negligible
		0	No Change

TABLE 2: CLASSIFICATION OF MAGNITUDE ON NOISE IMPACT CRITERIA

The different levels of significance relating the magnitude of impact with the sensitivity of the receptor are defined below:

Magnitude of Adverse Impact	Level of significance Relative to NSR		
	Low	Medium	High
Major	Moderate	Substantial	Severe
Moderate	Minor	Moderate	Substantial
Minor	Minor	Minor	Moderate
Negligible / No Change	Minor/Neutral	Minor/Neutral	Minor/Neutral

TABLE 3: LEVEL OF SIGNIFICANCE

Where:

Severe environmental significance is associated with the impacts where mitigation is not practical or would be ineffective and could influence the decision whether or not to proceed with the project.

Substantial environmental significance is associated with the effects that are important considerations, which could result in adverse effects if they are not mitigated.

Moderate environmental significance could have an influence on the decision unless it is mitigated.

Slight/Neutral environmental significance will not have an influence on the decision or require modification on the project design or alternative mitigation and noise need not be considered as a determining factor in the decision process.

The study should also take into account the relevant factors, but is not limited to:

- The cumulative effects with other existing sources including traffic and new development;
- Additional effects of road traffic associated with the operations on site;
- Identification and analysis of impact of all noise generated within the proposed development on itself.

Mitigation for onsite impacts

A summary report of findings from the noise impact study and any remedial action and/or mitigation measures which are to be implemented by the developer in order to reduce impacts resulting from the site of operation should be included. A number of various ways to control the noise exposure to people should be limited through one of the following designs:

- Engineering and building design – sound insulation and facade insulation treatment;
- Reducing noise at its point of generation – quiet machines;
- Containing noise – acoustic screening and barriers around site;
- Protecting noise-sensitive buildings and areas – improving sound insulation, screening with purpose-designed acoustic barriers;
- Layout design – adequate distance between source and NSR, screening with natural barriers, non critical rooms at the most exposed façade;
- Ventilation and/or cooling that will reduce the need to have windows open for provision of ventilation; and
- Management design – limiting operating time of source, restricting activities allowed on site.

The most effective mitigation measures are those which reduce the noise levels at source which is the preferred method for a noise generating development, rather than in transmission or at the receptor. If noise issues are addressed in the initial stages of the project, measures are usually more cost effective and less disruptive than inserting them late in the design process. Design measures for limiting the adverse effects of noise such as engineering and layout design are preferred over mitigation measurements such as restrict hours of operation.