Attn: Mr. Raymond Saliba
Bank of Valletta
[PRIVATE]

Date: 9 April 2021

Dear Sir,

Planning Ref.:	PA 02728/20
Proposal Description:	To demolish existing bank ancillary office/archives building and construct 3 levels of basement and 5 floors of open plan offices.
Location:	BOV Wignacourt, Triq il-Kbira San Guzepp c/w, Triq Carini, Santa Venera.

Environmental Impact Assessment Regulations (S.L. 549.46)

Reference is made to ERA's Assessment and Recommendations, dated 21 January 2021, and the Report including information on the existing and proposed peak hourly traffic flows relating to the proposed development, as referred directly to ERA on 29 January 2021.

Following review, ERA has noted that the proposed development is envisaged to lead to a considerable increase in traffic flows during both AM and PM peaks at two junctions along Triq Carini. In this regard, ERA has determined that a Traffic Noise Study based on road traffic monitoring is to be carried out, with an aim to confirm the predicted increase in traffic noise levels and suggest possible measures to mitigate noise impacts on the residential receptors along Triq Carini.

In addition, clarification is to be provided on whether the diverted traffic flows outlined in Table 2 of the aforementioned Report and referred to in paragraph 8 are counted twice, and would thus need be deducted from either the scheme traffic flows or the 2028 network traffic or else considered as part of the total estimated traffic flows.

The Terms of Reference for the said Noise Study are attached to this correspondence, as Annex I. Kindly note that as outlined in the said Terms of Refernece, a Method Statement is to be referred for ERA's approval prior to the initiation of the monitoring.

ERA reserves the right to issue its final recommendations and conditions, following the outcome of the above requested study.

Yours faithfully,

Yves De Blick
Environment Protection Officer
f/Director Environment and Resources

cc.: Dr. Edwin Mintoff, [PRIVATE]

Encl.: Terms of Reference for the Noise Study (Annex I)

Environment & Resources Authority
Hexagon House, Spencer Hill, Marsa MRS 1441 T. (+356) 2292 3500 E. info@era.org.mt W. era.org.mt

Terms of Reference for the Preparation of Environmental Noise Impact Study

For Development and Industrial Permit Proposals

PA/02728/20

To demolish existing bank ancillary office/archives building and construct 3 levels of basement and 5 floors of open plan offices.

BOV Wignacourt, Triq il-Kbira San Guzepp c/w, Triq Carini, Santa Venera

Ambient Quality and Waste

Version 1.0

TABLE OF CONTENTS

1. Introduction

Environmental noise is defined as unwanted sound or sound that is not desired by the recipient in places we live and work. The degree of annoyance and stress that can result from noise exposure is almost impossible to quantify. If this is not properly controlled, it can result in adverse effects on people's quality of life. Adverse effects can range from annoyance of an individual to serious and long lasting disturbance which can affect large parts of the community.

This might be an existing noise source, or one which is introduced such as in the context of new development, planning process or industrial operations. In these situations noise studies are needed to quantify and understand the likely impact, and inform the decision making process.

If the proposed development is likely to create noise which may affect existing nearby noise sensitive receptors, e.g. a new industrial area near existing residential development, an environmental noise impact study is normally required in order to assess and monitor for the noise impacts generated from the proposal.

The purpose of the noise impact study is to determine whether or not a proposed project may cause noise which would adversely affect existing development. If from the study, noise results to be an issue, mitigation measures need to be considered.

2. Purpose

The aim of these Terms of Reference is to assist developers, operators and consultants with the noise study and monitoring of terrestrial development and industrial permit proposals, which have a potential noise impact associated with proposed projects. It provides information on dealing with planning processes where potentially noise developments are introduced into existing noise sensitive areas which will create an increase in noise levels to the current noise climate.

This document focuses on noise aspects falling within the responsibility of the Environment and Resources Authority (ERA) and specifically on work related to study of the impacts of development proposals and also on noise studies carried out in the context of environmental permitting.

In preparing an application for a permit and supporting documentation, the consultant as commissioned by the developer[1] is responsible for assessing the significance of impact and advise on the role of any proposed actions and systems aimed to prevent and limit the adverse effects of noise on sensitive receptors and propose measures to reduce and mitigate the negative impacts.

[1] *"developer"* means the developer or operator seeking development or environmental proposal consent or intending to implement the project, and includes both private and public entities

3. Accreditation for Noise Impact Study and Monitoring Report

A noise impact study consists of the evaluation of potential impacts from the proposed project resulting from noise sources such as construction, demolition and operational noise. The degree of impact on the operational stage is assessed on the comparison between measured and estimated baseline conditions based on future predictions, when the project is operational.

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[2], e.g. ISO 1996,BS4142, BS 5228 and ISO 9613.
- Familiarity with acoustical monitoring equipment and with a range of noise indices including: L_{Aeq}, L_{A90}, L_{A10}, L_{Amax}, $L_{Ar,T}$
- 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

[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.

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:

The noise monitoring shall be commissioned by the developer as per the consultants' monitoring proposal, which shall be reviewed and approved by ERA prior to the commissioning of the noise monitoring survey. The proposal shall include a method statement including the methodology for the purpose of the report and source of noise under consideration shall be submitted to ERA prior the initiation of the survey.

Moreover, any other persons taking part in this study, such as those undertaking the noise monitoring survey, are to be duly qualified, the latter to be in possession of a certification for the collection of data. Copies of such qualifications and certification shall be submitted prior to the monitoring proposal.

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; L_{Aeq}, L_{AE} 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 L_{A10} and L_{A90} 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 L_{A10} 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 L_{Aeq}, L_{A10} and L_{A90}. 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.

4. Development Proposals

4.1 Construction Noise

The noise impact due to a proposed project depends on the difference between the predicted operational noise and the measured baseline noise level in the area. When noise has the potential to cause a significant impact such as annoyance, speech intelligibility, sleep disturbance and hearing impairment, or other long-term health impacts due to environmental noise, as a result of the operation a particular project that is being assessed by ERA, an Environmental Noise Impact Study may be requested to be commissioned by the developer. In the case of projects that have been requested to carry out an Environmental Impact Assessment (EIA), construction, demolition and excavation work noise at site may also need to be assessed through the preparation of a construction noise study.

This section deals with the methodology to be employed in cases where ERA considers that a Construction Noise Study is necessary. ERA will exercise its discretion to request a construction noise study depending on the **location**, **nature** and **extent** of the project and the **sensitive receptors** likely to be affected during the construction, demolition and excavation phases of the project. In cases where such construction noise studies are carried out, the consultant is expected to demonstrate that the anticipated negative noise impacts have been avoided, minimised and mitigated using best practice.

4.1.1 Construction Noise Study

The control and prediction of the significant noise levels generated from construction and open sites are predicted and assessed in accordance with the following current standard, or any applicable update to the standard:

BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise

The methodology for assessing the impact of construction noise involves predicting the noise levels at the sensitive receptors at the various phases of construction, such as site clearance and demolition, excavation and construction works. Constructional site noise is produced by a wide range of activities including various machinery and equipment. The character and intensity as well as the location and duration of the use of such machinery will reflect on the noise generated during the various stages of construction.

The noise levels of constructional noise sources can be determined by the method outlined in BS 5228-1 Annex F, where the estimation of noise from sites at the sensitive receptors can be predicted. The equivalent continuous sound level L_{Aeq} is used to predict the noise levels at the sensitive receptors. It is established using the A-weighted sound pressure levels at 10m (dB) as obtained from BS 5228-1 Annex C, which provides a sound level data in relation to typical construction site activities, plant and machinery. Correction needs to be made where there is a potential that multiple equipment will be operating simultaneously in order to generate the combined noise from the different noise sources which is calculated using logarithmic addition:

$$dB_{Total} = 10\log_{10}\left(10^{\frac{(dB_1)}{10}} + 10^{\frac{(dB_2)}{10}}\right)$$

A distance adjustment should also be considered to account for the distance of the noise sensitive receptors from the noise source using reference to BS 5228-1 Figure F.2 and also adjusting for soft ground or hard ground. Attenuation, when taking into account screening or reflection can also be considered as long as it is done in accordance with the standard.

This study must detail the particular activities that are likely to give rise to noise; an assessment of how loud they are likely to be at the receptors, and where they exceed levels detailed in BS 5228, the scheme of mitigation that will be put in place should be included.

The criteria for assessing the significance of construction noise impacts are outlined in BS 5228-1 Annex E.

(i) The ABC method[3]

The significance criteria for the construction noise study are based on 'The ABC Method' from BS 5228-1:2009+A1:2014. An extract describing this method is provided below.

Assessment Category and Threshold Value Period (L_{Aeq})	Threshold Value, in Decibels (dB)		
	Category A[A)]	Category B[B)]	Category C[C)]
Night-time (23.00-07.00)	45	50	55
Evenings and weekends[D)]	55	60	65
Daytime (07.00-19.00) and Saturdays (07.00-13.00)	65	70	75

Notes:

1. A **potential significant** effect **is indicated** if the site L_{AeqT} noise level, exceeds the threshold level for the Category appropriate to the ambient noise level.
2. If the ambient noise level exceeds the **Category C** threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a **potential** significant effect is **indicated** if the total L_{Aeq} noise level for the period increases by more than 3 dB due to **site noise**.
3. Applied to residential receptors only.

A). Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.

B). Category B: threshold values to use when the ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.

C). Category C: threshold values to use when the ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.

D).19:00-23:00 weekdays, 13:00-23:00 Saturdays and 07:00-23:00 Sundays.

*(Source: BS 5228-1:2009**+A1:2014**, Page119*

(ii) 5dB(A) change method[4]

The 5 dB(A) change method is based upon the premise that a significant effect for public open spaces is deemed to occur, if the total noise (pre-construction ambient plus construction noise) exceeds the pre-construction ambient noise by 5dB or more. The criterion is subject to lower cut-off values of 65dB, 55dB and 45dB L_{Aeq} for the daytime, evening and night-time periods respectively. The criteria further requires that for a significant effect to occur the total noise level must exceed the pre-construction ambient noise for a duration of one month or more, unless works of a shorter duration are likely to result in significant impacts.

Furthermore, the significance of impact of the constructional noise on the noise climate can be assessed from what is generally accepted in terms of human perception of changes in sound pressure levels. A 3 dB change in sound level is just perceptible as an increase (or decrease) in perceived loudness, a 5 dB change is perceived as a noticeable difference, and that a 10 dB change is perceived to be twice or half as loud.

4.1.2 Construction Noise Management

Noise must be actively managed once work starts on site. Noise emission from construction site could be minimised by adopting good site practice, silenced plant and quiet working methods and installation of

[3] BS 5228-1:2009 E.3.2

[4] BS 5228-1:2009 E.3.3

temporary noise barriers in accordance with the Environmental Management Construction Site Regulations, S.L. 552.09 (Schedule III, Regulation 5).

Noise control at construction site should be assessed for the noise levels, take all necessary actions to eliminate and remove noise sources, put in place measures to control and prevent exposure and review the study and amend control measures in place. If recommendations are to be proposed, then this could be included as a permit condition and the Building Regulations Office or the Planning Authority (PA) should ensure enforcement.

The following is a non-exhaustive list of actions to achieve good site practices:

- Inform potentially noise-affected neighbours about the nature of construction stages and of the proposed timing of the specific works and where practicable any times which are particularly sensitive for neighbours will be avoided in order to reduce complaints.
- All mechanical plant and construction equipment is to be silenced by best practical means including silencing measures such as compressor panels and mufflers should be properly maintained and utilised.
- Noise enclosures should always have all doors or hatches closed when the equipment is in use.
- Hoarding to be built around the site and maintained to maximise the reduction in noise levels to sensitive buildings.
- Avoid unnecessary noise, such as leaving noisy idle machinery operating, shouting, loud radios or excessive revving of engines.
- Where practical or possible stationary equipment such as pumps and generators should be located away from neighbours.

4.2 Operational Noise

i) EIA Developments

A Project Description Statement (PDS) is required by ERA for all projects falling within the scope of Schedule IA of the Environmental Impact Assessment (EIA) Regulations, 2017 (L.N. 412 of 2017). While an EIA is required for proposals falling under Category I, detailed EIA screening is undertaken for proposals falling under Category II of Schedule IA of the EIA Regulations. Detailed screening is undertaken to identify whether the proposal under assessment is likely to have any significant impacts.

ii) Non EIA Developments

For development proposals falling outside the scope of the EIA Regulations, 2017 (L.N. 412 of 2017), ERA would still need to determine whether there is a relative impact on the noise climate expected to be generated once the project is operational. It is at the discretion of ERA to determine which development proposals should be referred for environmental screening. Such cases would depend on the **location**, **nature** and **extent** of the project and the **sensitive receptors** likely to be affected during the operational phase of the project.

iii) Road Traffic

To determine whether the proposed development shall give rise to an increase in noise level due to operational traffic, the potential increase in peak traffic needs to be identified (Peak Traffic Forecast). The consultant will be required through the use of software modelling traffic flows, to delineate the extent of the area affected by increased traffic flows due to the project, as stipulated in the Terms of Reference set by ERA for the preparation of an Air Quality Study.

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 Road Traffic). This is calculated using the formula;

$$Change\ in\ noise\ in\ dB = 10 * \log\left(\frac{peak\ traffic\ forecast}{peak\ traffic\ actual}\right)$$

Whenever;

Peak Traffic Forecast > 1.25 x Peak Traffic Actual	Δ 1dB : Minor Adverse Impact	'Moderate – Minor' level of significance relative to NSR sensitivity classification
Peak Traffic Forecast > 1.99 x Peak Traffic Actual	Δ 3dB : Moderate Adverse Impact	'Substantial – Minor' level of significance relative to NSR sensitivity classification

Refer to section 5.2 for classification of High, Medium and Low NSR.

From the above calculation, ERA determines whether the project shall give rise to a significant increase in noise levels due to road traffic increase and an environmental Noise Impact Study is requested accordingly to confirm the difference in noise levels when compared to the baseline noise climate due to operational road traffic.

4.3 Noise Study Screening Procedure

A screening procedure is used to determine if a proposed project (irrespective of whether an EIA is required), is likely to have a significant community noise impact to warrant either a construction noise study or an operational noise impact study, or both. This screening procedure cover the assessment of potential noise impacts from the proposed project resulting from both **construction** and **operational** noise.

Two separate noise screening worksheet (online spreadsheets) are to be filled in by the consultants for both

i) Construction noise, including noise generated from construction, demolition or excavation works.
ii) operational noise, including road traffic or other noise generating equipment or machinery that will be operating once the development has been completed.

i) Construction Noise Screening Matrix

The construction noise screening worksheet (Appendix I or available online on era.org.mt) enables initial identification of the overall noise impact associated with the site and the proposed works. This enables early identification of generic or specific noise mitigation measures likely to be required, good site practices which may need to be considered and any construction noise studies which may be need to be carried out.

The screening matrix covers locality and site information regarding the duration of the works, distance to sensitive receptors, ambient noise levels and working hours. In addition, information about the demolition and excavation works will be necessary. The highest number of either the 'low', 'medium' or 'high' impact category identifies the construction noise impact category, from which ERA determines whether a construction noise impact study is required depending on the location, nature and extent of the project and the sensitive receptors likely to be affected.

ii) Operational Noise Screening Matrix

The operational noise screening worksheet (Appendix II or available online on era.org.mt) is performed by completing the questionnaire regarding the project and its setting. On completion of the questionnaire, the

weighting factors listed in Appendix III (Noise Study Project Score) are applied to the score selected for each question. The overall noise impact potential of the project and hence its likelihood of requiring a noise impact study is determined by tallying the weighed values for all the response scores to obtain a Total Weighted Project Score. If the total Weighted Project Score is **40 or greater**, ERA would consider requesting a noise impact study depending on the location, nature and extent of the project and the sensitive receptors likely to be affected during the operational phase of the project.

For proposals falling within the scope of the EIA Regulations and as part of the noise screening process, the consultants together with the information provided in the PDS would need to fill in the operational Noise Study Screening Worksheet (Appendix II) and after reviewing, ERA would determine whether the proposed development is expected to have any potential noise impacts on the residents and other sensitive receptors within the area, thus request an environmental noise impact study.

To understand whether non-EIA developments would require further noise screening, the operational Noise Study Screening Worksheet would still need to be completed by the consultants and eventually, ERA would determine whether a noise impact study is required.

5. Terms of Reference

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.

5.1 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[5] 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

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

5.1.1 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 is to be commissioned according to the latest revisions of ISO1996 and the rating of operational noise affecting residential areas shall be according to latest revisions of BS4142The 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 noise monitoring study for the operational assessment, as proposed by the commissioned consultant should address the following issues:

[5] 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.

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.

7. For traffic noise, $L_{A10,T}$ is more widely used and $L_{A90,T}$ is an appropriate noise metric to measure background noise at the noise sensitive receptor or location.

8. 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, $L_{Aeq,15min}$.

9. 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.

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

11. 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

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

Adjustments

13. 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

14. 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.

15. 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.

16. 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.

17. 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.

18. 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.

5.1.2 Industrial Permitting Methodology

This methodology sets out the consultants proposed approach as engaged by the operator to identify and measure the relevant noise sources associated with land-based industrial operations. As part of the application or when requested, the operator must provide information relating to:

- Noise emissions from the facility

- Detailed assessment of the noise impact on noise sensitive receptors
- The noise control measures that will be implemented, where necessary

In order to undertake an assessment of noise exposure from industrial operations, the below monitoring study shall be commissioned and applied to the establishment of baseline data and operational monitoring. These are aimed at addressing noise as a nuisance to humans from land-based industrial operations.

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 complaints significance scale. The study is to be commissioned according to the latest revisions of ISO1996 and the rating of industrial noise affecting residential areas shall be according to latest revisions of BS4142. The study should include perimeter noise levels, baseline noise levels at the 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 typical representation of what is happening at all receptor points.

The monitoring study for the operational assessment, 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:
    c. 4.0 ± 0.2 m in residential areas with multistorey buildings
    d. 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 not less than 4m and not more than 15m from the carriageway edge and microphone should be pointing vertically (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.

7. For traffic noise, $L_{A10,T}$ is more widely used and $L_{A90,T}$ is an appropriate noise metric used to measure background noise at the noise sensitive receptor or location.

8. 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, $L_{Aeq15min}$.

9. 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.

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

11. For facilities that operate continuously for 24 hours, it may be appropriate to measure at a time when all other noises have subsided. If it is possible 'specific noise' is estimated by measuring the noise level with and without the facility running.

12. 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.

13. For the propagation of noise from the power plant, the use of ISO 9613, ISO 8297: 1994, ISO 3744:2010and ISO 3746:2010; and any revision thereof (as per the interim methods of the Environmental Noise Directive 2002/49/EC) is strongly recommended.

14. In the case of multioperator installations where the evaluation and monitoring needs to distinguish between the impact caused by different or interconnected operators within the same installation, the application of the following standards is deemed necessary: standard ISO8297: 1994 and any revision thereof, and ISO37XX series or specifically ISO 9614-2:1996.

15. In case that operating conditions of the site are significantly different during the day, evening or night periods, the measurement procedure will be repeated for those periods of day/evening or night.Therefore, information from the operator is requested prior to the commencement of the measurements. If the information requested is not provided in time, the Consultants will assume that the site operates uniformly during the day, evening and night periods and measure during the daytime only. However, baseline noise levels would still need to be measured at the nearest noise sensitive locations at night in order to determine the impact.

Background Measurement

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

Adjustments

17. 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

18. A description of the installation – this shall include a description of all processes carried out on site and related equipment and infrastructures.

19. 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.

20. 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.

21. 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 19 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.

22. 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.

23. 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.

5.2 Noise Impact Study for Development and Industrial Permitting Proposals

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. This study is required if the proposed development will create noise (Noise Generating Development – NGD) which may affect nearby noise sensitive receptors, for example, a new commercial activity near existing residential properties.

Road Traffic

Current and predicted traffic noise levels are greatly influenced by the volume of traffic and distance from the source. Changes in noise climate are associated with changes in traffic flows where traffic is free flowing at speeds of at least 50kph and more than 1,000 vehicles per hour (vph). When this is not the case the IEMA[6] guidelines provide a useful estimate of what could be the likely change in traffic noise levels from the proposed development. The higher the existing level of traffic, the greater the increase in traffic that is required to produce a given noise change. In terms of human perception of changes in sound pressure levels, indicates a 3dB change in sound level is just perceptible in terms of an increase (or decrease) in perceived loudness, a 5dB change is perceived as a noticeable difference, and a 10dB change is perceived as being twice or half as loud.

Estimate baseline and future noise levels which use the procedures set out in the Calculation of Road Traffic Noise (CRTN) 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). Road traffic noise may require two separate considerations: day-time: $L_{Aeq,16hrs(0700\text{-}2300)}$ and night-time noise: $L_{Aeq,8hrs(2300\text{-}0700)}$.

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:

$$L_{Aeq,16hr(0700\text{-}2300)} \approx L_{A10,18hr(0600\text{-}2400)} - 2dB$$

And; $L_{A10(1hr)}=L_{Aeq(1hr)} + 3dB$

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.

Predicting Change in Traffic Noise Levels

The consultants should estimate the noise levels during the first year during which the scheme is in full operation (year X) as well as 5 and 15 years thereafter, respectively years (X+5) and (X+15), for both the "without the scheme" and the "with scheme" scenarios.

The assessment should include the existing traffic scenario, known as the baseline and a prediction of the traffic flows both, with and without the scheme in years X, X+5 and X +15. The significance of the scheme's impact on

[6] The Institute of Environmental Management and Assessment (IEMA) Guidance Notes No I *Guidelines for the Environmental Assessment of Road Traffic*

the noise climate shall be estimated by comparing the noise levels without the scheme to the noise levels with the schemes for all the three years in consideration (X, X+5 and X+15).

The 'without the scheme' scenario covers the predicted environmental conditions that would exist in the future, in the absence of the particular development under consideration and should include the predicted increase in network traffic flows.

In addition, the 'with scheme' scenario should cover the additional noise source impacts that would be brought about by the proposals, including total traffic flow as a result of the scheme.

The assessment for the proposed year of opening is considered to be short-term impact, where a 1dB increase is considered as perceptible. Whereas, a 3dB increase is considered as perceptible for the long-term impact, which is typically 15 years after opening of the scheme.

Industrial or Commercial Noise

The significance of sound of an industrial or commercial development depends on both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. Where the new noise source contains distinguishable tones, such as a whine, hiss or hum based on the subjective assessment at the assessment location, a correction factor needs to be added to the specific noise level to obtain the rating level, in accordance to BS 4142:2014.

Where a new NGD is proposed, the study will be based on the effect the new noise climate may have on the amenity value of the existing noise sensitive receptors.

The noise impact influences may have an impact on the amenities associated with the NSR up to a certain extent such as an effect on the quality of:

- Undisturbed sleep;
- Ability to relax;
- Ability to concentrate;
- Able to converse; and
- Use of outdoor facilities

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 NSRs
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
Road Traffic (Change in Noise level – Short Term Impact)			
Target Levels	Forecast – Existing Traffic Noise level	>5	Major
	$L_{A10,18hrs(06:00-24:00)}$< 1dB	<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
Road Traffic (Change in Noise level – Long Term Impact)			
Target Levels	Forecast – Existing Traffic Noise level	>10	Major
	$L_{A10,18hrs(06:00-24:00)}$< 3dB	<10 but ≥5	Moderate
		<5 but ≥3	Minor
	Day Time: $L_{Aeq[16hrs(07:00-23:00)]}$	<3 but ≥0	Negligible
	Night Time: $L_{Aeq[8hrs(23:00-07:00)]}$	0	No Change
Industrial or Commercial Noise			
Target Levels	Rating Level – Background Noise level (L_{Ar})-(L_{A90}) < 5dB	>10	Major
		≤10 but ≥5	Moderate
		<5 but ≥3	Minor
		<3 but ≥0	Negligible
		0	No Change

Table 2: Classification of Magnitude on Noise Impact Criteria from different Noise Sources

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.

5.3 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.

6. Definitions and Glossary of Acoustic Terms

"assessment" means evaluation method used to predict, estimate or measure the value of a noise indicator or the related harmful effects;
"developer" means the developer or operator seeking development or environmental proposal consent or intending to implement the project, and includes both private and public entities;
"noise sensitive receptor (NSR)" means any receptor which is potentially sensitive to noise or require the absence of noise. For example, any dwelling house, hotel, health building, educational establishment, place of worship or entertainment, or any other facility or other area of high amenity;
"monitoring" means the collection of baseline noise measurements and operational noise monitoring at the site of proposal or post project monitoring or any other individual exercise required for taking noise measurement;
"operator" has the same meaning as "developer"

Background Noise $L_{A90,T}$	The steady existing noise level present without contribution from any intermittent sources. The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90% of a given time period, T.
$L_{A10,T}$ index	$L_{A10,T}$ is the A-weighted sound level in dB that is exceeded 10% of the measurement period, T.
$L_{A90,T}$ index	The background noise level is commonly quoted using the $L_{A90,T}$ index. This is the A-weighted sound level in dB that is exceeded 90% of the measurement period, T.
$L_{A10,18h}$ index	The $L_{A10,18h}$ noise level is arithmetic mean of all the 18-one hour levels of $L_{A10,1h}$ during the period from 06:00 to 24:00. This is the standard index used to describe traffic noise. From research it has been found that subjective response to road traffic noise is closely linked to higher noise levels experienced and is correlated well with the $L_{A10,18h}$ index.
$L_{Aeq,T}$ index	The equivalent continuous sound level $L_{Aeq,T}$ is the level of a notional steady sound, which at a given position and over a defined period of time, T, would have the same A-weighted acoustic energy as the fluctuating noise.
$L_{AmaxF,T}$ index	The maximum A-weighted level measured during a given time period, T with the sound meter set on FAST response.

Rating Noise Level, $L_{Ar,Tr}$	The specific noise level plus any adjustment for the characteristic features of the noise; tonality, impulsivity and intermittency
Residual Noise Level, $L_{Aeq,T}$	The ambient noise level remaining at a given position in a given situation when the specific noise source is suppressed to a degree such that it does not contribute to the ambient noise.

7. References

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

ISO 9613-1:1993 – Attenuation of sound propagation outdoors – Part 1: Calculation of the absorption of sound by the atmosphere

ISO 9613-2:1996 – Attenuation of sound propagation outdoors – Part 2: General method of calculation

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

BS 7445-1:2003 -- Description and measurement of environmental noise Guide to quantities and procedures

BS 7445-2:1991, ISO 1996-2:1987 -- Description and measurement of environmental noise Guide to the acquisition of data pertinent to land use

BS 7445-3:1991, ISO 1996-3:1987 -- Description and measurement of environmental noise Guide to application to noise limits

BS 8233:2014 – Guidance on sound insulation and noise reduction for buildings - Code of Practice

BS 5228:2009+A1:2014 - Code of practice for noise and vibration control on construction and open sites. Noise

ISO 8297:1994 Acoustics — Determination of sound power levels of multisource industrial plants for evaluation of sound pressure levels in the environment — Engineering method

EN ISO 3744:1995 Acoustics — Determination of sound power levels of noise using sound pressure — Engineering method in an essentially free field over a reflecting plane

EN ISO 3746:1995 Acoustics — Determination of sound power levels of noise sources using an enveloping measurement surface over a reflecting plane

Directive 2002/49/EC relating to the assessment and management of environmental noise (END)

Environmental Protection Act, 2016 (CAP. 549)

Assessment and Management of Environment Noise Regulations, 2004 (Subsidiary Legislation S.L. 549.37; Legal Notice 193 of 2004, as amended)

Environmental Impact Assessment (EIA) Regulations, 2017 (Subsidiary Legislation S.L. 549.46; Legal Notice 412 of 2017).

Environmental Management Construction Site Regulations, 2007 (Subsidiary Legislation S.L.552.09; Legal Notice 295 of 2007, as amended)

Institute of Environmental Management and Assessment UK, (IEMA) *Guidance Notes No I, Guidelines for the Environmental Assessment of Rod Traffic*

Appendix I - Construction Noise Impact Assessment

Question 1 - Programme Duration	
How long is the duration of all the construction phases projected to be, including site clearance, demolition, excavation, construction and finishings?	
Less than 6 months	Low Impact
Between 6 months and 12 months	Medium Impact
More than 12 months	High Impact

Question 2 – Proximity of Nearest Sensitive Receptors	
How far is the nearest noise-sensitive land use (residences, schools, hospitals, parks, etc.) from the project site?	
More than 50m from the site boundary	Low Impact
Between 25m and 50m	Medium Impact
Less than 25m	High Impact

Question 3 – Daytime Ambient Noise Level	
How would you rate the baseline noise environment within the noise sensitive receptor nearest to the project site?	
High ambient noise levels (near busy roads, heavy industry)	Low Impact
Medium ambient noise levels (suburban residential area near distributor roads)	Medium Impact
Low ambient noise level (rural residential area, away from industry or main roads)	High Impact

Question 4 – Working Hours	
The normal construction working hours (as per S.L. 552.09): Construction shall not commence before 7.00 am and shall cease at 8.00 p.m. No construction work shall be carried out on Sundays and Public Holidays.	
Normal working hours	Low Impact
Some extended evening and weekend working	Medium Impact
Some night-time working	High Impact

Question 5 – External Demolition	
How long is the duration of external demolition across the entire works programme?	
Limited to 2 weeks	Low Impact
Between 2 weeks and 3 months	Medium Impact
More than 3 months	High Impact

Appendix II – Operational Noise Study Screening Worksheet

Question 1 - New Activity, Replacement or Expansion	
Will the project involve only the replacement of existing equipment or activities or the expansion of a pre-existing facility or activity, or will it involve significant new noise sources or activities?	
Replacement of existing equipment or activities	Score 1 point
Expansion of Existing Equipment or Activities	Score 3 points
New Equipment or Activities	Score 5 points

Question 2 - Noise Levels Expected or Project Site	
Based on experience with similar operations at the current location or elsewhere, do you expect that noise levels within the project site will be:	
Very Low	Score 1 point
Low	Score 2 points
Moderate	Score 3 points
High	Score 4 points
Very High	Score 5 points

Question 3 - Presence of Undesirable Characteristics	
Will the project any of the key activities/sources create ongoing noise which: 1) is clearly tonal (hums, whirs or whines), 2) is impulsive or has very rapid onset (bumps, bangs, material handling impacts, compressed air release, etc.), or 3) contains strong, low-frequency content (e.g. large diesel engines, large fans or air compressors)	
No	Score 0 points
Yes, noise will contain one such characteristic	Score 3 points
Yes, noise will contain two or three such characteristics	Score 5 points

Question 4 - Presence of High-energy Impulsive Noise	
Will any activities create ongoing noise which could be classified as "High-energy Impulsive"? Examples of such sources are limited but could include the industrial use of explosives	
No	Score 0 points
Yes	Score 5 points

Question 5 - Hours/Days of Operation	
Will the normal operating schedule be:	
Day Shift Only (5 days/week)	Score 1 point
Day Shift Only (7 days per week)	Score 2 points
Day & Evening Shifts (5 days/week)	Score 2 points
Day & Evening Shifts (7 days per week)	Score 3 points
24-hours per day (5 days/week)	Score 4 points
24-hours per day (7 days per week)	Score 5 points

Question 6 - Proximity to Noise-Sensitive Areas	
How far is the nearest noise-sensitive land use (residences, schools, hospital, passive parks, etc.) from the property line of the project site?	
More than 1,000m	Score 0 points
500 to 1,000m	Score 1 point
250 to 500m	Score 2 points
125 to 250m	Score 3 points
60 to 125m	Score 4 points
less than 60m	Score 5 points

Question 7- Presence of Noise Shielding or Reflection	
Will buildings, structures and/or landform partially or totally screen (i.e. interrupt the line of sight or direct hearing) project noise sources from nearby noise receptors?[7]	
Substantial, continuous noise shielding	Score 0 points
Substantial, but not continuous shielding	Score 1 point
Intermittent shielding e.g. row of smaller, non-adjoining buildings	Score 2 points
Scattered shielding by objects, machinery, stockpiles	Score 3 points
No shielding potential	Score 4 points
No noise shielding & will reflect noise towards sensitive areas	Score 5 points

[7] Consideration should be given to the relative elevations of the noise sources, receivers and the intervening buildings and/or landforms. Noise shielding effects are maximized when intervening buildings and/or landforms are higher and wider than both the noise source area and the noise receiver area.

Alternatively, the project may involve construction of a building or other structure that, while not necessarily a significant source of noise itself, reflects noise from other sources towards adjacent noise-sensitive areas.

Question 8 - Baseline Noise Environment	
How would you rate the baseline (pre-project) noise environment within the noise sensitive area nearest the project site?	
Very noisy (near busy roads, port, airport, heavy industry)	Score 1 point
Noisy (near busy arterial road, light industrial area, urban core)	Score 2 points
Moderately Noisy (near distributor road, suburban residential)	Score 3 points
Quiet (suburban residential away from distributor roads)	Score 4 points
Very Quiet (rural residential area, away from industry or main roads)	Score 5 points

Question 9 - Population Potentially Exposed to Project Noise	
Approximately how many residences or other noise sensitive land uses are located within 500m of the projects site's property line?	
5 or less	Score 1 point
5 to 15	Score 2 points
16 to 40	Score 3 points
41 to 100	Score 4 points
more than 100	Score 5 points

Question 10 - Level of Community Concern about Noise	
What level of concern (e.g. complaint history) currently exists among residents/users of adjacent noise sensitive lands regarding noise emissions from surrounding land in general and your project site in particular	
No history of concern or complaints	Score 1 point
Minor concerns have been expressed	Score 2 points
Unknown	Score 3 points
Moderate level of concern, some complaints	Score 4 points
High level of concern/organized complaints	Score 5 points

Question 11 - Traffic Flow Considerations			
The sensitivity of noise regarding the AADT shows that duplicating traffic flow whilst all other parameters remain constant, implies an equivalent noise level increase of 3dB. Using these finding, ERA will calculate the effect an increase in AADT will have on the noise environment. In order to do this, please provide the following details for existing roads as well as any new roads planned for construction within the delineation extent of the area affected by increased traffic flows.			
Existing Roads	AM Peak	PM Peak	Weekend Peak

Actual traffic flow (vehicles/ peak hour)			
Estimated increase in traffic flow (vehicles/ peak hour)			

Appendix III - Noise Study Project Score

This worksheet should be used together with the questionnaire in Appendix II - Noise Study Screening Worksheet. For each of the ten questions provided, a weighting factor is applied that is reflective of the relative importance of that attribute in forecasting noise impact potential. The overall noise impact potential of the project is determined by tallying the weighted values of all response scores to obtain a **Total Weighted Project Score** as follows:

1. Complete questionnaire in Appendix II, scoring each of the ten questions appropriately.
2. Transfer the ten questionnaire scores into the weighted project screening table shown below.
3. Apply the Importance Weighting factor by multiplying the weighting factor by the questionnaire score and determine the weighted score for each item.
4. Tally the weighted scores and determine the Total Weighted Project Score.

No	Attribute of Project or Project Setting	Questionnaire Score (Appendix I)	Importance Weighting	Weighted Score
1	New Activity, Replacement or Expansion		1.2	
2	Noise Levels Expected or Project Site		1.8	
3	Presence of Undesirable Characteristics		1.6	
4	Presence of High-energy Impulsive Noise		1.6	
5	Hours/Days of Operation		1.2	
6	Proximity to Noise-Sensitive Areas		1.6	
7	Presence of Noise Shielding or Reflection		1.8	
8	Baseline Noise Environment		1.6	
9	Population Potentially Exposed to Project Noise		1.0	
10	Level of Community Concern about Noise		1.2	
			Total Weighted Project Score:	