Oernant Extension Area, Penparc Quarry, Cardigan

Noise Assessment

11th October 2023

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1. INTRODUCTION

1.1. Overview

inacoustic has been commissioned by Carter Jonas, on behalf of the Cardigan Sand and Gravel Company Limited, to assess the impact of potential noise arising from the proposed Oernant Extension Area at Penparc Quarry, Cardigan.

The following technical noise assessment has been produced to accompany a Planning Application to Ceredigion County Council and is based upon environmental noise measurements undertaken at the site, a subsequent 3-dimensional noise modelling exercise.

This noise assessment is necessarily technical in nature; therefore a glossary of terms is included in Appendix A to assist the reader.

1.2. Scope and Objectives

The scope of the noise assessment can be summarised as follows:

- A sound monitoring survey was undertaken at discrete locations representative of the closest noise-sensitive receptors to the Site;
- A 3-dimensional noise modelling exercise, in accordance with ISO9613 [1] prediction methodology to predict sound levels at the closest noise-sensitive receptors to the Site;
- An assessment of potential noise impacts with respect to the prevailing acoustic conditions at existing off-site receptors; and
- Recommendation of mitigation measures, where necessary, to comply with the requirements of MTAN1[2].

[1] International Standards Organisation. ISO 9613-2:1996: Acoustics - Attenuation of sound during propagation outdoors - Part 1: Calculation of the absorption of sound by the atmosphere.
[2] Minerals Planning Policy (Wales). Minerals Technical Advice Note (Wales). 1: Aggregates. Welsh Assembly Government. March 2004.

2. PLANNING POLICY

2.1. National Policy - General

2.1.1. Planning Policy Wales

The Government's planning policies for Wales are contained in Planning Policy Wales (Edition 11, February 2021). The policy provides overarching requirements for developments to adequately control noise pollution, to provide appropriate soundscapes and to incorporate good acoustic design.

The policy is supplemented by the Noise and Soundscape Action Plan 2018-2023, which provides more detailed guidance on planning for a new development, but does not set out specific assessment methods or criteria. The guidance in this document has been used to inform a qualitative assessment of the effect the proposed development could have on the local soundscape.

2.1.2. Technical Advice Note (Wales) 11

This note provides advice on how the planning system in Wales can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business.

It outlines some of the main considerations which local planning authorities should take into account in drawing-up development plan policies and when determining planning applications for development which will either generate noise or be exposed to existing noise sources.

2.2. Minerals Technical Advice Note 1

2.2.1. Noise

MTAN1 sets out detailed advice on the mechanisms for delivering the policy for aggregates extraction by mineral planning authorities and the aggregates industry and states the following with regard to noise:

> ***Noise limits*** *– noise limits should relate to the background noise levels, subject to a maximum daytime noise limit of 55 dB(A) where background noise levels exceed 45 dB(A). 55 dB(A) is the lower limit of the daytime noise levels where serious annoyance is caused. Where background noise is less than 45 dB(A), noise limits should be defined as background noise levels plus 10 dB(A).*
>
> *Night-time working limits should not exceed 42 dB(A) at noise sensitive properties.*
>
> *Daytime working is defined as 0700-1900 hours and night-time as 1900-0700 hours.*
>
> *Noise limits should be set in terms of $L_{Aeq,T}$ over a 1-hour measuring period. L_{Aeq}, is the noise index used to describe the "average" level of noise that varies with time (T) and should be measured "free-field" that is, at least 3.5 metres away from a façade to prevent reflection of noise by any façade that faces the noise source.*
>
> *During temporary and short-term operations higher levels may be reasonable but should not exceed 67dB(A) for periods of up to 8 weeks in a year at specified noise sensitive properties.*

3. Current Planning

3.1. Decision Notice C1/404

The following existing planning conditions are of particular relevance to noise associated with the proposed works.

3.1.1. Condition 25

> The level of noise resulting from operations at the quarry, as measured at any noise sensitive properties affected by noise from the development hereby permitted, shall be controlled so as not to give rise to nuisance, nor to conflict with any British Standard, Code of Practice, Guidance Notes, etc., in force at that time.

4. Site Description

4.1. Site and Surrounding Area

Penparc Quarry is an established sand and gravel pit that has been in operation since the 1950s, is operated by the Cardigan Sand and Gravel Company Limited and is located 0.8km to the north-west of the village of Penparc.

The area is rural; however, the A487 arterial route runs through Penparc village, which connects Fishguard and Aberystwyth and carries a moderate level of road traffic, which influences the sound environment of the area, as does sound associated with the existing quarry operations.

The Proposed Development area can be seen in Figure 1, below, outlined in red, with the closest noise-sensitive receptors (NSRs) also identified.

An internal road provides access to the existing quarry infrastructure including the concrete batching plant, fixed plant site area, buildings and settlement lagoons, which are located at the southern end of the existing quarry area.

Figure 1: Application Site and Surrounding Area

4.2. Proposed Development Overview

There is no built development on the application site. However, public footpath CE/78/2/D runs along the eastern boundary of the site, while public footpath CE/78/3 runs along the southern boundary of the site.

The release of mineral would comprise approximately 118,000 tonnes of *"mineral allocated within the Local Development Plan"* and 477,000 tonnes of mineral within the batter slopes of the existing adjacent quarry.

Mineral extraction would be undertaken in accordance with all aspects of the existing planning permissions on the adjacent Quarry, and no change in operational practice would be required.

The site (incorporating the existing operations) would be worked at a maximum rate of 150,000 tonnes per annum (in line with the existing planning permissions).

The Mineral in the extension area will be worked to a depth of between 100m AOD and <90m AOD, with the mineral in the existing quarry batters being worked to the permitted depth of 80m AOD.

The mineral will be excavated by long arm excavators and loading shovels before being hauled to the adjacent Quarry plant site via an internal haul road for processing. The mineral would then be exported from the site for sale.

The soil from the site would be stripped in advance of mineral extraction and stored as a peripheral bund around the site, or as part of existing soil bunds, around the wider quarry for use in the future restoration of the site. The proposed soil bund would be located between the extraction area and the footpaths 78/2/D and 78/3, which will assist in visual and acoustic screening.

5. Measurement Methodology

5.1. General

The prevailing noise conditions in the area have been determined by an environmental noise survey conducted during both daytime and night-time periods between Wednesday 2nd and Thursday 3rd August 2023.

5.2. Measurement Details

All noise measurements were undertaken by a consultant certified as competent in environmental noise monitoring, and, in accordance with the principles of BS 7445[3].

All acoustic measurement equipment used during the noise survey conformed to Type 1 specification of British Standard 61672[4]. A full inventory of this equipment is shown in Table 1 below.

Table 1: Inventory of Sound Measurement Equipment

Measurement Position	Make, Model & Description	Serial Number
MP1	Rion NL-52 Sound Level Meter	01009671
	Rion NH-25 Preamplifier	09976
	Rion UC-59 Microphone	18146
	Cirrus CR:515 Acoustic Calibrator	34984020

The sound measurement equipment used during the survey was field calibrated at the start and end of the measurement period. A calibration laboratory has calibrated the field calibrator used within the twelve months preceding the measurements. A drift of less than 0.2 dB in the field calibration was found to have occurred on the sound level meter.

The weather conditions during the survey were conducive to noise measurement; it being predominantly dry, with low wind speeds, as measured on-site using a rain-tipping gauge and anemometer, respectively. When periods of inclement weather occurred, they have been removed from the dataset used to derive the typical ambient and background sound levels. Wind direction was variable but predominantly from the south-west.

The microphone was fitted with a protective windshield for the measurements, which is described in Table 2, with an aerial photograph indicating its respective location shown in Figure 2.

[3] British Standard 7445: 2003: *Description and measurement of environmental noise*. BSI.
[4] British Standard 61672: 2013: *Electroacoustics. Sound level meters*. Part 1 *Specifications*. BSI.

Table 2: Measurement Position Descriptions

Measurement Position	Description
MP1	Largely unattended daytime and night-time measurement, at a height of 1.5 metres above local ground level, located 200 metres south-east the boundary of the proposed site. The sound environment was quiet with the sound of vegetation in the wind. The Quarry was audible due 250 metres north west of the measurement position and was characterised by the sounds of plant, machinery, with occasional impulsive events.

Figure 2: Measurement Position

5.3. Summary of Measurement Results

The summarised results of the environmental noise measurement exercise are presented in Table 3, with a time history and statistical analysis presented under Appendix B.

TABLE 3: SUMMARY OF NOISE MEASUREMENT RESULTS

Measurement Position	Period	Noise Level, dB			
		$L_{Aeq,T}$	L_{A90}	L_{A10}	L_{Amax}
MP1	Daytime (07:00-19:00 excluding 08:00-18:00) No Activity	43.2	Mean: 38.1 Modal: 39.0	44.8	66.4
	Core Daytime (08:00-18:00) With Activity	43.5	Mean: 38.4 Modal: 39.0	44.8	59.4

A source measurement exercise was also undertaken within the existing quarry of the plant in operation. The results of this source determination exercise are set out in Table 4.

TABLE 4: SOURCE MEASUREMENT RESULTS

Index	Measured Noise Level - dB								
	63Hz	125Hz	250 Hz	500Hz	1kHz	2kHz	4kHz	8kHz	A
Floatex Tower 1 – 5m									
$L_{eq,T}$	70.9	67.4	65.6	63.3	64.2	62.8	62	61.1	70.0
Floatex Tower 2 – 10m									
$L_{eq,T}$	82.4	76.5	73	80.9	80.4	82.1	85.6	81.3	89.9
Hopper & Screen – 5m									
$L_{eq,T}$	76.9	72.8	77.5	74.1	73.7	73.6	70.9	63.7	79.7
Loading Shovel Loading Wagon – 5m									
$L_{eq,T}$	79.3	75.5	74	75.7	70	65.9	58.4	52.4	76.0
360 Excavator – 15m									
$L_{eq,T}$	66.9	63.7	67.6	60.3	57.6	52.7	46.2	37.1	63.7
Dumper – 5m									
$L_{eq,T}$	72.8	73.5	72.6	69.2	71.3	66.4	61.5	53.9	74.4
Screener – 3m									
$L_{eq,T}$	86.0	81.8	83.5	87.5	87.5	85.0	75.6	66.4	91.2

6. Operational Noise Assessment

6.1. Noise Modelling

6.1.1. Source Data

The sound levels, presented in Table 4 have been utilised within the noise modelling process; initially, to validate the baseline situation and then to reflect the proposed operational scenario, with plant operating within the application area.

6.1.2. Calculation Process

Calculations were carried out using Cadna/A, which undertakes its calculations in accordance with guidance given in ISO9613-1:1993 and ISO9613-2:1996.

6.1.3. Sound Data Assumptions

Given that the land between proposed development and nearest receptors is largely soft/absorbent, the ground factor has been set to 1.0, within the calculation software. Two orders of reflection have also been included.

It has been assumed that all processes will occur simultaneously and that the Floatex and Hopper will remain in their existing locations, with operations within the site comprising a 360 excavator, loading shovel, screener and dumper movements.

Furthermore, to represent a worst-case scenario, the extension activities have been modelled to occur at existing ground level, without the screening effects of a void or bunding.

6.1.4. Specific Sound Level Maps

The sound map showing the specific sound level emissions from the existing and extended future operation described in Section 4.2.1 of this report can be seen in Figure 3 and Figure 4 respectively.

FIGURE 3: SPECIFIC SOUND LEVEL MAP – EXISTING SITUATION

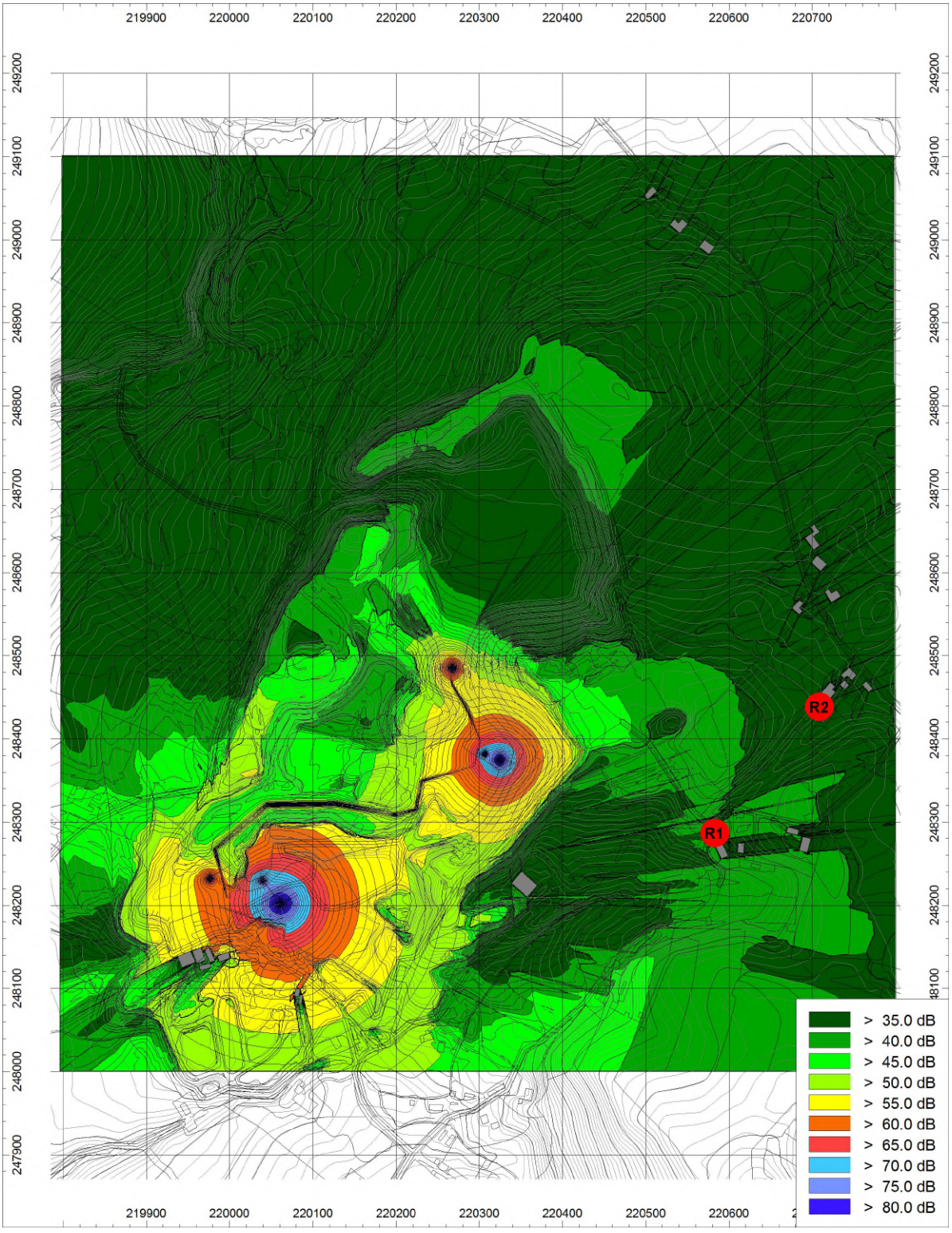
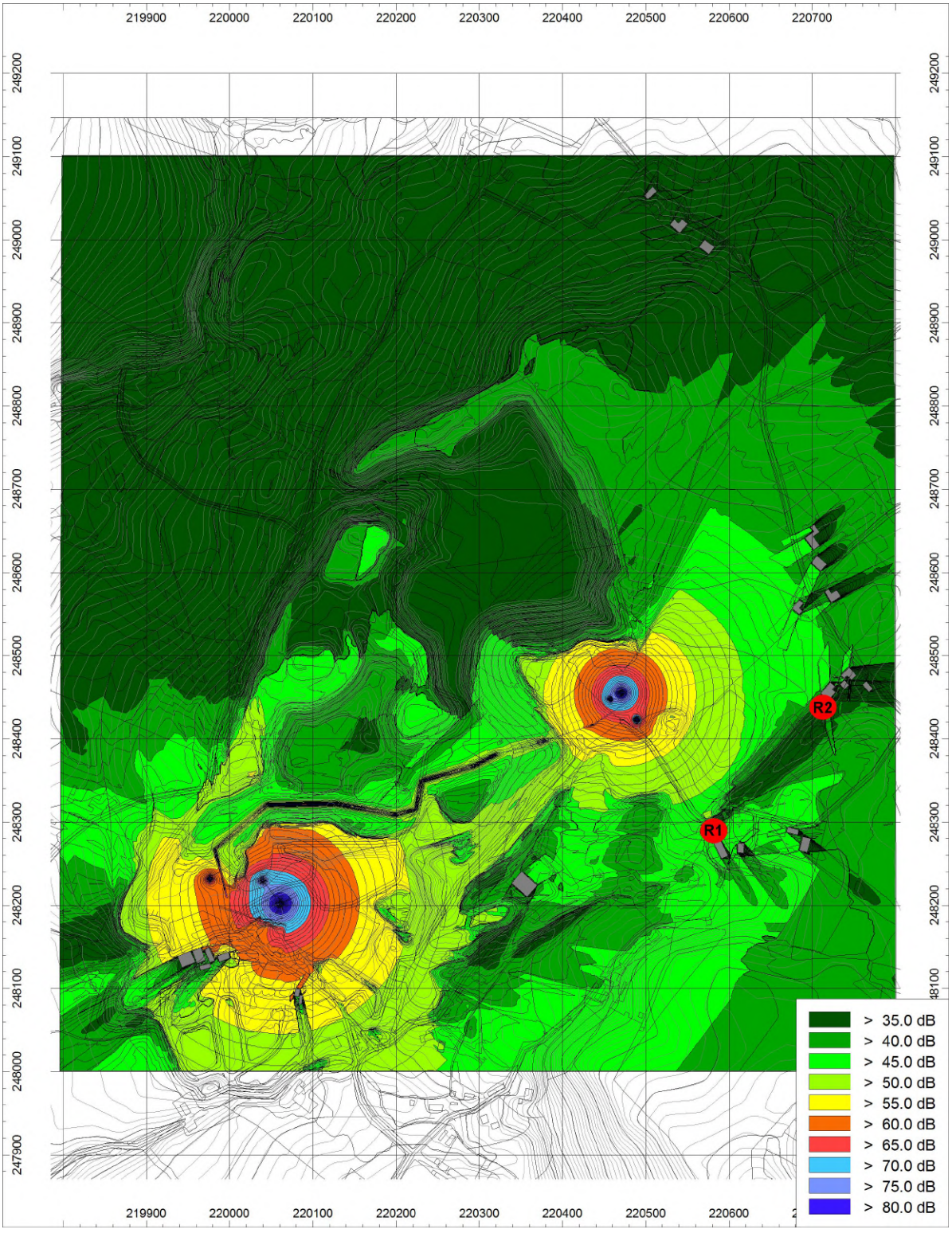


FIGURE 4: SPECIFIC SOUND LEVEL MAP – WORST-CASE FUTURE SCENARIO



6.1.5. Specific Sound Level Summary

A summary of the predicted specific sound levels at the NSRs, based on the sound maps shown in Figures 3 and 4.

TABLE 5: PREDICTED SPECIFIC SOUND LEVEL SUMMARY

NSR	Specific Sound Level (dB)	
	Existing Scenario	With Extension
1	39.4	47.3
2	33.6	42.9

Noise levels, during active operations at the site have been measured to be 53.3 dB(A) at Longhouse, as set out in Table 3. The current operations are ostensibly similar to those proposed under the preliminary stage of works, where a level of 53.4 dB(A) has been predicted at that receptor, which identifies a very close correlation between the actual measured sound levels and theoretically predicted levels, thus affording a very high degree of confidence to the predictive exercise.

6.2. Assessment

6.2.1. Receptor Limit

With reference to the guidance set out within MTAN1, an operational sound level limit of 49 dB $L_{Aeq,1hour}$ would apply at the receptors; being 10 dB above the measured background sound level, excluding existing quarry activity.

It should be noted that this guidance has been developed and adopted since the existing planning permission for the site, as existing, was approved and such a limit would only apply to the new activity area. Notwithstanding this, all site activities; both existing and proposed, have been considered cumulatively against this guidance.

6.2.2. Assessment

The noise assessment, considering the predicted specific noise levels against the adopted operational noise level limit; being 10 dB above the measured background sound level, is set out in Table 6.

TABLE 6: NOISE ASSESSMENT AT RECEPTORS

NSR	Predicted Specific Noise Level – $L_{Aeq,1\text{-}hour}$ - dB	Adopted Noise Level Limit – $L_{Aeq,1\text{-}hour}$ - dB	Excess over Adopted Noise Level Limit - dB
Existing (Observed) Activity			
1	39	49	-10
2	34	49	-15
Worst-Case Future/Proposed Activity			
1	47	49	-2
2	43	49	-6

It can be seen from Table 6 that the operation of the proposals is predicted to meet the noise requirements for the site, at the considered receptors, when operated in the manner described within this report.

The future activity, forming the subject of this noise impact assessment would considerably reduce, as the void is created and topsoil bunding is formed around the periphery of the application area, thus adding screening and breaking the line of sight between receptors and source. Consequently, this assessment is considered a worst-case, with the plant operating at existing ground level and at location close to the off-site receptors.

7. CONCLUSION

inacoustic has been commissioned by Carter Jonas, on behalf of the Cardigan Sand and Gravel Company Limited, to assess the impact of potential noise arising from the proposed Oernant Extension Area at Penparc Quarry, Cardigan.

This technical noise assessment has been produced to accompany a Planning Application to Ceredigion County Council and is based upon environmental noise measurements undertaken at the site, a subsequent 3-dimensional noise modelling exercise.

The assessment considers the potential noise generation from the site activities associated with the Proposed Development, with respect to the noise-limiting criteria set out within MTAN1.

The assessment identifies that the Proposed Development will give rise to predicted noise levels that comply with the MTAN1 planning requirements.

It is therefore recommended that noise should not be a considered constraint to the approval of this Planning Application, subject to the operational measures described within this report.

8. APPENDICES

8.1. Appendix A – Definition of Terms

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20μPa ($20x10^{-6}$ Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1 / s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Facade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS 5969.

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

TABLE 7: TYPICAL SOUND LEVELS FOUND IN THE ENVIRONMENT

Sound Level	Location
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory
100 to 110dB(A)	Burglar alarm at 1m away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A).

In accordance with logarithmic addition, combining two sources with equal noise levels would result in an increase of 3 dB(A) in the noise level from a single source.

A change of 3 dB(A) is generally regarded as the smallest change in broadband continuous noise which the human ear can detect (although in certain controlled circumstances a change of 1 dB(A) is just perceptible). Therefore, a 2 dB(A) increase would not be normally be perceptible. A 10 dB(A) increase in noise represents a subjective doubling of loudness.

A noise impact on a community is deemed to occur when a new noise is introduced that is out of character with the area, or when a significant increase above the pre-existing ambient noise level occurs.

For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time period of interest. In the UK, traffic noise is measured as the L_{A10}, the noise level exceeded for 10% of the measurement period. The L_{A90} is the level exceeded for 90% of the time and has been adopted to represent the background noise level in the absence of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, L_{Aeq}.

This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound.

To put these quantities into context, where a receiver is predominantly affected by continuous flows of road traffic, a doubling or halving of the flows would result in a just perceptible change of 3 dB, while an increase of more than 25%, or a decrease of more than 20%, in traffic flows represent changes of 1 dB in traffic noise levels (assuming no alteration in the mix of traffic or flow speeds).

Note that the time constant and the period of the noise measurement should be specified. For example, BS 4142 specifies background noise measurement periods of 1 hour during the day and 15 minutes during the night. The noise levels are commonly symbolised as $L_{A90,1hour}$ dB and $L_{A90,15mins}$ dB. The noise measurement should be recorded using a 'FAST' time response equivalent to 0.125 ms.

8.2. Appendix B – Full Measurement Results

FIGURE 5: MEASURED TIME HISTORY – MP1

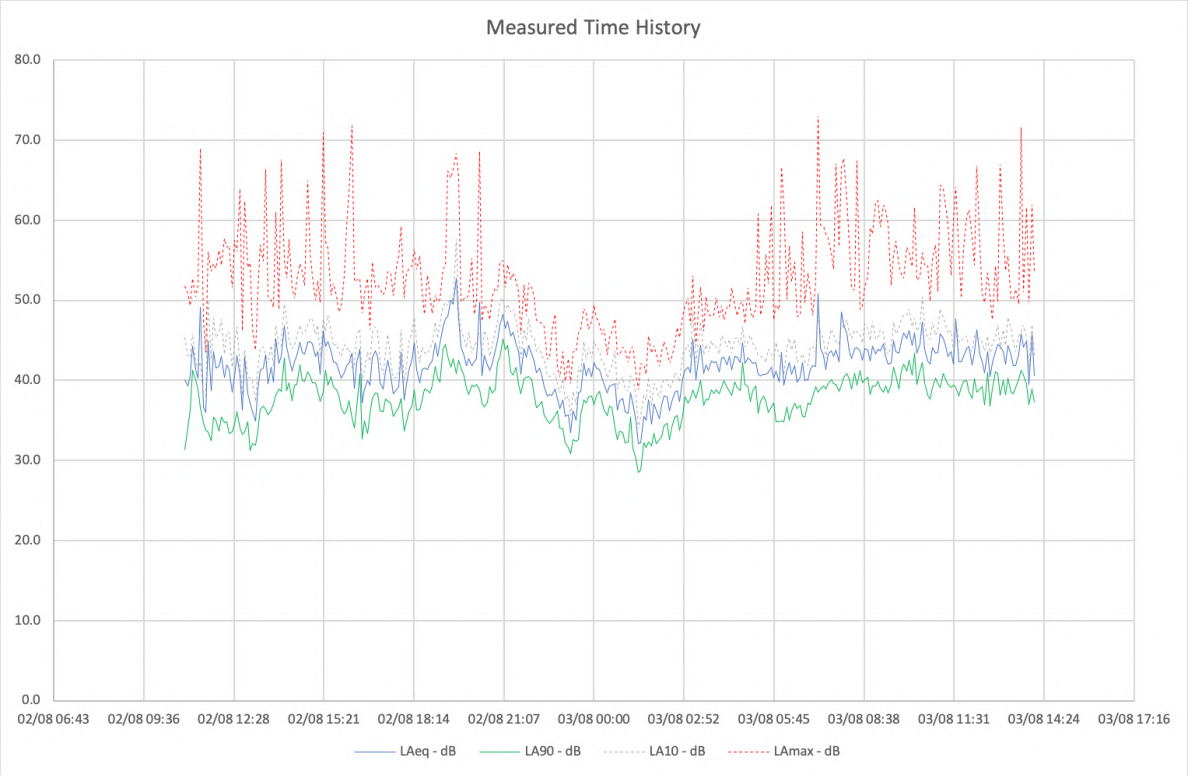
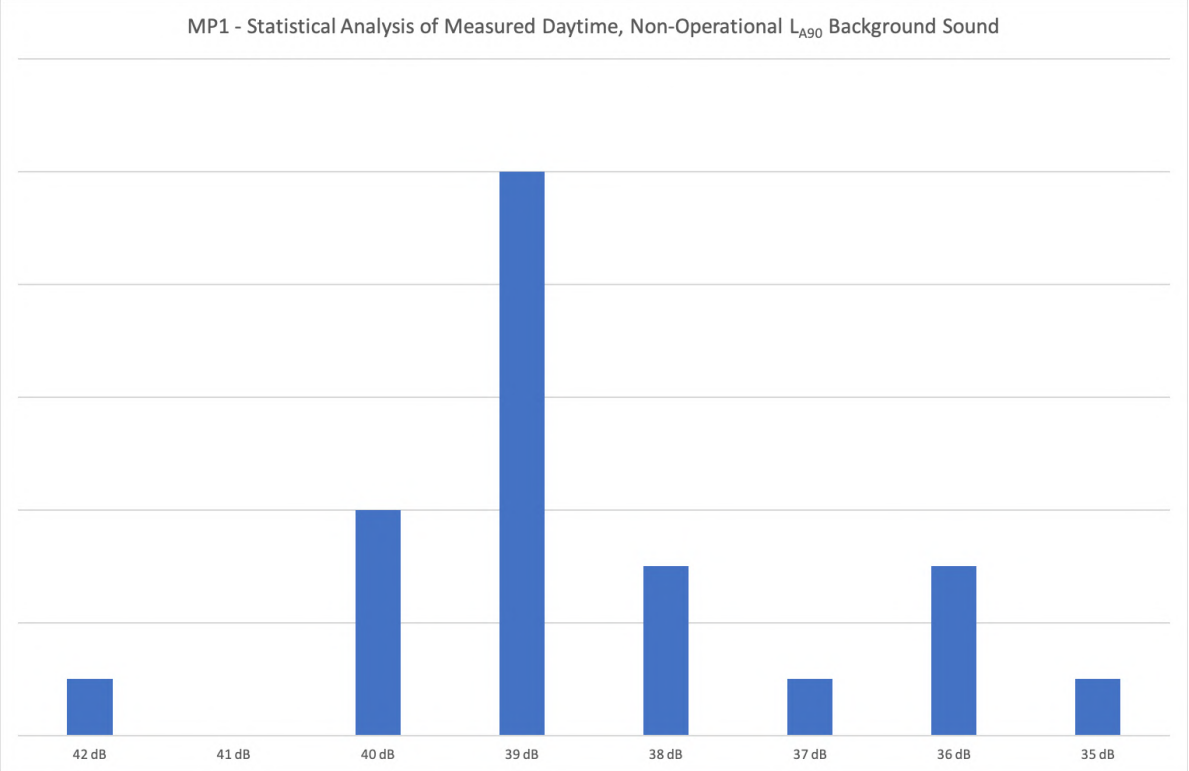


FIGURE 6: STATISTICAL ANALYSIS OF L_{A90} BACKGROUND – DAYTIME - MP1



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