AGENDA ITEM 6

APPENDIX 10

2018/0151/DET

NOISE ASSESSMENT

Chapter 12.0
Noise Assessment

VIBROCK

Assessment of Environmental Impact of Noise at Dalwhinnie Quarry, Highland

JOHNSON POOLE & BLOOMER

R18.9893/3/AF
Date of Report: 13 March 2018

QUALITY MANAGEMENT

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1.0 INTRODUCTION

1.1 The noise impact assessment was undertaken by Mr Allan Findlay BSc, CEng, MICE, MIOA, MIQ of Vibrock Ltd, who is a full member of The Institute of Acoustics and has, following 15 years working in the mineral extractive industry, a further 20 years experience in undertaking noise impact assessments for surface mineral and civil engineering projects.

1.2 Leiths (Scotland) Limited are proposing to re-open Dalwhinnie Quarry to produce aggregates for the local building and construction industries.

1.3 The planning application for the re-opening of Dalwhinnie Quarry is being prepared on behalf of Leiths by Johnson Poole and Bloomer (JPB). The operation of plant and machinery on quarry developments has the potential, if not properly controlled, to raise noise levels in the local area. As such Leiths considered it prudent that a noise assessment of the proposals at Dalwhinnie Quarry be undertaken.

1.4 Vibrock Limited, an independent firm of environmental consultants, has been engaged by JPB to undertake this noise study of the proposed working at Dalwhinnie Quarry.

1.5 The study commenced in February 2018 with a site inspection and the monitoring of background and ambient noise levels.

1.6 This report, that we understand will be submitted to the Local Authority, details the findings of the survey and assesses the noise impact of the proposed phased development of the quarry.

2.0 SITE DESCRIPTION

2.1 General Environs

2.1.1 The proposed Dalwhinnie Quarry is located some 1.2 km north of the village of Dalwhinnie. At a closer separation distance is the Dalwhinnie distillery and associated dwellings and buildings.

2.1.2 The Perth to Inverness rail line runs just to the north of the village and distillery, passing under the A889 to the north east of the distillery. The A889 is immediately to the west of the quarry and it is this road that quarry traffic will use to access the road network. The A9 is some 1 km to the south east of the quarry but at a lower topographic level.

2.2 Existing Noise Attenuating Features

2.2.1 Rock extraction has previously taken place at Dalwhinnie Quarry and a reasonably large quarry bowl has been developed. Some perimeter bunding is also already in place. The intention is that, as far as practicable, future operations will take place within the bowl where they will benefit from the screening provided by the face and the bunding.

2.2.2 To the west of the quarry there are areas of commercial woodland. The passage of noise in that direction will be attenuated by the presence of the trees.

2.3 Working Method

2.3.1 In a phased manner, the quarry bowl will advance to the north and east of its current position.

2.3.2 Following the removal of soils and overburden, the first operation in the extraction process will be the intermittent drilling of blast shot holes followed by blasting.

2.3.3 Rock from the blast pile will be fed into the primary crusher by a tracked excavator, from there the part processed rock will be conveyed to a further crusher and then onto screens. Wheeled loading shovels will either load the processed aggregates directly into HGVs for haulage from the quarry or place them in stockpiles for later use when required.

2.3.4 A more detailed explanation of the quarry working is contained in the planning application documentation.

3.0 NOISE TERMINOLOGY

3.1 Sound is produced by mechanical vibration of a surface, which sets up rapid pressure fluctuations in the surrounding air.

3.2 Between the quietest audible sound and the loudest tolerable sound there is a million to one ratio in sound pressure level. It is because of this wide range that a noise level scale based on logarithms is used in noise measurement. This is the decibel or dB scale.

3.3 Audibility of sound covers a range of about 0 to 140 decibels (dB) corresponding to the intensity of the sound pressure level. The ability to recognise a particular sound is dependent on the pitch or frequencies present in the source. Sound pressure measurements taken with a microphone cannot differentiate in the same way as the ear, consequently a correction is applied by the noise measuring instrument in order to correspond more closely to the frequency response of the ear which responds to sounds from 20 Hz to 20000 Hz. This is known as 'A-weighting' and written as dB(A).

3.4 The use of this unit is internationally accepted and correlates well with subjective annoyance to noise.

3.5 The logarithmic basis of noise measurements means that when considering more than one noise source their addition must be undertaken in terms of logarithmic arithmetic. Thus, two noise sources each of 40 dB(A) acting together would not give rise to 40 + 40 = 80 dB(A) but rather 40 + 40 = 43 dB(A). This 3 dB(A) increase represents a doubling in sound energy but would be only just perceptible to a human ear.

3.6 The following table gives typical noise levels in terms of dB(A) for common situations.

Approximate Noise Level dB(A)	Example
0	Threshold of hearing
30	Rural area at night, still air
40	Public library
50	Quiet office, no machinery
60	Normal conversation
70	Inside a saloon car
80	Vacuum cleaner
100	Pneumatic drill
120	Threshold of pain

3.7 Noise levels can vary with time according to source activity and indices have been developed in order to be able to assign a value to represent a period of noise level variations and to correspond with subjective response.

3.8 The L_{Aeq} or A-weighted equivalent continuous noise level index is used to average the noise energy over a period of intermittent noise levels. It is the level of steady sound of equivalent energy and is usually referred to as the ambient noise level.

3.9 The L_{A90} index represents the noise level exceeded for 90% of the measurement period and is used to indicate the quieter sections of the measurement period. It is usually referred to as the background noise level.

3.10 The L_{Amax} index is the maximum root mean square A-weighted noise level occurring during the measurement period.

4.0 NOISE CRITERIA

4.1 Introduction

4.1.1 The ambient environmental noise at any location will vary according to the activities in progress around that location. In the vicinity of a busy motorway, for example, the noise level will remain fairly constant due to the relatively steady noise input from road traffic, whereas the noise level close to a source of high noise over short periods, such as an airport, will vary over a much wider range. It is therefore necessary to consider how to quantify the existing noise levels in an area in order to accurately assess the acceptability of the introduction of a new noise source.

4.1.2 The background noise level, defined as the L_{A90} parameter, represents the noise level exceeded for 90% of a measurement period, or the ninety percentile level. It generally reflects the quieter noise level between noise events and generally ignores the effects of short term higher noise level events.

4.1.3 The fifty and ten percentile levels, L_{A50} and L_{A10}, represent the average noise level and the level exceeded for 10% of the measurement period, respectively. The latter, for example, is commonly used to describe and quantify noise from road traffic.

4.1.4 The equivalent continuous sound pressure level, or L_{Aeq} parameter, is a measure of the average sound energy over a given time period. It will include noise from all contributing sources. Unless the noise level at the receiving point is perfectly steady, the L_{Aeq} will always be higher than the L_{A90} over any one measurement period.

4.2 Planning Advice Note, PAN 50, "Controlling the Environmental Effects of Surface Mineral Workings."

4.2.1 Annex A of the above document entitled "The Control of Noise at Surface Mineral Workings", published in October 1996, is the latest Government advice applicable to the control of noise from surface mineral workings in Scotland.

4.2.2 PAN 50 recommends the setting of absolute values for noise limits, linked to day-time and night-time working periods, defined as 0700 - 1900 hours and 1900 - 0700 hours respectively. It also identifies evening and dawn periods as being typically 1900 - 2200 hours and 0600 - 0700 (or 0800) hours respectively.

4.2.3 PAN 50 introduces the concept of a maximum fixed acceptable noise level of 55 dB $L_{Aeq,1h}$ for daytime operation during the working week and states, in paragraph 33, that this is generally found to be a tolerable level. It also introduces a nominal night time limit of 42 dB $L_{Aeq,1h}$.

4.2.4 PAN 50 recommends that these noise limits be set in terms of free-field noise levels. Consequently only free field noise levels are considered in this report. PAN 50 also states in paragraph 30 that "….there should be sufficient flexibility in the guidance on what these limits should be, so that account can be taken of particular circumstances". The particular circumstances are not specified, but would appear to be locations where particularly low or particularly high background ambient levels exist prior to development.

4.2.5 The document also recognises the converse of the above in paragraph 36, where it indicates that in some circumstances, e.g. in quieter rural areas, the setting of nominal limits lower than those quoted above may be considered. This may be considered for example where the nominal 55 dB $L_{Aeq,1h}$ level is more than 10 dB above the measured background level.

4.2.6 However, in paragraph 37, the document goes on to say that where the daytime background level is below 35 dB(A), a condition limiting operators to a 10 dB(A) increase over the existing background is unduly restrictive and difficult to achieve. The paragraph concludes, "It would not normally be appropriate to require a daytime limit below 45 dB $L_{Aeq,1h}$, as such a limit should prove tolerable to most people in rural areas."

4.2.7 PAN 50 recognises that “open spaces which the public uses for relaxation may be considered to be noise-sensitive in some circumstances”. With regard to guideline noise limits the document states that “the limits would not be expected to be as low as at dwellings, and it is suggested that 65 dB $L_{Aeq,1h}$ during the normal working day and 55 dB $L_{Aeq,1h}$ at other times would be reasonable.”

4.3 Temporary Sources of High Noise Levels

4.3.1 PAN 50 states in paragraph 41 that "It will often be necessary to raise the noise limits to allow temporary but exceptionally noisy phases in the mineral extraction operation which cannot meet the limits set for routine operations”. A prime example would be to allow for the construction of baffle mounds. Other activities which would also merit a temporary raised limit include soils-stripping, removal of spoil heaps and construction of new permanent land forms.

4.3.2 In paragraph 60 of the document it is suggested that 70 dB $L_{Aeq,1h}$ (free field) for periods of up to 8 weeks in a year should be considered by Planning Authorities (PA) to facilitate this. It also leaves PA’s and mineral operators the ability to negotiate trade-offs between shorter periods of time versus higher noise limits and vice versa.

4.4 Other Noise Criteria

BS 8233: 2014 Guidance on sound insulation and noise reduction for buildings

4.4.1 British Standard 8233:2014 provides guidance for sound insulation and noise reduction in buildings. Tables in the document advise on acoustic criteria and limits which are appropriate for various types of space that have different functions. The guidance applies to external noise as it affects the internal acoustic environment from steady sources without a specific character.

4.4.2 For dwellings, the main considerations are; for bedrooms, the acoustic effect on sleep and for other rooms the acoustic effect on resting, listening and communicating. Table 4 in the BS gives desirable ambient noise levels that should not be exceeded. For dwellings the daytime, 0700 – 2300 hours, values are between 35 – 40 dB $L_{Aeq,16h}$ depending on the specific use of the room. The guideline value for bedrooms at night-time, 2300 – 0700 hours, is 30 dB $L_{Aeq,8h}$.

4.4.3 BS 8233 states that for external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. There is also a recognition that the above guideline values may not be achievable in all circumstances and that a balance between noise and other factors will require to be made.

World Health Organisation: Guidelines for Community Noise, April 1999

4.4.4 This document provides further information on noise and its affects on the community. It states “To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55 dB L_{Aeq} on balconies, terraces and in outdoor living areas. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50 dB L_{Aeq}. Where it is practical and feasible, the lower outdoor sound level should be considered the maximum desirable sound level for new development.’

4.5 Blast Induced Noise

4.5.1 Although the majority of energy generated within the atmosphere from any open pit blast will be of a sub-audible nature, there will also be a component that is audible, i.e. at frequencies greater than 20 Hz, and as such can be measured in terms of dB(A).

4.5.2 With the elimination of detonating cord, the characteristic noise of a blast is no longer a sharp crack but rather a dull thump. This is partly due to the detonating sequence and partly due to natural energy dissipation and attenuation.

4.5.3 Peak levels from blasting are comparable to the sort of levels routinely generated by cars etc., only in this case the noise would exist for less than a second and occur relatively infrequently. It is because of this very brief duration and its infrequent occurrence that blast noise is rarely measured in terms of dB(A) but rather looked at as part of the air overpressure generated and measured by the more meaningful parameter of dB.

4.5.4 It is our experience that residents soon become accustomed to such noise and that since the great majority of blast related complaints concern a fear of property damage, once it is clear that such noise is harmless then complaints are unlikely.

4.6 Existing Planning Conditions

4.6.1 The Planning Authority for the site, as it lies within the Cairngorms National Park, is the Cairngorms National Park Authority. They granted planning permission in February 2008, reference 07/309/CP, for the continued mineral extraction from land at Carn Dhomhnuill Bhain, Dalwhinnie. The current application is for the continuation and extension to the quarry detailed in planning permission reference 07/309/CP.

4.6.2 Condition 5 of the above permission was concerned with the control of noise and stated:

"The noise level from this development shall not exceed 45 dB L_{Aeq} when measured at any neighbouring property."

5.0 NOISE LEVEL PREDICTIONS

5.1 Introduction

5.1.1 Noise has been defined as sound which is undesired by the recipient. The effects of noise on the neighbourhood are varied and complicated, including such things as interference with speech communication, disturbance of work, leisure or sleep. A further complicating factor is that in any one neighbourhood some individuals will be more sensitive to noise than others.

5.1.2 A measure that is in general use and is recommended internationally for the description of environmental noise is the equivalent continuous noise level or L_{Aeq} parameter.

5.1.3 In general, the level of noise in the local environs that arises from a development site will depend on a number of factors. The more significant of which are:

(a) The sound power levels (L_{WA}) of the plant or equipment used on site.

(b) The periods of operation of the plant on site.

(c) The distance between the source noise and the receiving position.

(d) The presence or absence of screening effects due to barriers, or ground absorption.

(e) Any reflection effects due to the façades of buildings, etc.

5.2 Prediction Methodology

5.2.1 In order to assist in the noise assessment Cadna A environmental noise prediction software, version 2017, has been used to model the noise emanating from the proposed development.

5.2.2 The noise prediction software has been configured to undertake the noise calculations in accordance with BS 5228-1: 2009 “Code of practice for noise and vibration control on construction and open sites – Part 1: Noise”.

5.2.3 BS 5228-1: 2009 incorporates recommendations made in Planning Advice Note (PAN) 50, Annex A, "The Control of Noise at Surface Mineral Workings" which was issued in 1996. PAN 50 proposed several modifications to the 1984 version of BS 5228, the most important ones being the option of calculated barrier shielding rather than estimated shielding, the inclusion of attenuation due to soft ground and angle of view corrections.

5.2.4 The maximum barrier attenuation of 10 dB(A) quoted within BS 5228-1 can be conservative and is recognised as such in section F.2.2.2.1 where it states "High topographical features and specifically designed and positioned noise barriers could provide greater attenuation". Examples of the former are overburden mounds and excavation high walls whilst baffle banks and acoustic fences are examples of the latter.

5.2.5 In order to more accurately estimate the barrier attenuation for this study, the noise prediction software has been configured to undertake barrier attenuation calculations in accordance with Figure F.3 contained within BS 5228-1. This method of calculating barrier attenuation is frequency dependant.

5.2.6 In all noise prediction calculations, the soft ground absorption has been set to '1' representing soft ground. Soft ground attenuation, in accordance with the BS 5228 calculation method, has not been included when barrier attenuation is present.

5.3 Plant Complement

5.3.1 A list of plant sound power levels (L_{WA}) from which the noise predictions were made are presented in Table 2. The plant complement is based on information provided by JPB / Leiths. The sound power levels used are either from manufacturer's data or from Vibrock's extensive in-house database of sound power levels measured over the years. All measured sound power levels take into consideration where applicable the operation of any reverse warning systems fitted to the plant.

5.4 Noise Prediction Assumptions

5.4.1 The noise prediction exercises are based on a number of assumptions concerning the working of the site. These assumptions are presented as follows:

5.4.2 All predictions have been calculated with the combinations of plant working at the closest / highest point to the prediction location. They are therefore worst-case scenarios which may be of relatively short duration. However, they indicate the maximum L_{Aeq} noise level to which a particular property or group of properties may be exposed during the working of the site. By definition, the worst-case situation may occur intermittently over the lifetime of the site, but longer term noise levels perceived outside of the site boundary would normally be significantly less.

5.4.3 For the purposes of this prediction exercise, the above described worst-case situation has been considered at all times, thus operations are assumed to be undertaken at their realistic minimum distances and maximum heights. In this exercise only the major operations have been considered as they are likely to have the most impact on the local environs.

5.4.4 Given that all prediction methods are estimates and that in practice measured levels are invariably lower due to the effects of interactions between such things as meteorological conditions and air absorption, these predicted levels are a reasonable representation of the worst-case predictions assuming ideal meteorological conditions for sound propagation.

6.0 SURVEY METHOD

6.1 Introduction

6.1.1 The methodology described below was employed during the noise surveys. Wherever possible all measurements were undertaken to comply with the requirements of BS 7445:2003.

6.2 Environmental Noise Measurement Technique

6.2.1 At all locations the microphone was placed between 1.2 - 1.5 m above the ground and at least 3.5 m from the nearest reflecting surface. The sound level meters were programmed to monitor over 15 minute periods and the following parameters were recorded:

L_{A10} in dB
L_{A90} in dB
L_{Amax} in dB
L_{Aeq} in dB

6.2.2 Two 2-hour noise surveys were undertaken to determine the existing noise levels in the vicinity of potentially sensitive residential properties around the site. A further survey, of 1-hour duration, was undertaken to the north of Dalwhinnie on National Cycle Route (NCR) 7 in Glen Truim.

6.3 Existing Noise Measurement Locations

6.3.1 The two noise sensitive locations where existing noise levels were measured, and which were agreed in advance with the Environmental Health Department of Highland Council, are listed as Location 1 and 2 in the table below and shown in Figure 1:

Location No.	Description
1	Allt an t'Sluic Lodge
2	Distillery House, Dalwhinnie
3	NCR 7 – Glen Truim

7.0 SURVEY DETAILS

7.1 Instrumentation

7.1.1 The following instrumentation was used for all noise measurements:

Manufacturer	Description	Type	Serial Numbers	Date of Last Calibration
Cirrus	Sound Level Meter	CR 831B CR 811C CR 1710	C18435FF D20518FD G071372	30/11/16 11/12/17 26/02/16
Cirrus	½ Pre Polarised Cond. Microphones	CRL 224	-	-
Cirrus	Foam Windshields	-	-	-
Cirrus	Electronic Calibrator	CR 515	74765	14/07/17

7.1.2 The following set-up parameters were used on the sound level meters during all noise measurements:

Time Weighting: Fast
Frequency Weighting: A
Measurement Period: 15 minutes

7.2 Calibration

7.2.1 The sound level meters were calibrated with the electronic calibrator prior to commencement and on completion of the surveys. No significant drift (i.e. no greater than ±0.5 dB) in the calibration value was observed between the initial and final checks.

7.3 Survey Dates and Personnel

7.3.1 Noise levels were measured between 10:15 hours and 12:30 hours on 21 February 2018. The surveys were conducted by Mr A Findlay of Vibrock Limited.

7.4 Meteorological Conditions

7.4.1 Weather conditions were noted during the survey periods.

Wednesday 21 February 2018

7.4.2 At the start of the survey there was 40% high, thin, cloud cover and bright conditions. Winds were virtually non existent at this time and the temperature was around 3°C. In the final 30 minutes of the survey, when the temperature had increased to 5°C, a light southerly wind was present, having speeds in the range 2 to 3 ms^{-1}. There was no precipitation during the monitoring.

8.0 RESULTS

8.1 Summaries of the noise survey results of the existing noise levels around the proposed development are presented in Table 1.

8.2 Typical sound power levels of plant used in the noise predictions are presented in Table 2.

8.3 The results of the noise prediction calculations together with an assessment are presented in Table 3.

9.0 DISCUSSION

9.1 Introduction

9.1.1 Summaries of the worst-case noise level predictions from the proposed working in the extension area to each of the two receptor locations are given in Tables 3.1 and 3.2, together with an indication as to the difference between the predicted and measured existing levels and the criteria in the extant planning permission, which reflects the limit recommended in PAN 50.

9.1.2 A series of predictions have also been undertaken to a point on the National Cycle Route No. 7 and to points on the recognised core footpath that runs, initially, west from the A889 across the moor towards Feagour.

9.1.3 For the purposes of the noise prediction calculations it has been assumed that there would be 6 lorry movements / 3 loads during the 1-hour assessment period considered.

9.1.4 The results of the noise prediction calculations shown in Tables 3.1 – 3.5, in all cases, allow for HGV movements and a wheeled loading shovel filling these vehicles within the quarry, plus rock processing with crushers and screens; nominally referred to as routine operations. The other operation considered is the intermittent drilling of blast shot holes.

9.2 Allt an t'Sluic Lodge

Existing Ambient Noise Levels

9.2.1 This receptor is located some 1 km west of the quarry, access being gained from the A889. There are several outbuildings at the property.

9.2.2 The sound level meter was positioned at the edge of the garden area, south of the kennels that were positioned on the opposite side of the surfaced area.

9.2.3 During the survey period the noise sources that contributed to the measured levels were very distant traffic, thought to be originating from the A9 to the south, water flow noise from the Allt an t'Sluic burn that was some 60 m to the south and noise from free roaming turkeys. In addition, when the occasional vehicle arrived at the property the dogs in the kennels barked for a few minutes.

9.2.4 Referring to Table 1.1, the average weekday daytime background noise level, L_{A90}, was 41 dB, with measurements in the range 40.5 to 41.7 dB(A). The corresponding average weekday daytime $L_{Aeq,2h}$ was 52 dB comprising 15-minute measurements in the range 42.4 to 58.0 dB(A).

Predicted Operational Noise Levels

9.2.5 Table 3.1 presents the results of the noise prediction calculations and a comparison with PAN 50 noise criterion.

9.2.6 As shown on Table 3.1, the level predicted from the initial soil and overburden strip, with associated perimeter mound construction, is 33 dB $L_{Aeq,1h}$, a level significantly below the PAN 50 temporary operation criterion; 70 dB $L_{Aeq,1h}$.

9.2.7 The range of predicted levels from routine operations is 37 to 38 dB $L_{Aeq,1h}$, increasing by 3 or 4 dB(A) during the brief periods when drilling is taking place. All of the predicted levels easily satisfy the 51 dB $L_{Aeq,1h}$ criterion that is derived from the existing background level plus 10 dB, as detailed in PAN 50.

9.3 Distillery House, Dalwhinnie

Existing Ambient Noise Levels

9.3.1 This receptor, as suggested by the name, is located close to Dalwhinnie distillery and is one of several dwellings positioned close to the commercial operation. It is south of the quarry, the minimum separation distance being some 700 m.

9.3.2 At this receptor the sound level meter was positioned to the east of the properties garden, on the grass verge of the access road that leads to the other cottages at the distillery. This position was chosen to screen as far as possible noise generated by maintenance work taking place at the distillery.

9.3.3 Noise audible during the survey period included traffic on the nearby roads, trains, bird song and the maintenance work referred to above. This was particularly noticeable during the final three 15-minute periods.

9.3.4 As shown in Table 1.2, the average weekday daytime background noise level, L_{A90}, at this receptor was 40 dB, with individual 15-minute measurements in the range 37.6 to 42.5 dB(A). The corresponding average weekday daytime $L_{Aeq,2h}$ was 50 dB with individual measurements in the range 43.3 to 52.6 dB(A).

Predicted Operational Noise Levels

9.3.5 The initial soil and overburden handling work that includes the construction of the perimeter screening mound is predicted to result in a received level of 37 dB $L_{Aeq,1h}$. This easily meets the 70 dB $L_{Aeq,1h}$ limit suggested as being appropriate for such temporary operations in the latest guidance.

9.3.6 Routine operations, which exclude drilling, are predicted to give rise to noise levels of 34 to 35 dB $L_{Aeq,1h}$, which are all below the measured background level. On the limited occasions when drilling is underway, typically 3 to 4 days before each blast, the levels increase to a maximum of 42 dB $L_{Aeq,1h}$, which although slightly higher than the measured average background level is well below the PAN 50 derived criterion of 50 dB $L_{Aeq,1h}$.

9.4 National Cycle Route 7

Existing Ambient Noise Levels

9.4.1 A nominal point on the National Cycle Route 7, some 1 km north east of the Dalwhinnie distillery was chosen as a representative location.

9.4.2 The instrument was located at the rear of a lay-by on General Wade's Military Road that runs from Dalwhinnie to Crubenmore.

9.4.3 The noise sources that contributed to the recorded levels were traffic passing the monitoring location on the minor road, distant traffic on the A9 and occasional train passes.

9.4.4 Referring to Table 1.3, the average weekday daytime background noise level, L_{A90}, was 42 dB, with measurements in the range 40.3 to 43.5 dB(A). The corresponding average weekday daytime $L_{Aeq,1h}$ was 58 dB comprising 15-minute measurements in the range 50.5 to 60.7 dB(A).

Predicted Operational Noise Levels

9.4.5 This receptor location is assessed against the public open space criterion suggested in PAN 50; 65 dB $L_{Aeq,1h}$. As shown in Table 3.3, the highest predicted level is 38 dB $L_{Aeq,1h}$ significantly below this recommended value.

9.4.6 The acoustic model has been interrogated to get an understanding of where the 65 dB $L_{Aeq,1h}$ would be achieved. The worst case would occur when drilling was taking place, as the noise source is in an elevated position. However, even in these limited cases the public open space noise criterion, because of the perimeter screening, does not extend any significant distance outside the site. For example, with drilling taking place in the south east corner of Phase 1 the 65 dB $L_{Aeq,1h}$ criterion would be satisfied 60 m from the boundary.

9.5 Footpath

9.5.1 On the opposite side of the A889 to the quarry entrance is part of the Dalwhinnie to Feagour Core footpath. The route, initially, heads west from the public highway. No background or ambient noise survey was undertaken at this receptor location, as the PAN 50 guidance does not relate the allowable noise level to the pre-existing background level.

Predicted Operational Noise Levels

9.5.2 During the initial soil and overburden strip with associated construction of the western perimeter mound immediately north of the quarry access point the predicted level at the closest point on the footpath is 55 dB $L_{Aeq,1h}$, falling to 49 dB $L_{Aeq,1h}$ at a point 100 m from the A889. Both of these levels are comfortably below the temporary operation criterion given in PAN 50 Annex A; 70 dB $L_{Aeq,1h}$.

9.53 At the footpath adjacent to the A889 the range of predicted levels from routine operations is 50 to 51 dB $L_{Aeq,1h}$, increasing by no more than 2 dB when the intermittent drilling takes place. Levels 5 or 6 dB lower will be received at a notional point on the route some 100 m west of the A889 when compared to those experienced at footpath beside the A889. All of the predicted levels are well below the guidance criterion for public open spaces, 65 dB $L_{Aeq,1h}$.

10.0 CONCLUSIONS

10.1 A visual survey of the proposed development area has been made and existing ambient noise levels measured at three noise sensitive locations around the proposed development. Measurements were made in terms of L_{Aeq}, L_{A90}, L_{A10} and L_{Amax} thus enabling the existing noise climate to be characterised.

10.2 A series of noise predictions, based upon BS 5228: 2009 and including the assumptions embodied in Section 5 of this report, have been made to two of the closest residential locations around the proposed quarry, plus to a point on the national Cycle Route 7 and to points on the core footpath. In respect of the residential properties the predicted levels have been assessed against the existing noise level and the criteria given in PAN 50 Annex A. The predicted levels on the National Cycle Route and at the core footpath have been assessed against the public open space criterion in PAN 50 Annex A.

10.3 It should be noted that all the predicted noise levels in this report refer to worst-case scenarios, when operations are undertaken at their closest distance / highest topographic position to sensitive receptors and therefore have the greatest influence on the noise levels at these locations. These worst-case noise scenarios may only last for a few weeks or even days throughout the envisaged working life of the proposed extension area.

10.4 From the results discussed in earlier sections it is apparent that calculated worst-case noise levels from quarrying operations will not exceed the noise criteria given in PAN 50 Annex A for the control of noise at surface mineral workings.

11.0 RECOMMENDATIONS

11.1 The following are recommended as positive statements of the maximum noise levels which could be permitted in accordance with PAN 50 Annex A:

11.2 During the normal daytime working hours the free-field Equivalent Continuous Noise Level ($L_{Aeq,1h}$) for the period due to quarry operations, excluding soil and overburden handling activity and other works in connection with landscaping, at Dalwhinnie Quarry Extension shall not exceed the higher of existing background level plus 10 dB(A) or 45 dB $L_{Aeq,1h}$ free field as recorded at any existing noise sensitive property.

11.3 Soil and overburden handling and other works in connection with landscaping shall not exceed 70 dB $L_{Aeq,1h}$ free field at any existing noise sensitive property and be limited to a period not exceeding 8 weeks at any one property.

12.0 REFERENCES

1. Planning Advice Note (PAN) 50, Annex A: The Control of Noise at Surface Mineral Workings.

2. British Standard 5228 Part 1: 2009 Code of practice for noise and vibration control on construction and open sites. British Standards Institution, 2009.

3. British Standard 8233: 2014 Guidance on sound insulation and noise reduction for buildings. British Standards Institution, February 2014.

4. Guidelines for Community Noise, World Health Organisation.

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

INDEX TO TABLES

TABLE 1

Table 1.1

Results of Existing Noise Level Surveys
Dalwhinnie Quarry, Highland

Location No. 1: Allt an t'Sluic Lodge

Date: 21 February 2018

Start Time	Duration (mins)	Statistical Parameters dB(A)			
		L_{eq}	L_{10}	L_{90}	L_{max}
10:15	15	42.4	43.6	40.5	54.9
10:30	15	58.0	43.6	40.5	85.3
10:45	15	52.9	46.0	41.7	83.0
11:00	15	51.8	45.0	40.9	75.4
11:15	15	50.3	46.9	40.9	72.9
11:30	15	42.7	43.8	40.9	50.6
11:45	15	45.6	43.5	40.6	78.2
12:00	15	53.0	44.3	41.1	82.7
Average during survey period		**52**	**45**	**41**	**85.3***

* Highest L_{Amax} during survey period

Table 1.2

Results of Existing Noise Level Surveys
Dalwhinnie Quarry, Highland

Location No. 2: Distillery House, Dalwhinnie

Date: 21 February 2018

Start Time	Duration (mins)	Statistical Parameters dB(A)			
		L_{eq}	L_{10}	L_{90}	L_{max}
10:30	15	46.3	46.3	40.0	63.8
10:45	15	51.1	55.8	40.3	66.7
11:00	15	43.3	45.3	37.6	56.8
11:15	15	50.1	44.4	37.8	84.9
11:30	15	45.0	46.1	38.7	64.3
11:45	15	49.6	47.6	42.1	68.2
12:00	15	50.6	48.7	42.5	70.1
12:15	15	52.6	50.7	41.7	70.5
Average during survey period		**50**	**48**	**40**	**84.9***

Table 1.3

Location No. 3: National Cycle Route 7

Date: 21 February 2018

Start Time	Duration (mins)	Statistical Parameters dB(A)			
		L_{eq}	L_{10}	L_{90}	L_{max}
10:45	15	57.3	51.7	43.5	82.2
11:00	15	50.5	46.1	41.1	76.7
11:15	15	58.1	47.5	40.3	82.9
11:30	15	60.7	49.5	41.6	87.3
Average during survey period		**58**	**49**	**42**	**87.3***

* Highest L_{Amax} during survey period

TABLE 2

List of Plant and Sound Power Levels
Dalwhinnie Quarry, Highland

Plant Description	Quantity	Sound Power Level (dB(A))
Soil and Overburden Handling		
Excavator	1	106
Bulldozer	1	111
Articulated Dumptruck	6 loads per hour	111
Drilling		
Drill Rig and Compressor	1	118
Mineral Processing		
Jaw Crusher	1	118
Cone Crusher	1	113
Screens	2	110
Excavator	1	106
Wheeled Loading Shovel	1	106
Wheeled Loading Shovel Filling HGV's	1	115
Road Lorry's	3 loads per hour	105

TABLE 3

Table 3.1

Summary of Worst-case Predicted Noise Levels
Dalwhinnie Quarry, Highland

Location No. 1: Allt an t'Sluic Lodge

Description of Operation	Existing Noise Levels dB(A)		Predicted Worst Case dB $L_{Aeq,1h}$	Difference dB(A)	
	L_{Aeq}	L_{A90}		Existing L_{Aeq}	PAN 50 Criteria *
Initial soil and overburden strip with associated screening bund formation	52	41	33	-19	-37
Phase 1 - Routine Operations	52	41	37	-15	-14
Phase 1 - Routine Operations plus Drilling	52	41	41	-11	-10
Phase 2 - Routine Operations	52	41	37	-15	-14
Phase 2 - Routine Operations plus Drilling	52	41	41	-11	-10
Phase 3 - Routine Operations	52	41	38	-14	-13
Phase 3 - Routine Operations plus Drilling	52	41	41	-11	-10

* Assessed against levels of:

70 dB $L_{Aeq,1h}$ for soil and overburden handling
The higher of background level + 10 dB or45 dB $L_{Aeq,1h}$ for routine operations

Table 3.2

Summary of Worst-case Predicted Noise Levels
Dalwhinnie Quarry, Highland

Location No. 2: Distillery House, Dalwhinnie

Description of Operation	Existing Noise Levels dB(A)		Predicted Worst Case dB $L_{Aeq,1h}$	Difference dB(A)	
	L_{Aeq}	L_{A90}		Existing L_{Aeq}	PAN 50 Criteria
Initial soil and overburden strip with associated screening bund formation	50	40	37	-13	-33
Phase 1 - Routine Operations	50	40	35	-15	-15
Phase 1 - Routine Operations plus Drilling	50	40	42	-8	-8
Phase 2 - Routine Operations	50	40	35	-15	-15
Phase 2 - Routine Operations plus Drilling	50	40	40	-10	-10
Phase 3 - Routine Operations	50	40	34	-16	-16
Phase 3 - Routine Operations plus Drilling	50	40	39	-11	-11

* Assessed against levels of:

70 dB $L_{Aeq,1h}$ for soil and overburden handling
The higher of background level + 10 dB or45 dB $L_{Aeq,1h}$ for routine operations

Table 3.3

Summary of Worst-case Predicted Noise Levels
Dalwhinnie Quarry, Highland

Location No. 3: National Cycle Route 7

Description of Operation	Existing Noise Levels dB(A)		Predicted Worst Case dB $L_{Aeq,1h}$	Difference dB(A)	
	L_{Aeq}	L_{A90}		Existing L_{Aeq}	PAN 50 Criteria
Initial soil and overburden strip with associated screening bund formation	58	42	32	-26	-38
Phase 1 - Routine Operations	58	42	33	-25	-32
Phase 1 - Routine Operations plus Drilling	58	42	37	-21	-28
Phase 2 - Routine Operations	58	42	35	-23	-30
Phase 2 - Routine Operations plus Drilling	58	42	38	-20	-27
Phase 3 - Routine Operations	58	42	35	-23	-30
Phase 3 - Routine Operations plus Drilling	58	42	38	-20	-27

* Assessed against levels of:

70 dB $L_{Aeq,1h}$ for soil and overburden handling
65 dB $L_{Aeq,1h}$ for routine operations

Table 3.4

Summary of Worst-case Predicted Noise Levels
Dalwhinnie Quarry, Highland

Location No. 4: Core Footpath at A889

Description of Operation	Predicted Worst Case dB $L_{Aeq,1h}$	Difference dB(A) to PAN 50 Criteria*
Initial soil and overburden strip with associated screening bund formation	55	-15
Phase 1 - Routine Operations	51	-14
Phase 1 - Routine Operations plus Drilling	53	-12
Phase 2 - Routine Operations	50	-15
Phase 2 - Routine Operations plus Drilling	52	-13
Phase 3 - Routine Operations	50	-15
Phase 3 - Routine Operations plus Drilling	51	-14

* Assessed against levels of:

70 dB $L_{Aeq,1h}$ for soil and overburden handling
65 dB $L_{Aeq,1h}$ for routine operations

Table 3.5

Summary of Worst-case Predicted Noise Levels
Dalwhinnie Quarry, Highland

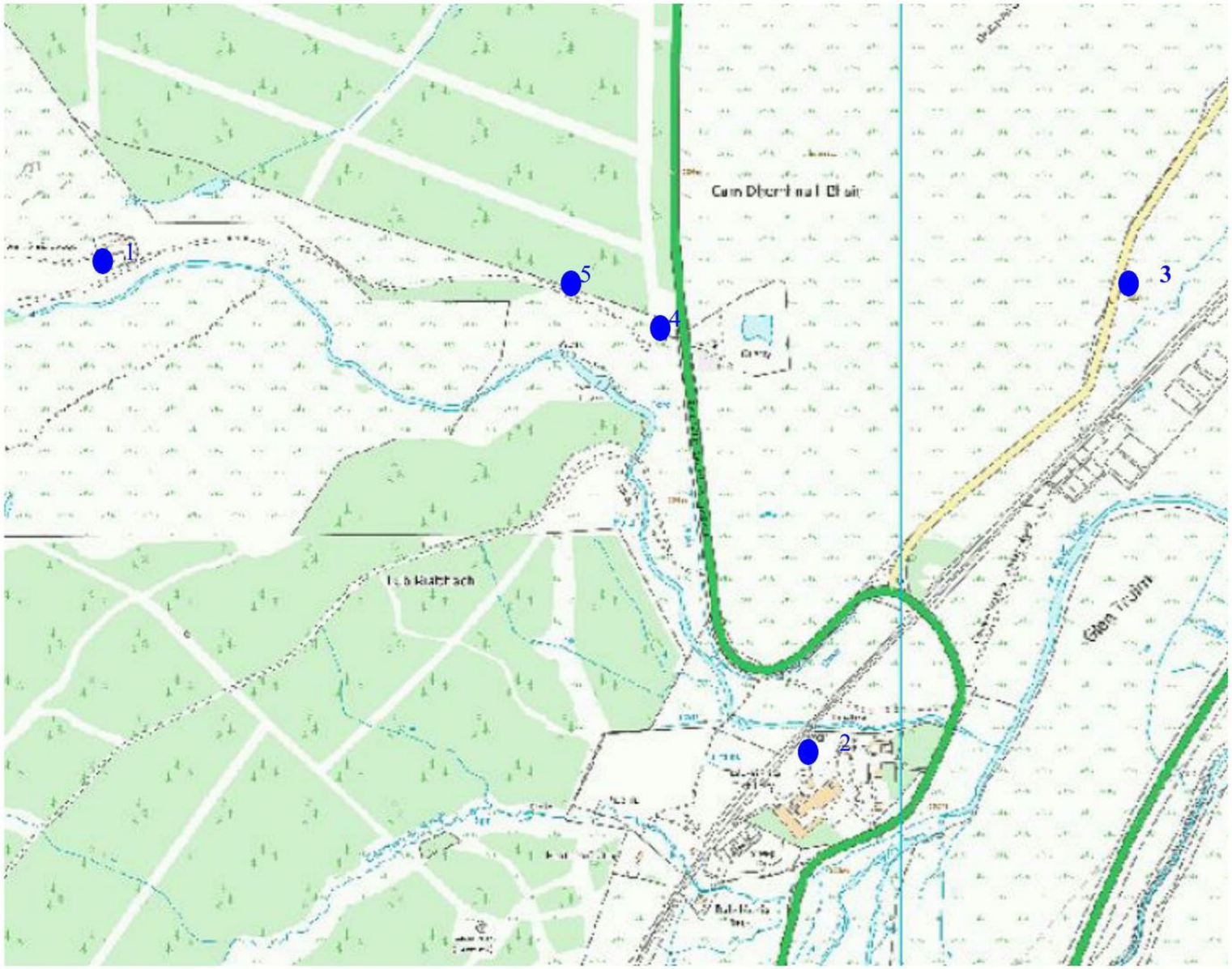
Location No. 5: Core Footpath 100 m from A889

Description of Operation	Predicted Worst Case dB $L_{Aeq,1h}$	Difference dB(A) to PAN 50 Criteria*
Initial soil and overburden strip with associated screening bund formation	49	-21
Phase 1 - Routine Operations	46	-19
Phase 1 - Routine Operations plus Drilling	48	-17
Phase 2 - Routine Operations	45	-20
Phase 2 - Routine Operations plus Drilling	47	-18
Phase 3 - Routine Operations	44	-21
Phase 3 - Routine Operations plus Drilling	46	-19

* Assessed against levels of:

65 dB $L_{Aeq,1h}$ for routine operations
70 dB $L_{Aeq,1h}$ for soil and overburden handling

FIGURE 1 – NOISE RECEPTORS



Receptors

1	Allt an t'Sluic Lodge
2	Distillery House, Dalwhinnie
3	National Cycle Route 7
4	Core Footpath at A889
5	Core Footpath 100m from A889