11.0 Noise

11.1 Introduction

11.1.1 The noise impact assessment of the proposed water bottling plant is based upon the noise impact assessment of the previous proposal for the site with the road traffic noise assessment revised to reflect the new access road location and the proposal to provide access to the site through a tunnel, and the removal of proposals for a heritage centre.

11.2 Site Description

11.2.1 The proposed development is to be located on the site of a disused quarry situated between Cowdale and Staden, south-east of Buxton. The site is bounded to the north by the A6 and a railway line running in the deep dale of the river Wye. Beyond the road and railway line is another working quarry.

11.2.2 To the south-west of the site is open land then a small number of farms and residences at Staden. South-east of the site is the village of Cowdale.

11.2.3 The topography of the site is unusual in that the former quarry has left a level site cut into the side of the hill, such that there are cliffs surrounding the site on all sides with the exception of a small section alongside the A6 and a steep path leading down from the eastern side near Cowdale.

11.2.4 Line of sight from the floor of the site to Cowdale and Staden is obscured by cliffs between 15m and 20m high.

11.3 Noise Assessment Criteria

National Planning Policy Framework

11.3.1 The National Planning Policy Framework states the following with regard to local planning policy and taking planning decisions:

> ***"14. At the heart of the National Planning Policy Framework is a presumption in favour of sustainable development, which should be seen as a golden thread running through both plan-making and decision-taking.***
>
> ***For plan-making this means that:***
>
> - ***local planning authorities should positively seek opportunities to meet the development needs of their area;***
> - ***Local Plans should meet objectively assessed needs, with sufficient flexibility to adapt to rapid change, unless:***
>   - ***any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in this Framework taken as a whole; or***
>   - ***specific policies in this Framework indicate development should be restricted***
>
> ***For decision-taking this means:***

- ***approving development proposals that accord with the development plan without delay; and***
- ***where the development plan is absent, silent or relevant policies are out-of-date, granting permission unless:***
    - ***any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in this Framework taken as a whole; or***
    - ***specific policies in this Framework indicate development should be restricted.***

11.3.2 With regard to noise, the Framework states the following:

''Planning policies and decisions should aim to:

- ***avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;***
- ***mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;***
- ***recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and***
- ***identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.''***

11.3.3 The terms 'significant adverse impact' and 'other adverse impacts' are defined in the explanatory notes of the 'Noise Policy Statement for England (NPSE) which states;

''There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:

<u>NOEL – No Observed Effect Level</u>

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

<u>LOAEL – Lowest Observed Adverse Effect Level</u>

This is the level above which adverse effects on health and quality of life can be detected.2.21

Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

<u>SOAEL – Significant Observed Adverse Effect Level</u>

This is the level above which significant adverse effects on health and quality of life occur.''

11.3.4 The notes also offer an explanation of the term 'other adverse impacts' as follows;

> ***"… refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development (paragraph 1.8). This does not mean that such adverse effects cannot occur."***

11.3.5 It should be noted that no specific noise limits for LOAEL and SOAEL have been defined, however, guidance from other acoustic standards may be employed to determine suitable levels within the overall principal of the National Planning Policy Framework.

BS4142:1997

11.3.6 The effect of industrial noise on the nearest noise sensitive residence will be assessed in accordance with BS4142:1997 – 'Method for rating industrial noise affecting mixed residential and industrial areas'.

11.3.7 This standard describes a method of determining the level of a noise, together with procedures for assessing whether the noise in question is likely to give rise to complaints from persons living in the vicinity.

11.3.8 Briefly the standard may be thought of as a procedure for comparing the noise from industrial sources with background noise levels in the absence of the industrial noise and determining the likelihood of complaints.

11.3.9 In accordance with BS 4142 the background noise level is the A-weighted sound pressure level at the assessment position that is exceeded for 90% of a given time interval (L_{A90}). The specific noise level is the equivalent continuous (L_{Aeq}) sound pressure level at the assessment position produced by the noise source over a given time interval.

11.3.10 Certain acoustic features can increase the likelihood of complaint over that expected from a simple comparison between the specific noise level and the background level. Where such features are present, these are taken into account by adding 5 dB to the specific noise level this is called the rating level.

11.3.11 This 5 dB correction should be applied if one or more of the following features occur, or are expected to be present.

- The noise contains a distinguishable, discrete, continuous tone (whine, hiss, screech, hum, etc.)
- The noise contains distinct impulses (bangs, clicks, clatters, or thumps)
- The noise is irregular enough to attract attention.

11.3.12 From the above the rating level is established, this being the value that is compared with the background noise.

According to BS 4142 a rating level of:

- 10 dB(A) or more above the background is an indication that complaints, attributable to the operation of the noise source, are likely.

- 5 dB(A) above the background is of marginal significance.
- 10 dB(A) below the background is a positive indication that complaints attributable to the operation of the noise source are unlikely.

11.3.13 BS4142 indicates that the noise source should be evaluated over the appropriate time interval which is as follows:

- 1h during the day
- 5 min during the night

11.3.14 It should be noted however BS4142 does not give specific time periods that constitute day or night-time. Instead it states that the night period should cover the times when the general adult population are preparing for sleep or are actually sleeping.

11.3.15 It is generally accepted that the night-time period runs from 23:00 to 07:00 and the daytime period runs from 07:00 to 23:00.

BREEAM New Construction 2011

11.3.16 The BREEAM scheme is a scheme for the design and assessment of sustainable buildings devised by the UK Building Research Establishment. In the BREEAM scheme a number of design standards are defined to allow buildings to be designed and built in a sustainable manner. With regard to noise pollution from buildings the most recent BREEAM 2011 standard awards sustainability credits to buildings where the specific noise from a building does not exceed the background noise level by more than 5 dB during the day or 3 dB during the night, when assessed at nearby noise sensitive properties. This ties in with the assessment method of BS4142 and suggests that buildings with noise rating levels less than 5 dB above background during the day and less than 3 dB above background during the night are sustainable with respect to noise emissions. In accordance with the National Planning Policy Framework it is presumed that sustainable developments will be permitted.

World Health Organisation Guidelines on Community Noise

11.3.17 The World Health Organisation (WHO) Guidelines on Community Noise give noise criteria for residences above which noise may be considered to have an adverse effect on residents. It should be borne in mind that these are not mandatory limits and many residences are located in areas where these noise levels may be regularly exceeded. The noise levels outside residences are those relevant to this development and they are detailed in the table below:

Table 11.1 - WHO Guideline values for community noise

Specific environment	Critical health effect(s)	L_{Aeq} (dB)	Time base (hours)
Outdoor Living Area	Serious annoyance, daytime and evening	55	16
	Moderate annoyance, daytime and evening	50	16
Outside Bedrooms	Sleep disturbance, window open (outdoor values outside open bedroom windows)	45	8
Dwelling Indoors	Speech intelligibility & moderate annoyance, daytime and evening	35	16

Inside bedrooms	Sleep disturbance, night-time	30	8

Design Manual for Roads and Bridges

11.3.18 The Design Manual for Roads and Bridges (DMRB), Volume 11 'Environmental Assessment', Section 3 'Environmental Assessment Techniques', Part 7 'Noise and Vibration', provides guidance on the impacts that road projects may have on levels of noise and vibration.

11.3.19 The DMRB advice states that road traffic noise impact should be assessed using the methodology given in the Calculation of Road Traffic Noise (CRTN) which is the standard method for calculating noise from a road in the UK.

11.3.20 CRTN predicts noise levels due to new roads in terms of the $L_{A10,18h}$ parameter. In Annex 2 of DMRB it is stated that research has shown that;

> ***'In the period following a change in traffic flow, people may report positive or negative benefits when changes are as small as 1 dB(A).'***

11.3.21 DMRB also gives tables describing the magnitude of impact of changes in the $L_{A10,18h}$ noise level as follows;

Table 11.2 – Impacts of changes in road traffic noise in the short term

Noise change, $L_{A10,18h}$	Magnitude of Impact
0	No change
0.1 – 0.9	Negligible
1 – 2.9	Minor
3 – 4.9	Moderate
5 +	Major

Table 11.3 – Impacts of changes in road traffic noise in the long term

Noise change, $L_{A10,18h}$	Magnitude of Impact
0	No change
0.1 – 2.9	Negligible
3 – 4.9	Minor
5 – 9.9	Moderate
10 +	Major

11.3.22 For noise impacts at night DMRB states that only noise impacts in the long term (Table 11.3) should be considered.

Calculation of Road Traffic Noise

11.3.23 Calculation of Road Traffic Noise (CRTN) is the standard method for calculating noise from a road in the UK.

11.3.24 CRTN calculates road traffic noise by using a mathematical formula taking into account the traffic flow rate, speed, percentage of Heavy Goods Vehicles, gradient, road

surface, propagation distance, screening, ground cover and reflections. The CRTN calculation method is limited to roads with moderate to high vehicle flow rates (≥ 50 vehicles per hour for each hour between 6am and midnight). For flow rates lower than this the standard recommends traffic noise levels are determined by measurement.

BS 5228:2009 Code of practice for noise and vibration control on construction and open sites

11.3.25 BS5228 gives guidance on noise control for sites where noisy work is performed outdoors such as during construction projects. The guidance recommends that the developer submits a construction noise management plan which shows predicted noise levels, impacts and impact durations on noise sensitive properties for each construction stage and determines remedial measures or limits on operations where appropriate. Following agreement of the construction plan with the Local Planning Authority and a programme of information and consultation with the affected property owners the construction work is performed in accordance with the agreed plan. Often for larger construction projects noise monitoring is carried out periodically during the construction process to ensure that the predicted noise levels are being adhered to.

11.3.26 With regard to the impact of construction noise on a noise sensitive residence the standard gives two example methods of how the impact should be calculated. These two methods are detailed below:

E.3.2 Example method 1 – The ABC method

Table E.1 shows an example of the threshold of significant effect at dwellings when the total noise level, rounded to the nearest decibel, exceeds the listed value. The table can be used as follows: for the appropriate period (night, evening/weekends or day), the ambient noise level is determined and rounded to the nearest 5 dB. This is then compared with the total noise level, including construction. If the total noise level exceeds the appropriate category value, then a significant effect is deemed to occur.

Table E.1 **Example threshold of significant effect at dwellings**

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

NOTE 1 A significant effect has been deemed to occur if the total L_{Aeq} noise level, including construction, exceeds the threshold level for the Category appropriate to the ambient noise level.

NOTE 2 If the ambient noise level exceeds the threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a significant effect is deemed to occur if the total L_{Aeq} noise level for the period increases by more than 3 dB due to construction activity.

NOTE 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 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 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.

E.3.3 Example method 2 – 5 dB(A) change

Noise levels generated by construction activities are deemed to be significant if the total noise (pre-construction ambient plus construction noise) exceeds the pre-construction ambient noise by 5 dB or more, subject to lower cut-off values of 65 dB, 55 dB and 45 dB $L_{Aeq, Period}$, from construction noise alone, for the daytime, evening and night-time periods, respectively; and a duration of one month or more, unless works of a shorter duration are likely to result in significant impact.

These evaluative criteria are generally applicable to the following resources:

- *residential housing;*
- *hotels and hostels;*
- *buildings in religious use;*
- *buildings in educational use;*
- *buildings in health and/or community use.*

For public open space, impact might be deemed to be significant if the total noise (pre-construction ambient plus construction noise) exceeds the pre-construction ambient noise ($L_{Aeq, Period}$) by 5 dB or more.

11.4 Survey Details

11.4.1 An ambient noise survey was carried out in the vicinity of the proposed development to determine the existing noise levels at nearby noise sensitive properties. Measurements were taken over a full 24 hours. It should be noted that the A6 running past the site was closed for work to stabilise the rock face above the road during the time when the survey was carried out. As the purpose of the survey is to determine the ambient noise climate in the absence of the development, we would consider the measurements to be conservative and would expect our measurements to predict a somewhat greater noise impact due to the new development than the 'normal' case when the A6 is open.

Measurement Procedure

Survey times

11.4.2 The ambient noise survey was made from 08:45 on 9th February 2010 until 07:30 on 10th February 2010. The survey was fully attended by Mr Liam Kavaney and Miss Lucy Bowden both of PDA Ltd.

Measurement Locations

11.4.3 Measurements for the ambient noise survey were taken from two positions. Position 1 was at the end of Staden Lane nearest to the site. Position 2 was in Cowdale where the road through Cowdale joins the track leading down to the site. The houses adjacent to the two measurement positions are the nearest noise sensitive properties to the proposed development.

Measurement Equipment

11.4.4 The survey was conducted using a CEL Instruments 593 sound level meter. The CEL 593 sound level meter is a precision grade 1 (as per BS EN 60651: 1994 and IEC 651) computing sound level meter capable of operating as an integrating sound level meter complying with BS EN 60204: 1994 (IEC 804). The meter was set to measure both linear and 'A' weighted octave band sound pressure levels and the time weighting was set to fast response. The microphone was of the 'free field' type. In additional a range of statistical indicators was also measured. The meter was field calibrated before, after and during the survey as required, during which time no significant calibration drift was observed.

Description of Noise Sources

Position 1 – Staden Lane

11.4.5 Morning 0700 – 1200

Distant traffic audible throughout. Some banging from machinery at nearby farms. Stone crushing from quarry across A6 subjectively quite loud for approximately 1½ hours. Other noises from quarry occasionally audible. Occasional traffic on local roads and farm vehicles muck spreading audible. Aircraft pass overhead regularly. At quieter periods distant humming could be heard.

11.4.6 Afternoon 1200 – 1800

Distant traffic and distant humming audible throughout. Local traffic occasionally and noises from within nearby residences. Aircraft pass overhead regularly. Tractors and occasionally motorcycles audible in fields. Wind in trees audible.

11.4.7 Evening 1800 – 2300

Distant and occasionally local traffic audible. Regular aircraft overhead. Some noise from nearby residences. Occasional trains can be heard. Humming noise apparently from nearby industrial sites (Tunstead Limestone works and Hillhead / Buxton / Hindlow quarries). Humming more dominant later into the measurement. Dog barking nearby towards late evening.

11.4.8 Night 2300 – 0700

Distant humming from industrial sites audible throughout. Wind in trees nearby and occasional traffic and aircraft flights overhead.

Position 2 – Cowdale

11.4.9 Morning 0700 – 1200

Distant humming from industrial sites audible. Occasional local traffic and aircraft overhead. Stone crushing from quarry across A6 subjectively quite loud for approximately 1 ½ hours. Occasional bangs from nearby farms and noises from people entering and leaving nearby houses.

11.4.10 Afternoon 1200 – 1800

Distant humming from industrial sites. Wind in trees. Motorbike in nearby fields and occasional local traffic. Regular aircraft overhead. Tractors working in fields and nearby farms. Humming noise from farm in Cowdale late afternoon.

11.4.11 Evening 1800 – 2300

Distant humming from industrial sites constant. Regular aircraft overhead. Occasional cars on local roads and distant traffic audible. Distant crowd noise (like a sports ground) audible for a time.

11.4.12 Night 2300 – 0700

Constant humming from industrial sites audible throughout. Becomes dominant noise in quieter periods. Wind noise in trees and occasional aircraft overhead.

Measured Results

11.4.13 The ambient noise survey results are summarised in Table 11.4 below:

Table 11.4 – Summary of ambient noise measurements

Measurement location	Daytime noise level (0700 – 2300)		Night time noise level (2300 – 0700)	
	L_{Aeq} [dB]	L_{A90} [dB]	L_{Aeq} [dB]	L_{A90} [dB]
Position 1 (Staden Lane)	51	33 – 45	40	30 – 39
Position 2 (Cowdale)	50	36 – 47	47	33 – 41

11.4.14 Full measurement results are included in appendix 11.1 to this report.

11.5 Operational Impact of Proposed Development

11.5.1 The proposed development consists of a bottling plant for bottled water with associated storage space. The proposed development also incorporates a new access road to access the site incorporating a tunnel from the A6 and an access road in a cutting following the south-western edge of the floor of the former quarry.

11.5.2 Road traffic noise due to the bottling plant and loading / unloading noise are considered in Section 11.6.

Plant description

11.5.3 The bottling plant is to consist of a bottling and storage facility for spring water. The main processes housed within the factory will be pumps to deliver the water and a bottling line for plastic water bottles and a warehouse for storage. Internal noise sources will be the bottling line itself (including 'blowing' and labelling the bottle blanks) and associated conveyors plus the operation of fork-lifts within the warehouse. Bottles will be delivered to the site as un-blown blanks which will be heated and blown to shape in a die using compressed air. Externally noise sources will be compressor intakes for the bottle blowing process and chillers associated with the compressors.

Calculation method

11.5.4 Noise due to the bottling plant at the nearest noise sensitive residences has been calculated using the methods of ISO 9613-2 "Acoustics – Attenuation of sound during propagation outdoors – General method of calculation" using 'Soundplan' acoustic modelling software. ISO 9613 takes into account attenuation due to geometrical spreading, barrier attenuation, ground absorption and atmospheric attenuation and also accounts for reflections in hard surfaces such as the cliffs and areas of hard ground.

11.5.5 A model of the site has been constructed in 'Soundplan' software using a digital terrain model of the site and surrounding receivers to accurately calculate propagation paths and barrier, ground and reflection effects due to the unusual terrain. The entire western end of the quarry (including the cliff faces) has been set as hard reflective ground to account for ground reflections in the hard stand near to the proposed plant and in the cliff faces. The remainder of the ground has been left as soft ground as the remaining area between the development and noise sensitive residences is grassland.

11.5.6 In order to model the noise break-out from the bottling plant we have taken the very conservative assumption that internal noise levels within the plant and associated warehouse, will be at the lower action value limit (the point at which hearing protection must be provided) of the Control of Noise at Work Regulations. We have taken noise measurements from a much noisier industrial process (plastics recycling including shredding and bailing of plastics waste) which are at the lower action value of the Control of Noise at Work Regulations, and assumed that the entire internal space within the proposed plant is operating at these levels. This is a very conservative model of the noise levels likely within the development as noise due to the bottling line may be expected to be well below this level, and a large proportion of the building will be taken up by storage which would not generate any noise at all, other than the operation of electric fork-lift trucks. It must be ensured in the detailed design that these noise limits (shown in Table 11.7) are not exceeded within the general factory space, by application of suitable engineering noise control techniques to the production plant. In practice this will be easily achievable, using enclosures for example to enclose any noisy plant areas.

11.5.7 We have used manufacturers sound insulation data and Insul® sound insulation prediction software to determine the sound insulation of the proposed building envelope and have used the adopted internal noise levels to calculate intensity of sound breaking out through the building structure. This has been entered as an area source covering the roof and proposed walls of the building in the Sound plan model.

11.5.8 The fixed external noise sources associated with the building are the compressor intakes and associated chillers. The compressor intake louvres have been modelled in the Soundplan model as sources attached to the side of the building at the western end of the north-facing façade of the building and the chillers have been modelled as point sources outside the building between the north façade and the quarry wall. The area and noise level of the compressor intake louvres and the number and sound power level of the chillers has been calculated by comparison with a similar plastic bottling plant and applying a scaling factor for the plant capacity.

11.5.9 In addition to the above fixed sources we have modelled noise due to the loading of water onto HGVs from the bottling plant. Noise sources will consist of electric forklift truck operation and the associated 'knocks' and 'rattles' etc, associated with loading or unloading a truck. The noise sources have been modelled as an area source on an apron in front of the building. The sound power of this source has been set to the sound power of an electric forklift truck, plus the sound power of the general loading noise measured from a typical HGV loading operation from the PDA database. In order to account for the impulsive nature of the delivery noise a +5dB penalty has been added to the sound power of the delivery measurement. The duty of the forklift and delivery operation noise was calculated using the very conservative assumption that it would take 5 minutes to load each pallet with 22 pallets assumed for each HGV trip (assuming that each HGV would be loaded / unloaded both when it arrives and when it leaves the plant).

11.5.10 All calculations have been performed in octave frequency bands. Octave band noise levels for within the plant have been taken from measurements within an industrial plastics recycling facility and are at the Lower Action Value of the Control of Noise at Work regulations. Octave band noise spectra for the compressor louvres and for the chillers have been taken from measurements of similar compressors and chillers from the PDA database of noise sources which have then been normalised to give the correct overall sound power value.

Building Envelope Construction

11.5.11 The bottling plant is proposed to be constructed from the following elements:

External walls

11.5.12 Built up construction of steel profiled outer, 250mm rockwool insulation and internal steel liner. The sound insulation of this build up has been modelled in Insul® sound insulation prediction software. We have used the conservative assumption that steel studs will connect the inner and outer leaves for the purposes of the model. In reality a more resilient connection is likely due to the necessity to provide thermal isolation between the inner and outer steel. The predicted sound reduction of the proposed walls is shown below:

Table 11.5 – Proposed wall sound insulation

Frequency [Hz]	63	125	250	500	1k	2k	4k
Sound Reduction Index	10	18	33	43	53	61	68

Roof

11.5.13 The proposed roof construction is a standing seam outer sheet with 250mm mineral wool insulation and a steel inner liner sheet. We have taken the conservative sound insulation from laboratory test data for a similar roof build-up, but with only 180mm mineral wool insulation. The predicted sound reduction of the proposed roof is shown below:

Table 11.6 – Proposed roof sound insulation

Frequency [Hz]	63	125	250	500	1k	2k	4k
Sound Reduction Index	18	30	40	46	49	52	58

Proposed sources

11.5.14 The internal noise level of the plant has been conservatively assumed to be at the Lower Action Value of the Control of Noise at Work regulations and has been taken from measurements within a plastics recycling facility. Assumed internal noise levels are shown in Table 11.7 below:

Table 11.7 – Bottling plant assumed internal noise levels

Frequency [Hz]	63	125	250	500	1k	2k	4k
Sound pressure level	79	77	77	79	74	68	63

11.5.15 Applying the sound insulation of the building elements and a 6dB correction for reverberant internal sound field to external free-field intensity the external sound intensity of the building elements has been calculated as follows:

Table 11.8 – Bottling plant assumed internal noise levels

Frequency [Hz]	63	125	250	500	1k	2k	4k
Internal Sound pressure level	79	77	77	79	74	68	63
Wall sound reduction	10	18	33	43	53	61	68
Reverberant field correction	-6	-6	-6	-6	-6	-6	-6
Wall sound source intensity	**63**	**53**	**38**	**30**	**15**	**1**	**-11**
Internal Sound pressure level	79	77	77	79	74	68	63
Roof sound reduction	18	30	40	46	49	52	58
Roof sound source intensity	**55**	**41**	**31**	**27**	**19**	**10**	**-1**

11.5.16 The compressor intakes have been calculated to be a 2.5m x 4.5m louvre for this size of bottling plant with a sound intensity for the louvre of 85 dBA L_I. Correcting for the louvre area gives a total sound power of 95.5 dBA for the louvres. Taking the octave band spectrum from measurements of a similar compressor louvre we have normalised these to obtain the calculated overall sound power and have used the following octave band levels in the Soundplan model:

Table 11.9 – Compressor louvres overall sound power

Frequency [Hz]	63	125	250	500	1k	2k	4k
Sound power level	107	100	98	91	89	87	83

11.5.17 Based on similar bottling plant we have estimated that three chillers are likely to be required for a development of this scale (with some capacity to spare). Each chiller will likely have a sound power level of 87.5 dB(A), giving an overall sound power of 92.5 dB(A) for all chillers operating simultaneously. We have used the octave band spectrum taken from previous chiller measurements to determine the total sound power in octave frequency bands as follows:

Table 11.10 – Chillers overall sound power (3 chillers)

Frequency [Hz]	63	125	250	500	1k	2k	4k
Sound power level	78	85	88	86	91	80	72

11.5.18 Noise from delivery activities and electric forklift operation have been taken from the PDA database. Note that the loading noise levels stated below were increased by 5dB to account for the impulsive character of the noise before entering into the noise model.

Table 11.11 – Electric forklift and loading noise sound power

Frequency [Hz]	63	125	250	500	1k	2k	4k
Electric forklift sound power level	86	81	83	81	84	80	72
Loading noise sound power level	86	80	79	79	78	75	70

BS4142 Assessment

11.5.19 Noise levels have been calculated at the nearest residential receivers using the Soundplan model. Results of the model in terms of noise levels calculated at the receivers, and noise contours are shown in Figure 11.2 and Figure 11.3. BS4142 assessments are based upon upstairs window heights which are worst-case in terms of propagated noise levels. Note that we have used the minimum measured night-time L_{A90} assuming that the plant will be operational over 24 hours.

11.5.20 *Staden – night-time*

Minimum background Noise Level L_{A90}	=	30 dB
Contribution from source alone L_{Aeq}	=	24 dB
Acoustic Character Correction [1]	=	0 dB
Rating Level (BS4142:1997)	=	24 dB
Excess of Rating Level Over Background Level dB	=	-6 dB

11.5.21 *Staden – day time*

Minimum background Noise Level L_{A90}	=	33 dB
Contribution from source alone L_{Aeq}	=	25 dB
Acoustic Character Correction [1]	=	0 dB
Rating Level (BS4142:1997)	=	25 dB
Excess of Rating Level Over Background Level dB	=	-8 dB

11.5.22 *Dale View – night-time*

Minimum background Noise Level L_{A90}	=	33 dB
Contribution from source alone L_{Aeq}	=	21 dB
Acoustic Character Correction [1]	=	0 dB
Rating Level (BS4142:1997)	=	21 dB
Excess of Rating Level Over Background Level dB	=	-12 dB

11.5.23 *Dale View – day time*

Minimum background Noise Level L_{A90}	=	36 dB
Contribution from source alone L_{Aeq}	=	23 dB
Acoustic Character Correction [1]	=	0 dB
Rating Level (BS4142:1997)	=	23 dB
Excess of Rating Level Over Background Level dB	=	-13 dB

11.5.24 *Swallow House – night-time*

Minimum background Noise Level L_{A90}	=	33 dB
Contribution from source alone L_{Aeq}	=	23 dB
Acoustic Character Correction [1]	=	0 dB
Rating Level (BS4142:1997)	=	23 dB
Excess of Rating Level Over Background Level dB	=	-10 dB

11.5.25 *Swallow House – day-time*

Minimum background Noise Level L_{A90}	=	36 dB
Contribution from source alone L_{Aeq}	=	24 dB
Acoustic Character Correction [1]	=	0 dB
Rating Level (BS4142:1997)	=	24 dB
Excess of Rating Level Over Background Level dB	=	-12 dB

Notes:

1 Note that no acoustic character correction has been applied here as a 5dB penalty has already been applied to the impulsive delivery source prior to the propagation calculation. We do not expect the remaining sources indicated to be subjectively tonal, impulsive or intermittent at the receivers and hence have not applied any ‘rating penalty’.

Discussion

11.5.26 The predicted noise levels at the residences in Cowdale and Staden are all well below the pre-existing minimum night-time background noise levels. This is well below the +5dB marginal significance rating of BS4142. With regard to noise pollution, and the BREEAM 2011 Technical Manual states that developments with noise levels less than 3dB above background levels at nearby noise sensitive properties during the night, and less than 5dB above background levels during the day, may be awarded credits for sustainability. As such these noise levels are both below the level of marginal significance for the likelihood of complaints in accordance with BS4142 and also are widely considered to be at a sustainable level, thus meeting the criteria for acceptable development under the National Planning Policy Framework. It should also be borne in mind that the calculations are for plant with no noise attenuation measures. Noise levels at the residences could be further reduced by fitting acoustic louvres to the compressor house.

11.6 Impact of Road Traffic Noise

11.6.1 The development includes a new access road for the bottling plant which will run from the proposed new tunnel access in the north-western corner of the quarry following the south-western edge of the quarry in a cutting initially ~25m deep rising up to two aprons 15m and 4m below the existing quarry floor level respectively. Road traffic will consist of employees vehicles travelling to and from the bottling plant and HGVs largely collecting bottled water, with a lesser number of inbound deliveries of bottle blanks, caps and labels etc.

Calculation Method

11.6.2 We have taken the predicted road traffic volumes from the Cambria Civil and Structural Engineers Transport Assessment for the development. The normal method of calculating road traffic noise in the UK is using Calculation of Road Traffic Noise, however, the method is not suitable for very low flows of traffic below 50 vehicles per hour. For this development vehicle flow rates are very much lower on the access road so an alternative measurement based approach has been used.

11.6.3 We have taken measurements of the maximum noise levels of the drive past of a car and a lorry from the PDA noise source database. Using these maximum levels and correcting for the drive-by distance we have calculated the sound power of the driving vehicle at approximately 30mph. Note that for the HGV we have only used the measured values to obtain an octave band frequency spectrum. The sound power of a HGV has been set at the EU maximum permitted value of 108 dBA.

11.6.4 We have estimated the time taken for a vehicle to traverse the access road within the site and with a very conservative assumption that the vehicle would travel at no more than 5mph for the whole of the road length we have estimated that each vehicle would take no longer than 5 minutes to traverse the road. We have then calculated the equivalent L_{eq} averaged sound power of the road as a line source over the daytime and night-time periods accounting for the sound power of these vehicle sources and the amount of time they will be operating on the road. Note that this is a very conservative calculation as we are using noise levels for vehicles travelling at high speed, but also assuming a relatively slow (and therefore long duration) traverse along the road. The calculated line-source was then modelled using Soundplan software to predict the noise levels at nearby noise sensitive residences.

Sources

11.6.5 The noise source levels used in the model are as follows:

Table 11.12 – Vehicle source noise levels

Frequency [Hz]	63	125	250	500	1k	2k	4k
Car sound power level	89	84	86	84	87	82	75
HGV sound power level	131	108	105	97	99	98	92

11.6.6 The traffic movements predicted in terms of annual average trips during the day between 07:00 and 23:00 and the night between 23:00 and 07:00 are shown in the table below and indicate individual trip numbers (i.e. an empty vehicle travelling to the site, being loaded and leaving is counted as 2 trips in the table below).

Table 11.13 – Daytime and night-time average trip rates

Time period	07:00 – 23:00	23:00 – 07:00
Bottling plant staff traffic	32	11
HGV traffic	78	7

11.6.7 Note that for the purposes of the assessment we have assumed that all of the vehicles other than the designated HGV traffic will be cars.

Results

11.6.8 The results of the assessment of vehicle noise assessment are as follows;

Table 11.14 – Daytime and night-time vehicle noise levels, L_{Aeq}

Location	07:00 – 23:00			23:00 – 07:00		
	Current level	Predicted level	**Increase**	Current level	Predicted level	**Increase**
Staden	51	51.0	**0.0**	40	40.1	**0.1**
Dale View	50	50.0	**0.0**	47	47.0	**0.0**
Swallow House	50	50.0	**0.0**	47	47.0	**0.0**

Discussion

11.6.9 Noise levels due to vehicles on the access road and site are predicted to increase average noise levels at nearby noise sensitive receivers by 0.1 dB during the night-time at Staden, and by less than 0.05 dB at all other locations during both the day and the night. The criterion for assessment of vehicle noise impact from the Design Manual for Roads and Bridges (DMRB) in the short-term is shown below:

Table 11.15 – Impacts of changes in road traffic noise

Noise change, $L_{A10,18h}$	Magnitude of Impact
0	No change
0.1 – 0.9	Negligible
1 – 2.9	Minor
3 – 4.9	Moderate
5 +	Major

11.6.10 In accordance with this criterion the impact is negligible during the night-time at Staden, and shows no practical change in levels at all other locations. Note that the DMRB uses the $L_{A10,\ 18hr}$ parameter to assess impact. L_{A10} is used as this is the parameter calculated by Calculation of Road Traffic Noise, however, for a normal road traffic flow the difference between L_{A10} and L_{Aeq} will tend to be a constant value so we would consider the impact on changes in L_{Aeq} to be equivalent. Note also for night-time noise DMRB states that only the long-term impact criteria should be employed. These are shown in Table 11.3 and indicate that increases below 2.9 dB in the long-term and during the night-time are of negligible impact.

11.7 Construction Noise

11.7.1 A detailed construction plan for the development would be agreed with the Local Planning Authority following the granting of planning permission. As part of this process a detailed construction noise management plan would be produced in accordance with BS 5228:2009 “Code of practice for noise and vibration control on construction and open sites.” The construction noise management plan would incorporate noise modelling and noise levels would be monitored in-line with the agreed plan during the construction phase, with construction being halted and remedial action taken should predicted noise levels be exceeded.

11.7.2 Although the detailed construction programme has not yet been developed, in terms of noise, the greatest impact is likely to be due to the removal of rock to cut the new access tunnel through to the A6 and to form the access road cutting and lowered area of the quarry floor for the plant and aprons. A number of options are available for removal of this rock which include the use of large track mounted pecking machinery, toothed wheel rock planning machines, or drilling and blasting. The options differ in terms of the noise level although it should be borne in mind that a short term high noise process may be preferable to a much longer duration of lower level noise.

11.7.3 In order to estimate the maximum impact of construction we have modelled the noise due to a tracked semi-mobile stone crusher (250 kW) and a tracked mobile drilling rig (317 kW, 125mm dia) operating simultaneously on the quarry floor. These represent the likely highest sound power plant items which could potentially be used (with the exception of the short impulsive noise due to blasting). Sound power data for these sources was taken from the construction noise source calculation tables of BS 5228.

11.7.4 The results of the calculation using the Soundplan model give potential noise levels in Cowdale of up to 52dBA, and in Staden of up to 40 dBA. In accordance with Annex E of BS 5228 using both of the suggested methods to calculate impact of construction noise these levels would not be deemed as ‘significant impact’ at this site providing construction activites were limited to the daytime.

11.8 Noise Management Plan

11.8.1 The noise assessment above shows that the worst case noise levels from the development are not predicted to give rise to disturbance at near by noise sensitive properties. However, it is important to ensure that noise levels generated by the proposed development are minimised as far as practicable. In order to achieve this we would propose that a detailed Noise Management Plan is developed during the design phase in order to minimise noise impact.

11.8.2 The plan should include measures to;

- Update the noise model for the proposed development to reflect specific plant selections and to specify appropriate remedial treatments where required to minimise adverse noise impacts.
- Ensure that the general internal noise levels are not predicted to exceed the assumed levels in Table 11.7. Where these levels are predicted to be exceeded specify appropriate engineering noise control measures to plant to reduce the levels below the required limit.
- Ensure that the loading bay is designed to minimise loading noise egress. Access for fork-lifts into the building needs to be arranged so that fork-lifts enter the warehousing area or a buffer space, and there is not a direct link from the outside to production areas.
- Specify generic measures to reduce noise impact such as using light-beacons instead of reversing alarms for the fork lifts. Where this is not possible the use of 'broadband' noise reversing alarms or smart alarms should be employed.
- Specify good practice operational procedures to minimise noise generation outside the plant and to ensure that loading operations are performed with minimal noise, doors to production areas remain closed, staff are informed about the need to avoid shouting etc in external areas.
- Periodic noise monitoring of the plant following completion to ensure that the plant achieves the predicted noise levels and to prevent noise 'creep' due to changes in operation of the plant over time.

11.9 Conclusion

11.9.1 The modelling and assessment of noise due to the proposed facility has shown that there will be no significant noise impact on residences in Staden or Cowdale either in terms of the noise due to operation of the plant, or noise due to vehicles. It has also been shown that due to the large distance between the site and the nearest residences construction noise is also likely to be below the level of significant impact.

APPENDIX 11.1

Figure 11.1 – Ambient noise survey measurement locations

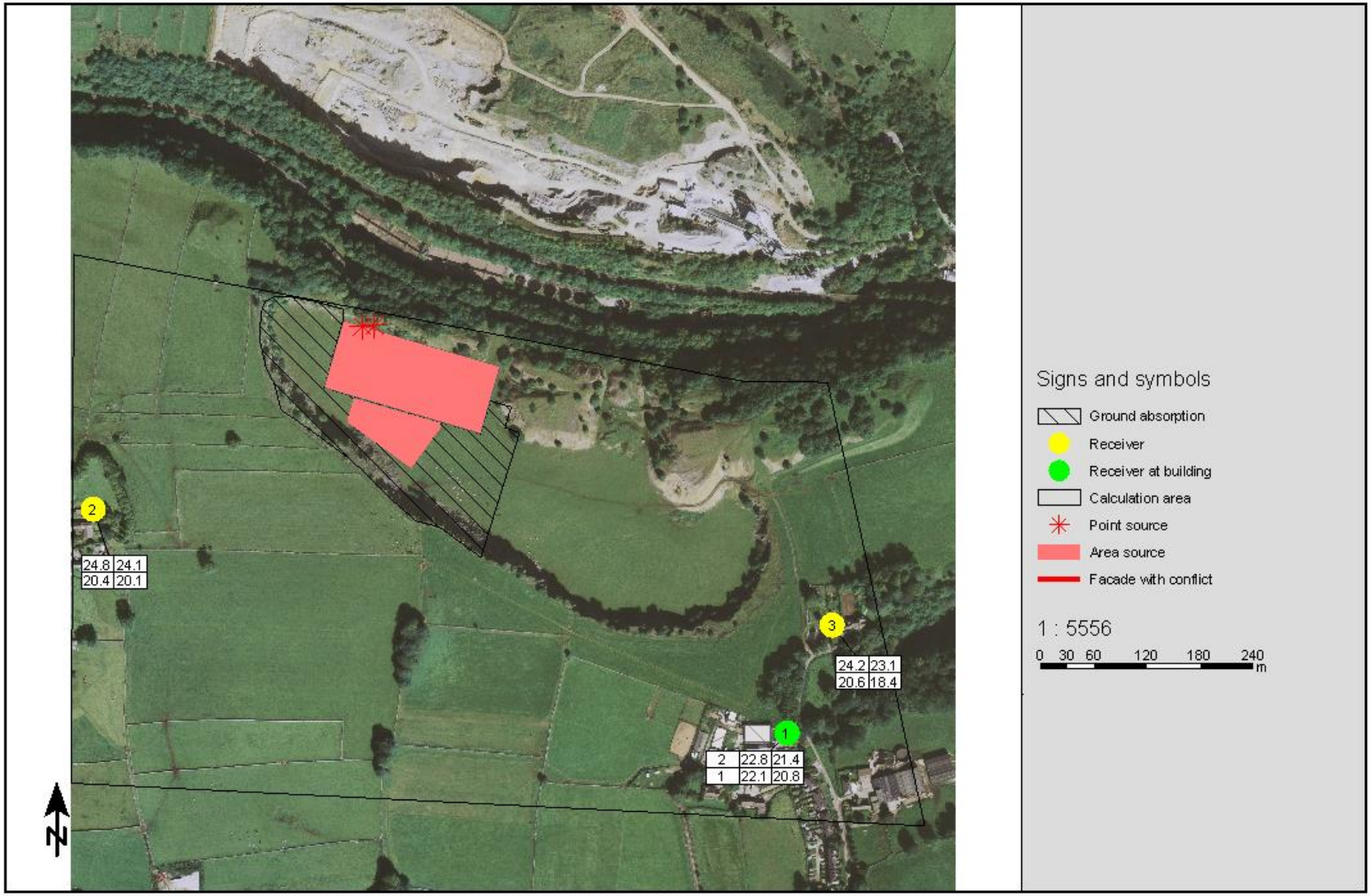

Figure 11.2 – Soundplan noise levels at sensitive receivers – operation

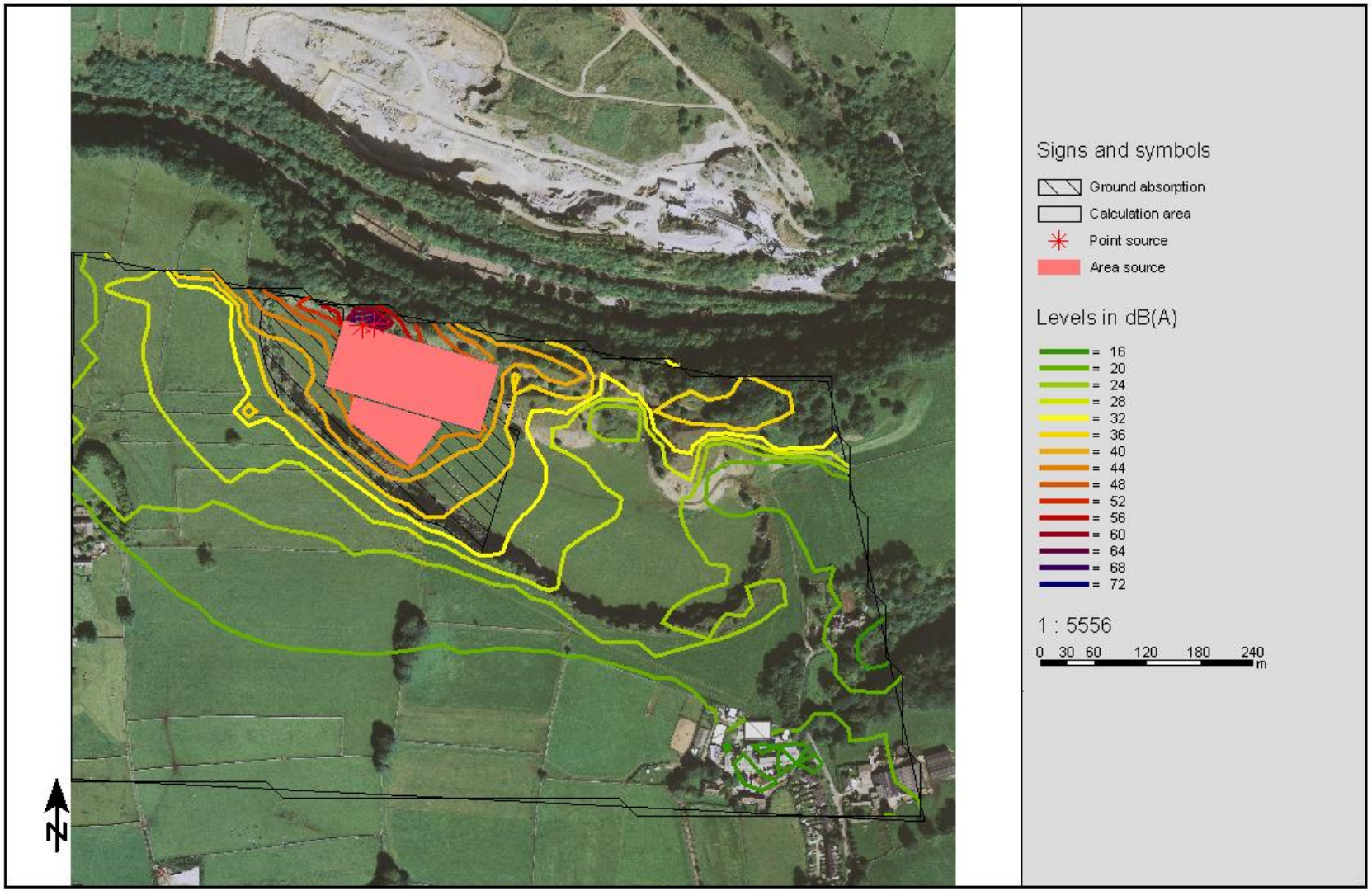

Figure 11.3 – Soundplan noise countours – operation

Figure 11.4 – Soundplan noise levels at sensitive receivers – vehicle noise

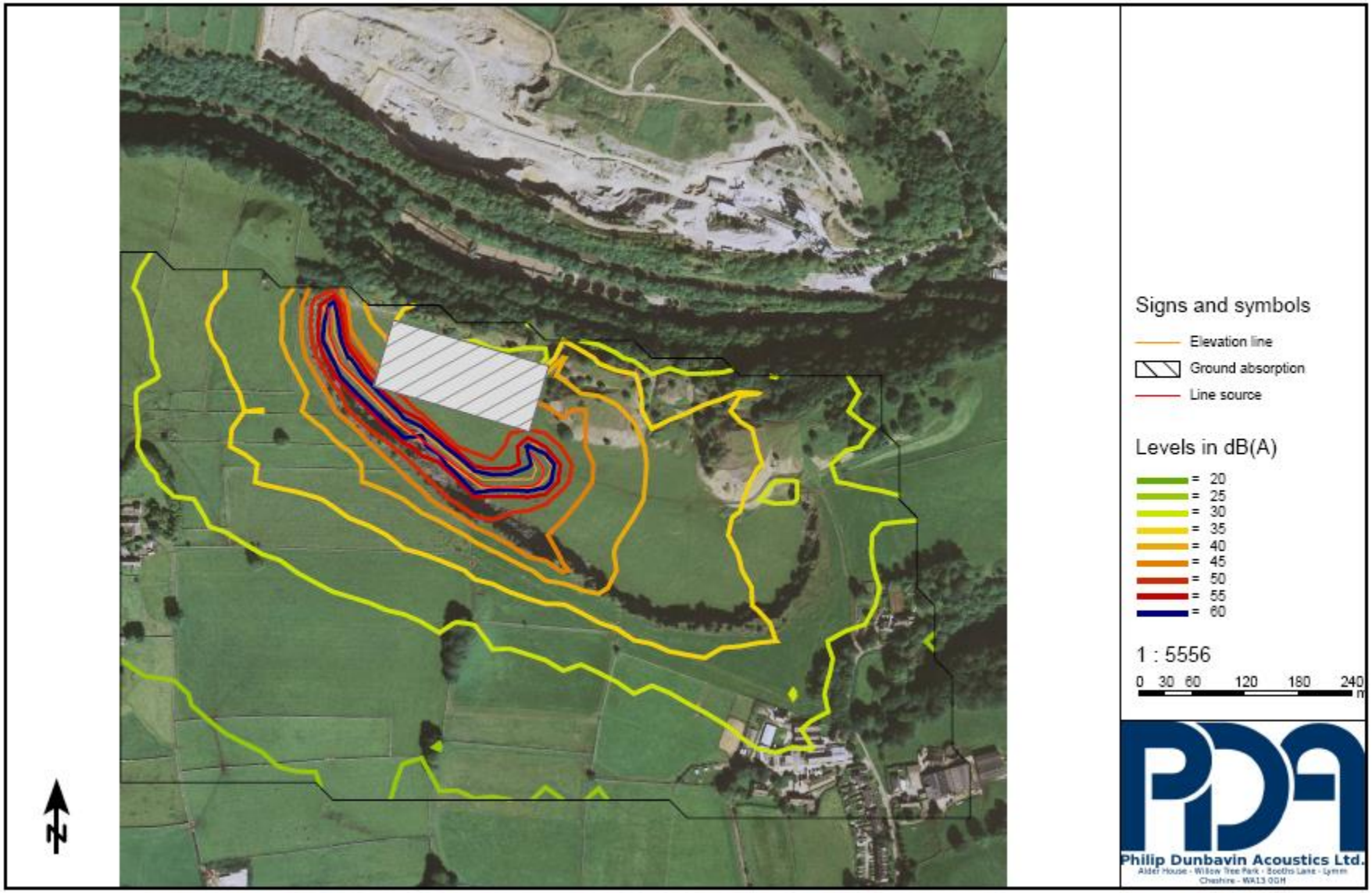

Figure 11.5 – Soundplan noise contours – vehicle noise, daytime

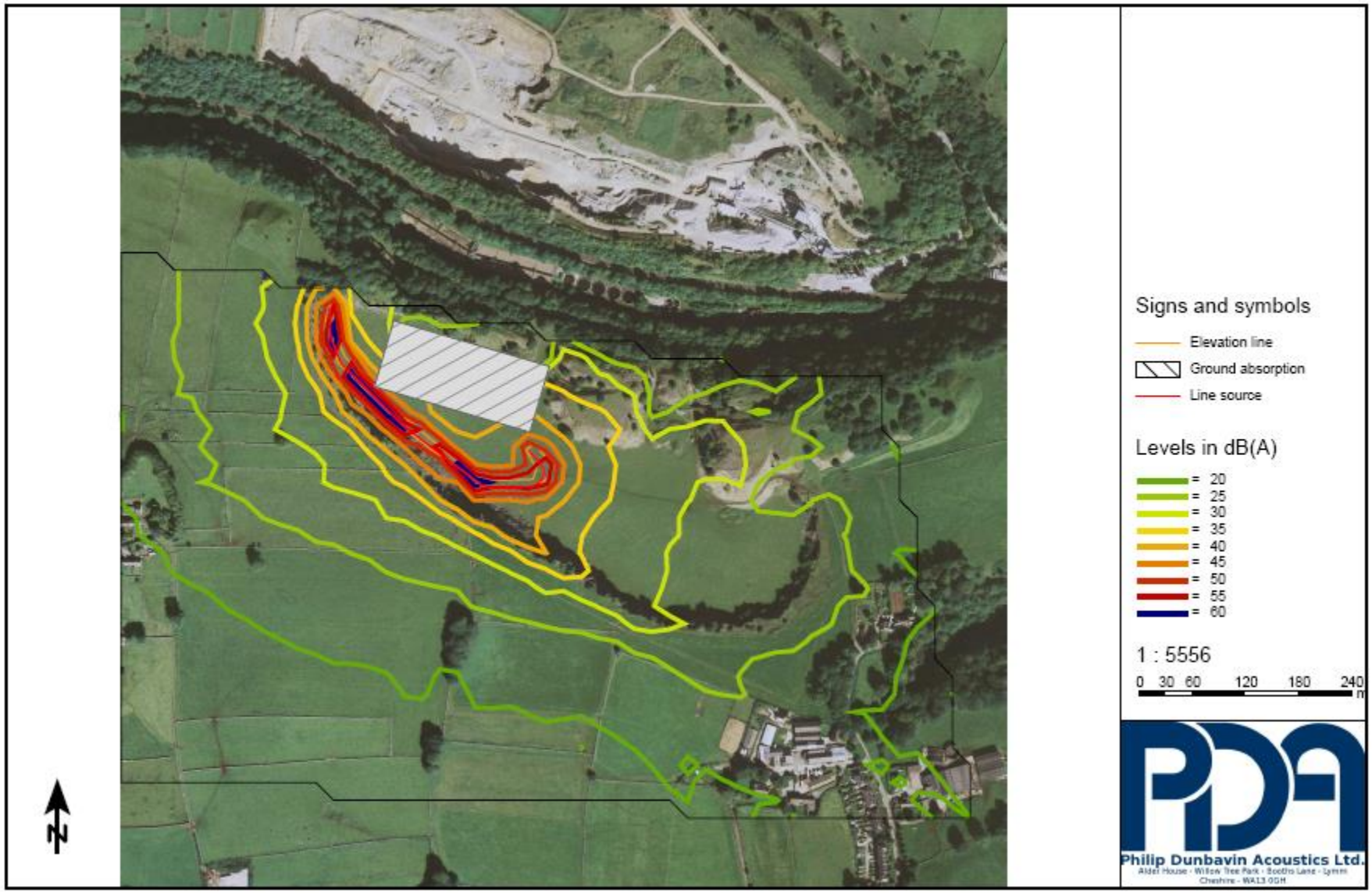

Figure 11.6 – Soundplan noise contours – vehicle noise, night-time

Ambient noise survey measurements

Our ref: 6473
Project: Buxton quarry
Survey Date: 09/02/2010 - 10/02/2010
Position 1

	A-Weighted	Octave Band Centre Frequency									
	dB(A)	32 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8k Hz	16k Hz
Daytime											
07:00 - 07:15											
Leq	**46.8**	52.5	48.9	47.2	42.4	37.0	30.9	30.4	43.7	41.2	0.0
Lmax	**64.2**	67.8	55.5	67.8	60.0	52.2	47.9	50.1	63.2	61.6	42.5
L90	**36.0**	50.0	47.0	40.0	36.0	33.0	27.0	0.0	0.0	0.0	0.0
07:15 - 07:30											
Leq	**44.2**	52.1	49.3	47.3	41.4	38.9	33.2	33.3	39.8	36.4	0.0
Lmax	**59.6**	63.6	57.6	63.6	55.8	55.0	51.2	55.8	57.7	56.1	38.4
L90	**36.0**	49.0	47.0	41.0	36.0	33.0	28.0	0.0	0.0	0.0	0.0
08:44 - 08:59											
Leq	**45.6**	53.5	51.0	45.9	46.4	43.2	38.6	35.6	38.3	29.5	0.0
Lmax	**59.4**	73.6	68.9	64.7	60.3	60.9	55.5	52.6	55.6	51.6	32.1
L90	**39.0**	50.0	48.0	42.0	40.0	36.0	33.0	27.0	0.0	0.0	0.0
08:59 - 09:14											
Leq	**54.7**	62.5	59.0	54.4	51.4	51.2	50.8	46.6	44.3	36.2	0.0
Lmax	**79.8**	95.2	83.6	75.0	79.5	77.2	76.3	70.8	65.8	58.8	45.5
L90	**40.0**	51.0	48.0	43.0	41.0	37.0	34.0	29.0	0.0	0.0	0.0
09:14 - 09:29											
Leq	**48.3**	54.3	49.9	54.0	53.6	46.8	37.5	33.3	35.3	26.9	0.0
Lmax	**62.5**	64.4	62.5	72.0	70.1	63.2	53.1	58.5	53.9	48.2	30.0
L90	**38.0**	51.0	47.0	42.0	39.0	36.0	32.0	0.0	0.0	0.0	0.0
10:40 - 10:55											
Leq	**46.1**	55.4	51.5	48.9	48.1	43.3	36.7	34.8	40.3	29.6	17.6
Lmax	**60.5**	73.0	67.6	67.0	69.4	62.7	56.5	53.7	58.1	51.3	41.8
L90	**38.0**	50.0	46.0	42.0	38.0	35.0	31.0	26.0	26.0	19.0	0.0
10:55 - 11:10											
Leq	**47.7**	64.8	59.0	50.5	47.6	43.1	41.3	40.1	39.9	32.3	21.8
Lmax	**67.9**	80.9	72.2	72.6	70.5	63.0	65.1	63.1	60.6	58.5	47.9
L90	**36.0**	50.0	46.0	40.0	37.0	34.0	30.0	24.0	21.0	16.0	0.0
11:10 - 10:25											
Leq	**49.5**	66.0	56.1	51.9	47.0	44.9	43.4	43.7	42.0	36.0	27.7
Lmax	**71.2**	86.3	78.1	75.2	75.4	73.3	67.8	72.0	64.8	63.5	60.3
L90	**39.0**	51.0	48.0	43.0	38.0	35.0	32.0	27.0	24.0	18.0	0.0
11:25 - 11:40											
Leq	**46.3**	57.1	58.9	53.3	47.8	42.4	38.9	38.2	36.1	27.8	18.0
Lmax	**50.8**	63.4	65.1	61.4	51.8	47.6	45.6	46.4	41.5	37.6	27.5
L90	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12:40 - 12:55											
Leq	**42.2**	53.2	49.7	44.7	46.0	41.1	34.8	31.1	28.5	22.8	15.3
Lmax	**62.0**	73.9	70.5	61.0	63.0	59.4	58.6	55.6	48.6	46.8	35.6
L90	**36.0**	48.0	45.0	39.0	37.0	34.0	29.0	22.0	18.0	15.0	0.0
12:55 - 13:10											
Leq	**38.2**	51.7	48.0	42.1	38.8	35.6	30.6	27.9	30.8	20.7	0.0
Lmax	**54.9**	73.9	63.9	67.4	61.7	53.3	43.7	46.9	52.4	42.9	26.8
L90	**34.0**	48.0	44.0	39.0	35.0	31.0	27.0	21.0	18.0	15.0	0.0
13:10 - 13:25											
Leq	**63.7**	68.8	67.6	60.9	54.4	56.3	56.4	54.4	57.0	59.2	53.7
Lmax	**88.1**	86.0	86.1	77.4	78.6	76.0	77.4	79.4	82.5	86.6	81.9
L90	**33.0**	47.0	45.0	37.0	32.0	30.0	26.0	20.0	19.0	15.0	0.0
14:30 - 14:45											
Leq	**44.5**	54.4	49.8	45.4	47.1	43.4	35.1	33.3	36.1	29.1	16.4
Lmax	**62.4**	71.4	60.4	64.7	66.6	64.8	57.3	56.4	54.9	50.0	36.9
L90	**36.0**	51.0	47.0	40.0	36.0	34.0	30.0	23.0	22.0	16.0	0.0
14:45 - 15:00											
Leq	**49.0**	55.9	50.7	45.9	44.6	41.5	36.1	37.2	46.5	33.4	16.7
Lmax	**58.5**	66.5	60.8	64.6	64.7	58.4	55.2	52.9	57.6	47.7	38.5
L90	**40.0**	52.0	47.0	40.0	36.0	35.0	32.0	29.0	32.0	20.0	0.0

15:00 - 15:15											
Leq	**45.9**	55.1	50.8	49.8	50.5	43.6	37.0	35.1	34.6	27.6	14.7
Lmax	**63.7**	64.2	57.7	69.2	69.0	62.1	53.3	61.5	56.5	55.7	37.3
L90	**38.0**	52.0	48.0	42.0	38.0	36.0	32.0	26.0	21.0	15.0	0.0
15:15 - 1530											
Leq	**53.2**	54.5	51.2	50.3	40.4	37.0	35.1	41.0	51.6	39.2	20.1
Lmax	**60.6**	64.3	61.0	66.3	56.1	52.5	52.2	57.3	59.5	52.2	36.6
L90	**45.0**	51.0	48.0	40.0	36.0	34.0	31.0	35.0	41.0	28.0	0.0
16:30 - 16:45											
Leq	**42.9**	53.1	51.8	44.1	41.9	39.0	36.9	34.8	35.0	27.3	16.8
Lmax	**62.5**	68.5	62.3	57.9	56.0	59.0	56.5	55.4	61.5	51.5	39.9
L90	**36.0**	49.0	48.0	40.0	36.0	34.0	30.0	22.0	15.0	0.0	0.0
16:45 - 17:00											
Leq	**43.1**	53.0	51.4	50.4	42.1	39.7	36.2	33.7	35.2	31.8	16.5
Lmax	**60.0**	75.5	73.0	69.8	55.2	54.7	56.0	55.1	58.4	55.1	39.6
L90	**37.0**	49.0	48.0	40.0	37.0	36.0	32.0	23.0	17.0	0.0	0.0
17:00 - 17:15											
Leq	**44.6**	52.7	52.9	51.8	46.3	43.1	37.9	30.8	33.6	30.9	16.6
Lmax	**59.7**	65.7	65.5	67.5	59.5	59.8	56.4	52.4	56.3	56.3	37.9
L90	**37.0**	49.0	49.0	41.0	37.0	36.0	32.0	23.0	15.0	0.0	0.0
17:15 - 17:30											
Leq	**45.1**	53.4	51.3	50.4	41.6	39.3	37.9	37.4	38.6	34.7	21.9
Lmax	**63.3**	77.1	70.8	72.0	52.4	54.1	56.3	60.7	57.3	53.2	50.7
L90	**38.0**	49.0	48.0	41.0	38.0	36.0	32.0	23.0	17.0	0.0	0.0
18:45 - 19:00											
Leq	**41.6**	53.3	51.1	44.9	41.9	39.7	36.1	32.3	29.4	24.8	17.3
Lmax	**58.9**	70.5	63.7	59.0	55.4	57.2	56.0	52.7	50.4	49.5	41.1
L90	**37.0**	48.0	48.0	41.0	37.0	35.0	32.0	24.0	21.0	16.0	0.0
19:00 - 19:15											
Leq	**45.2**	54.2	53.3	46.8	44.8	43.5	39.5	37.5	32.4	24.6	16.5
Lmax	**61.4**	70.4	75.9	64.6	63.0	60.8	55.5	57.2	52.2	43.8	38.9
L90	**38.0**	49.0	48.0	42.0	38.0	37.0	33.0	26.0	22.0	17.0	0.0
19:15 -19:30											
Leq	**45.8**	53.6	51.0	54.0	48.0	41.9	39.5	36.1	33.6	29.1	20.5
Lmax	**64.5**	74.9	74.8	71.3	63.9	59.3	60.8	57.5	55.2	53.9	45.7
L90	**38.0**	49.0	47.0	42.0	39.0	37.0	33.0	26.0	23.0	18.0	0.0
20:30 - 20:45											
Leq	**40.9**	50.4	48.0	51.7	43.6	39.0	33.0	28.0	26.2	22.1	15.4
Lmax	**56.2**	60.1	59.4	67.9	59.6	57.8	49.1	47.0	43.5	38.0	28.0
L90	**35.0**	47.0	44.0	40.0	37.0	33.0	28.0	21.0	19.0	17.0	0.0
20:45 - 21:00											
Leq	**38.8**	51.7	47.5	42.7	40.6	37.5	32.9	27.6	25.8	21.9	15.2
Lmax	**47.4**	72.0	59.1	53.7	46.6	45.0	42.8	41.7	36.0	33.1	27.0
L90	**36.0**	48.0	45.0	40.0	38.0	35.0	30.0	23.0	20.0	18.0	0.0
21:00 - 21:15											
Leq	**40.5**	51.9	47.9	53.7	40.8	36.8	32.4	28.7	25.2	20.8	14.9
Lmax	**58.6**	72.2	68.8	75.2	56.8	52.6	50.8	48.7	42.1	35.3	38.2
L90	**35.0**	48.0	44.0	39.0	37.0	33.0	28.0	21.0	19.0	16.0	0.0
21:15 - 21:30											
Leq	**40.5**	54.0	49.4	43.3	41.3	39.1	34.8	30.6	27.6	22.8	15.9
Lmax	**62.0**	79.4	73.7	64.3	61.8	59.8	57.9	55.4	48.3	38.5	33.0
L90	**36.0**	47.0	43.0	40.0	38.0	35.0	30.0	24.0	21.0	18.0	0.0
22:45 - 22:50											
Leq	**40.8**	51.1	47.4	45.5	43.8	39.6	33.8	29.5	27.5	23.1	16.2
Lmax	**51.4**	61.9	60.2	64.9	55.4	50.1	48.1	44.2	40.3	35.8	31.7
L90	**37.0**	48.0	44.0	41.0	39.0	35.0	30.0	23.0	21.0	17.0	0.0
22:50 - 22:55											
Leq	**42.7**	51.7	47.8	45.9	44.3	41.4	36.5	32.4	30.5	25.7	17.5
Lmax	**48.7**	61.3	54.0	53.1	52.2	48.6	43.3	39.1	37.2	32.7	23.2
L90	**40.0**	49.0	45.0	43.0	41.0	38.0	34.0	29.0	26.0	21.0	15.0
22:55 - 23:00											
Leq	**41.1**	53.3	49.1	43.8	42.5	39.8	35.2	30.7	28.5	24.0	16.3
Lmax	**45.2**	62.1	58.7	48.8	48.0	44.7	39.9	35.7	34.6	30.0	21.1
L90	**39.0**	48.0	44.0	42.0	40.0	37.0	33.0	28.0	25.0	21.0	15.0

Nighttime											
23:00 - 23:05											
Leq	**39.9**	50.6	46.2	42.7	41.3	37.9	34.9	29.5	27.0	22.7	15.5
Lmax	**52.1**	57.8	55.8	50.6	47.8	46.1	51.6	43.2	35.4	30.4	21.2
L90	**37.0**	48.0	44.0	41.0	39.0	35.0	31.0	25.0	23.0	19.0	0.0
23:05 - 23:10											
Leq	**43.0**	51.4	47.0	44.8	43.6	40.8	38.8	33.0	29.6	25.0	16.8
Lmax	**53.3**	58.9	53.2	53.9	50.3	47.6	52.6	44.8	36.5	32.0	22.6
L90	**39.0**	48.0	45.0	42.0	41.0	37.0	33.0	28.0	25.0	21.0	15.0
23:10 - 23:15											
Leq	**43.0**	51.8	47.4	45.5	44.0	41.4	37.6	33.0	30.8	26.2	17.7
Lmax	**53.4**	63.7	53.6	53.7	51.6	47.5	52.9	41.0	37.3	32.9	23.3
L90	**39.0**	49.0	45.0	42.0	41.0	37.0	33.0	28.0	26.0	22.0	15.0
23:15 - 23:20											
Leq	**41.7**	51.4	47.1	44.5	42.8	40.3	35.9	31.8	29.8	25.0	16.8
Lmax	**55.5**	63.3	57.5	52.7	50.9	50.4	50.2	50.5	48.8	37.0	24.2
L90	**37.0**	48.0	44.0	41.0	39.0	36.0	31.0	26.0	24.0	20.0	0.0
23:20 - 23:25											
Leq	**39.9**	50.6	46.1	43.0	41.1	38.3	33.9	29.7	28.3	24.1	16.8
Lmax	**56.9**	57.4	52.8	49.8	48.8	49.9	51.4	50.2	51.0	47.2	40.3
L90	**37.0**	48.0	44.0	41.0	38.0	35.0	31.0	25.0	23.0	19.0	0.0
00:30 - 00:35											
Leq	**37.8**	51.0	46.5	42.1	39.0	36.3	31.9	27.5	24.6	0.0	0.0
Lmax	**59.4**	67.2	53.1	53.6	52.1	51.1	55.0	54.6	48.3	38.7	28.1
L90	**33.0**	48.0	44.0	39.0	35.0	31.0	25.0	0.0	0.0	0.0	0.0
00:35 - 00:40											
Leq	**34.4**	50.1	46.1	40.8	36.6	33.3	28.2	0.0	0.0	0.0	0.0
Lmax	**41.3**	58.5	53.5	47.3	43.6	40.4	37.0	32.4	29.6	27.2	0.0
L90	**32.0**	47.0	44.0	39.0	34.0	31.0	25.0	0.0	0.0	0.0	0.0
00:40 - 00:45											
Leq	**32.7**	49.7	45.6	40.0	35.7	31.9	25.0	0.0	0.0	0.0	0.0
Lmax	**41.4**	57.5	52.3	44.7	40.8	42.2	36.9	28.3	0.0	0.0	0.0
L90	**31.0**	47.0	43.0	38.0	33.0	29.0	0.0	0.0	0.0	0.0	0.0
00:45 - 00:50											
Leq	**35.5**	50.3	46.4	43.6	40.0	35.0	25.0	0.0	0.0	0.0	0.0
Lmax	**47.9**	60.0	54.9	57.6	54.4	50.1	32.3	0.0	0.0	0.0	0.0
L90	**31.0**	48.0	43.0	38.0	34.0	30.0	0.0	0.0	0.0	0.0	0.0
00:50 - 00:55											
Leq	**32.2**	49.4	45.0	39.9	35.3	31.3	24.5	0.0	0.0	0.0	0.0
Lmax	**37.5**	55.7	51.6	50.8	42.4	38.3	31.6	25.7	0.0	0.0	0.0
L90	**30.0**	47.0	43.0	38.0	32.0	29.0	0.0	0.0	0.0	0.0	0.0
00:55 - 01:00											
Leq	**31.8**	48.9	45.1	39.4	34.9	30.4	24.6	0.0	0.0	0.0	0.0
Lmax	**36.5**	58.5	51.5	44.6	43.8	35.7	32.8	27.8	0.0	0.0	0.0
L90	**30.0**	46.0	43.0	37.0	33.0	29.0	0.0	0.0	0.0	0.0	0.0
01:00 - 01:05											
Leq	**33.7**	49.2	44.1	39.8	35.5	32.0	27.0	0.0	0.0	0.0	0.0
Lmax	**54.8**	55.5	50.0	51.2	52.0	46.1	49.2	48.9	48.2	37.6	0.0
L90	**30.0**	46.0	42.0	37.0	32.0	29.0	0.0	0.0	0.0	0.0	0.0
01:05 - 01:10											
Leq	**32.0**	48.9	44.0	39.1	34.8	31.3	24.5	0.0	0.0	0.0	0.0
Lmax	**36.7**	62.8	50.8	44.9	39.8	38.2	30.3	29.2	26.4	0.0	0.0
L90	**31.0**	46.0	42.0	37.0	33.0	29.0	0.0	0.0	0.0	0.0	0.0
01:10 - 01:15											
Leq	**31.7**	48.5	45.1	39.1	34.8	30.6	0.0	0.0	0.0	0.0	0.0
Lmax	**35.0**	54.1	51.8	46.7	41.1	35.7	30.1	0.0	0.0	0.0	0.0
L90	**30.0**	46.0	43.0	37.0	33.0	29.0	0.0	0.0	0.0	0.0	0.0
01:15 - 01:20											
Leq	**32.9**	49.2	44.7	39.4	36.0	31.8	25.4	0.0	0.0	0.0	0.0
Lmax	**39.3**	58.7	50.6	49.0	45.6	38.3	34.3	29.7	29.6	25.3	0.0
L90	**31.0**	46.0	43.0	38.0	34.0	30.0	0.0	0.0	0.0	0.0	0.0
01:20 - 01:25											
Leq	**32.5**	49.1	44.5	39.2	35.5	31.2	25.0	0.0	0.0	0.0	0.0
Lmax	**39.7**	56.5	49.6	46.5	44.8	39.0	33.4	30.7	27.2	0.0	0.0
L90	**30.0**	46.0	43.0	37.0	33.0	28.0	0.0	0.0	0.0	0.0	0.0

01:25 - 01:30											
Leq	**40.1**	50.2	45.8	41.7	39.1	36.4	34.5	32.5	31.2	24.6	0.0
Lmax	**57.8**	60.9	56.2	54.1	49.0	47.1	52.6	51.9	51.8	42.8	33.9
L90	**33.0**	47.0	43.0	39.0	35.0	30.0	25.0	0.0	0.0	0.0	0.0
02:30 - 02:35											
Leq	**45.0**	54.4	48.1	46.3	45.5	44.2	39.5	35.0	30.7	0.0	0.0
Lmax	**57.0**	78.5	66.0	55.6	54.1	53.6	48.6	50.6	52.8	44.4	34.6
L90	**38.0**	49.0	45.0	41.0	39.0	37.0	32.0	26.0	0.0	0.0	0.0
02:35 - 02:40											
Leq	**43.2**	51.8	47.4	45.1	44.2	42.6	37.8	32.5	26.2	0.0	0.0
Lmax	**51.9**	60.2	53.3	53.2	53.9	52.2	47.8	42.3	35.6	34.7	27.4
L90	**37.0**	49.0	45.0	41.0	39.0	37.0	31.0	25.0	0.0	0.0	0.0
02:40 - 02:45											
Leq	**42.0**	51.5	48.1	45.7	43.1	41.3	36.5	31.1	25.3	0.0	0.0
Lmax	**61.3**	62.9	70.8	72.2	58.6	58.7	56.6	51.3	42.2	35.0	28.2
L90	**38.0**	49.0	45.0	41.0	39.0	37.0	32.0	25.0	0.0	0.0	0.0
02:45 - 02:50											
Leq	**42.5**	51.6	47.2	44.6	43.6	42.0	37.0	31.6	25.8	0.0	0.0
Lmax	**50.4**	63.0	53.1	52.8	51.5	50.7	45.2	39.6	45.9	41.3	0.0
L90	**37.0**	48.0	45.0	41.0	39.0	36.0	30.0	0.0	0.0	0.0	0.0
02:50 - 02:55											
Leq	**38.7**	50.7	46.6	42.0	40.4	38.1	32.9	26.8	0.0	0.0	0.0
Lmax	**44.1**	57.4	51.4	47.4	45.8	43.9	41.8	35.6	27.5	0.0	0.0
L90	**36.0**	48.0	44.0	40.0	38.0	35.0	29.0	0.0	0.0	0.0	0.0
02:55 - 03:00											
Leq	**37.3**	50.4	46.1	41.2	39.2	36.8	31.4	25.0	0.0	0.0	0.0
Lmax	**43.8**	57.9	51.5	48.7	46.1	43.8	39.0	33.7	26.5	0.0	0.0
L90	**35.0**	48.0	44.0	39.0	37.0	34.0	28.0	0.0	0.0	0.0	0.0
03:00 - 03:05											
Leq	**38.9**	50.3	46.8	42.1	40.6	38.3	33.1	27.1	0.0	0.0	0.0
Lmax	**50.8**	58.2	55.4	58.9	56.9	48.3	45.5	36.1	31.7	0.0	0.0
L90	**35.0**	47.0	44.0	39.0	37.0	34.0	28.0	0.0	0.0	0.0	0.0
03:05 - 03:10											
Leq	**39.4**	51.0	47.1	43.2	40.9	38.7	33.7	27.8	0.0	0.0	0.0
Lmax	**47.8**	62.0	52.6	55.5	49.2	47.6	46.0	38.0	34.0	0.0	0.0
L90	**35.0**	48.0	45.0	40.0	37.0	34.0	29.0	0.0	0.0	0.0	0.0
03:10 - 03:15											
Leq	**39.4**	51.6	46.4	42.3	40.9	38.8	33.8	27.9	0.0	0.0	0.0
Lmax	**50.0**	65.5	53.8	50.0	48.9	47.6	49.6	37.4	33.5	0.0	0.0
L90	**35.0**	48.0	44.0	39.0	37.0	34.0	28.0	0.0	0.0	0.0	0.0
03:15 - 03:20											
Leq	**42.5**	52.1	47.0	44.4	43.4	42.0	37.0	31.8	25.9	0.0	0.0
Lmax	**49.1**	72.9	62.2	51.7	50.4	49.3	43.9	39.0	36.7	29.8	0.0
L90	**34.0**	49.0	44.0	38.0	36.0	33.0	27.0	0.0	0.0	0.0	0.0
03:20 - 03:25											
Leq	**49.5**	51.6	47.1	46.2	45.0	44.2	42.8	44.8	39.5	36.8	0.0
Lmax	**75.5**	58.3	57.4	69.0	69.6	69.2	68.3	71.2	65.7	63.1	48.4
L90	**36.0**	49.0	45.0	41.0	38.0	35.0	29.0	0.0	0.0	0.0	0.0
04:30 - 04:35											
Leq	**35.4**	50.9	46.5	39.3	36.9	34.0	29.2	0.0	0.0	0.0	0.0
Lmax	**51.4**	57.0	52.8	48.5	55.2	50.2	45.7	45.2	46.9	40.3	31.6
L90	**32.0**	48.0	44.0	37.0	34.0	30.0	25.0	0.0	0.0	0.0	0.0
04:35 - 04:40											
Leq	**37.1**	51.9	47.0	41.2	39.1	36.5	31.3	24.6	0.0	0.0	0.0
Lmax	**43.6**	59.8	53.5	47.8	44.9	43.3	38.4	32.8	27.9	0.0	0.0
L90	**33.0**	49.0	45.0	39.0	36.0	32.0	27.0	0.0	0.0	0.0	0.0
04:40 - 04:45											
Leq	**37.2**	51.4	47.1	40.7	38.9	36.5	31.3	25.0	0.0	0.0	0.0
Lmax	**45.5**	68.5	53.7	48.1	47.2	45.7	40.1	35.1	28.9	0.0	0.0
L90	**33.0**	48.0	45.0	38.0	35.0	32.0	27.0	0.0	0.0	0.0	0.0
04:45 - 04:50											
Leq	**36.1**	51.1	47.7	40.4	38.2	35.3	30.0	0.0	0.0	0.0	0.0
Lmax	**42.8**	59.0	56.5	46.6	45.5	42.4	37.8	33.0	0.0	0.0	0.0
L90	**33.0**	49.0	45.0	38.0	35.0	32.0	26.0	0.0	0.0	0.0	0.0

04:50 - 04:55											
Leq	**35.3**	51.7	49.6	40.1	37.6	34.3	29.2	0.0	0.0	0.0	0.0
Lmax	**45.9**	61.4	59.0	47.9	44.5	41.0	45.7	30.4	26.8	0.0	0.0
L90	**32.0**	49.0	47.0	38.0	35.0	31.0	25.0	0.0	0.0	0.0	0.0
04:55 - 05:00											
Leq	**36.7**	52.2	49.3	42.8	39.7	35.6	30.0	0.0	0.0	0.0	0.0
Lmax	**44.1**	59.4	55.4	52.4	51.8	42.4	36.9	31.2	25.8	0.0	0.0
L90	**33.0**	49.0	47.0	39.0	36.0	32.0	26.0	0.0	0.0	0.0	0.0
05:00 - 05:05											
Leq	**38.0**	51.5	49.1	41.5	39.7	37.3	32.2	26.3	0.0	0.0	0.0
Lmax	**42.4**	57.6	56.8	46.2	45.1	42.4	40.1	32.2	28.5	0.0	0.0
L90	**35.0**	49.0	47.0	39.0	37.0	33.0	28.0	0.0	0.0	0.0	0.0
05:05 - 05:10											
Leq	**36.9**	51.1	47.9	40.8	38.9	36.1	30.9	24.7	0.0	0.0	0.0
Lmax	**42.0**	60.2	53.1	46.3	44.7	41.6	40.5	31.8	26.0	0.0	0.0
L90	**34.0**	48.0	46.0	38.0	36.0	32.0	27.0	0.0	0.0	0.0	0.0
05:10 - 05:15											
Leq	**38.5**	51.6	47.8	41.9	40.3	37.9	32.6	26.7	0.0	0.0	0.0
Lmax	**43.4**	58.0	53.6	46.8	45.1	43.5	42.0	32.3	27.2	0.0	0.0
L90	**35.0**	49.0	46.0	39.0	37.0	33.0	28.0	0.0	0.0	0.0	0.0
05:15 - 05:20											
Leq	**38.5**	52.6	48.2	41.2	39.3	36.6	32.1	29.5	27.1	0.0	0.0
Lmax	**54.0**	59.1	57.6	47.4	48.5	47.7	43.9	49.6	49.1	41.5	33.5
L90	**35.0**	50.0	46.0	39.0	37.0	34.0	29.0	0.0	0.0	0.0	0.0
06:35 - 06:40											
Leq	**41.5**	54.3	49.9	45.6	42.9	40.4	35.8	30.6	26.1	0.0	0.0
Lmax	**54.5**	74.3	67.5	64.9	53.6	52.8	49.8	47.9	44.9	43.5	37.1
L90	**38.0**	51.0	47.0	43.0	40.0	37.0	31.0	0.0	0.0	0.0	0.0
06:40 - 06:45											
Leq	**39.5**	54.2	50.0	44.8	42.1	38.7	33.1	26.6	0.0	0.0	0.0
Lmax	**50.0**	69.6	65.9	58.6	54.2	50.7	41.0	37.7	31.6	30.4	25.0
L90	**37.0**	50.0	47.0	42.0	39.0	36.0	30.0	0.0	0.0	0.0	0.0
06:45 - 06:50											
Leq	**41.2**	56.3	50.9	47.7	43.9	39.7	34.6	29.3	26.1	0.0	0.0
Lmax	**55.7**	82.0	77.2	59.8	59.3	49.7	46.0	49.4	51.7	45.8	41.9
L90	**35.0**	50.0	46.0	41.0	37.0	34.0	29.0	0.0	0.0	0.0	0.0
06:50 - 06:55											
Leq	**39.2**	52.8	49.0	44.6	41.2	38.4	33.5	26.5	0.0	0.0	0.0
Lmax	**45.9**	65.0	58.1	52.2	49.4	45.5	41.0	38.1	38.7	31.2	0.0
L90	**36.0**	50.0	47.0	42.0	38.0	35.0	30.0	0.0	0.0	0.0	0.0
06:55 - 07:00											
Leq	**45.5**	52.3	48.3	42.5	39.6	37.0	31.6	32.1	41.8	40.7	0.0
Lmax	**67.7**	65.2	54.0	51.5	49.0	48.1	46.1	51.4	64.5	64.2	47.8
L90	**34.0**	49.0	46.0	40.0	37.0	34.0	27.0	0.0	0.0	0.0	0.0

Our ref: 6473
Project: Buxton quarry
Survey Date: 09/02/2010 - 10/02/2010
Position 2

	A-Weighted	Octave Band Centre Frequency									
	dB(A)	32 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8k Hz	16k Hz
Daytime											
07:39 - 07:54											
Leq	**43.3**	58.8	54.4	51.8	43.6	40.6	37.7	34.0	28.8	0.0	0.0
Lmax	**64.9**	83.4	73.9	69.6	65.4	60.4	61.1	60.7	50.5	45.8	33.4
L90	**39.0**	52.0	50.0	46.0	39.0	37.0	32.0	0.0	0.0	0.0	0.0
07:54 - 08:09											
Leq	**43.9**	57.1	54.2	48.9	42.1	40.4	37.8	35.8	34.0	32.7	0.0
Lmax	**70.9**	78.4	71.3	63.5	57.0	59.7	60.8	68.4	63.4	59.4	52.3
L90	**39.0**	51.0	50.0	45.0	39.0	38.0	33.0	0.0	0.0	0.0	0.0
08:09 - 08:24											
Leq	**42.2**	57.3	57.7	56.4	50.3	48.7	45.3	42.1	39.7	36.8	33.3
Lmax	**59.6**	83.0	88.7	89.6	83.6	82.1	78.8	75.7	72.7	69.8	67.3
L90	**38.0**	51.0	51.0	45.0	38.0	37.0	32.0	0.0	0.0	0.0	0.0
08:35 - 08:50											
Leq	**53.1**	65.5	61.9	55.8	51.1	50.5	50.2	45.9	38.2	34.9	29.3
Lmax	**68.9**	87.1	90.8	88.7	84.0	81.4	78.7	75.7	72.6	69.7	67.1
L90	**46.0**	54.0	55.0	50.0	44.0	44.0	41.0	35.0	27.0	0.0	0.0
08:50 - 09:05											
Leq	**53.1**	67.3	61.6	56.0	51.6	49.3	48.6	46.4	38.3	31.2	0.0
Lmax	**72.1**	87.0	80.3	76.8	71.6	64.3	65.1	68.0	58.6	52.7	40.2
L90	**45.0**	55.0	55.0	49.0	44.0	43.0	40.0	32.0	0.0	0.0	0.0
09:05 - 09:20											
Leq	**53.2**	68.3	62.5	57.4	53.6	51.5	51.0	46.5	39.4	36.4	33.7
Lmax	**81.5**	88.4	92.0	89.9	87.5	82.9	80.1	77.0	73.9	71.5	69.1
L90	**47.0**	55.0	54.0	50.0	46.0	45.0	42.0	35.0	26.0	0.0	0.0
09:20 - 09:35											
Leq	**51.3**	60.0	56.0	51.4	48.5	47.7	48.2	43.7	31.6	24.9	0.0
Lmax	**58.2**	72.1	61.3	56.4	55.8	54.6	55.8	53.3	49.8	44.3	35.0
L90	**47.0**	53.0	53.0	49.0	45.0	45.0	43.0	36.0	0.0	0.0	0.0
11:40 - 11:55											
Leq	**52.2**	64.1	60.2	57.1	54.3	51.4	48.6	45.8	43.1	40.7	38.9
Lmax	**78.2**	84.1	83.5	82.2	77.5	75.4	73.3	71.8	68.7	65.7	64.2
L90	**40.0**	52.0	50.0	45.0	41.0	39.0	34.0	26.0	17.0	0.0	0.0
11:55 - 12:10											
Leq	**56.3**	67.3	65.5	62.5	58.2	55.4	52.0	48.6	45.9	43.2	41.3
Lmax	**80.8**	84.2	85.5	85.2	78.8	79.8	75.9	72.8	69.2	66.5	64.9
L90	**41.0**	53.0	51.0	46.0	42.0	40.0	35.0	28.0	19.0	0.0	0.0
12:10 - 12:25											
Leq	**46.9**	59.0	55.0	52.1	47.3	44.2	42.5	39.5	35.3	30.3	26.5
Lmax	**72.2**	82.6	80.0	79.5	75.3	72.0	68.9	65.9	64.1	61.7	59.8
L90	**39.0**	51.0	50.0	44.0	40.0	38.0	34.0	26.0	17.0	0.0	0.0
12:25 - 12:40											
Leq	**54.7**	66.6	65.8	62.4	59.6	56.5	53.1	50.5	47.7	45.2	42.8
Lmax	**76.1**	84.6	85.9	81.8	78.2	75.6	72.4	69.3	66.5	65.3	63.6
L90	**42.0**	52.0	50.0	46.0	43.0	41.0	36.0	28.0	20.0	0.0	0.0
13:26 - 13:41											
Leq	**46.8**	61.3	57.0	52.2	49.5	47.4	43.5	40.4	37.5	35.2	32.9
Lmax	**74.5**	84.7	84.6	80.0	77.3	74.6	71.4	70.1	67.3	63.7	61.4
L90	**39.0**	51.0	49.0	43.0	39.0	38.0	33.0	23.0	16.0	0.0	0.0
13:41 - 13:56											
Leq	**54.3**	66.1	62.7	59.8	56.9	53.9	51.5	48.6	46.3	43.1	40.8
Lmax	**80.2**	85.9	84.2	81.8	81.2	78.6	74.5	72.0	69.7	67.7	67.4
L90	**39.0**	52.0	50.0	45.0	41.0	38.0	33.0	24.0	18.0	15.0	0.0
13:56 - 14:11											
Leq	**56.0**	68.0	66.3	62.9	59.2	56.3	53.7	51.0	48.1	45.3	43.1
Lmax	**78.2**	86.7	87.1	83.4	80.3	77.6	75.1	73.4	70.7	68.6	67.1
L90	**40.0**	50.0	49.0	44.0	40.0	38.0	34.0	26.0	20.0	16.0	0.0

14:11 - 14:26											
Leq	**55.7**	65.6	62.8	59.7	56.9	55.0	51.8	49.5	47.3	45.1	43.3
Lmax	**82.6**	86.7	85.8	84.4	80.6	80.9	75.2	74.0	73.4	71.7	71.1
L90	**39.0**	50.0	49.0	44.0	39.0	37.0	33.0	24.0	17.0	0.0	0.0
15:38 - 15:53											
Leq	**50.8**	57.7	55.3	52.9	45.6	43.7	45.3	45.3	42.3	31.3	0.0
Lmax	**81.6**	74.5	72.4	70.8	72.1	71.2	74.7	74.3	78.0	65.4	56.3
L90	**36.0**	50.0	49.0	43.0	36.0	34.0	31.0	0.0	0.0	0.0	0.0
15:53 - 16:08											
Leq	**47.5**	60.8	60.1	51.2	43.0	40.9	42.7	41.9	35.1	26.9	0.0
Lmax	**65.3**	78.4	78.2	68.2	58.8	57.7	61.3	61.3	56.9	51.5	39.3
L90	**37.0**	51.0	50.0	43.0	36.0	34.0	31.0	0.0	0.0	0.0	0.0
16:08 - 16:23											
Leq	**47.9**	57.5	60.2	52.6	43.2	41.7	41.2	42.2	40.0	32.5	0.0
Lmax	**77.8**	69.5	74.9	68.1	70.3	70.0	70.1	72.5	71.9	63.4	51.9
L90	**38.0**	50.0	51.0	45.0	37.0	36.0	33.0	27.0	0.0	0.0	0.0
17:40 - 17:55											
Leq	**46.2**	57.0	54.1	50.7	47.0	45.6	41.6	38.2	35.6	32.8	30.3
Lmax	**76.2**	83.6	83.1	80.7	79.1	74.6	72.0	68.8	68.6	66.2	63.3
L90	**37.0**	49.0	49.0	43.0	38.0	35.0	31.0	23.0	18.0	0.0	0.0
17:55 - 18:10											
Leq	**44.0**	53.3	51.5	52.0	51.3	39.7	33.4	26.8	20.6	0.0	0.0
Lmax	**65.3**	70.0	67.1	74.1	74.6	57.8	52.5	49.1	43.1	36.2	25.1
L90	**37.0**	48.0	48.0	43.0	37.0	35.0	31.0	22.0	17.0	0.0	0.0
18:10 - 18:25											
Leq	**44.5**	57.6	54.9	52.2	47.8	44.2	41.5	38.5	35.6	31.8	29.0
Lmax	**74.6**	83.1	83.4	80.3	76.3	73.1	71.4	67.2	64.5	62.0	59.5
L90	**36.0**	48.0	48.0	43.0	37.0	35.0	31.0	21.0	15.0	0.0	0.0
18:25 - 18:40											
Leq	**45.1**	56.8	54.3	46.5	42.2	40.9	41.8	37.7	32.7	26.3	22.2
Lmax	**73.6**	82.4	80.7	76.7	74.2	71.1	71.7	65.9	62.7	60.4	58.9
L90	**36.0**	48.0	48.0	42.0	37.0	34.0	31.0	21.0	15.0	0.0	0.0
19:36 - 19:51											
Leq	**41.9**	60.9	52.8	44.5	42.2	39.2	35.3	33.6	31.9	27.0	0.0
Lmax	**67.3**	81.0	74.3	60.9	61.7	54.2	56.5	61.3	62.8	59.0	49.9
L90	**36.0**	51.0	48.0	40.0	37.0	35.0	31.0	0.0	0.0	0.0	0.0
19:51 - 20:06											
Leq	**40.2**	64.2	55.2	44.7	41.5	38.3	34.0	30.1	27.6	0.0	0.0
Lmax	**63.8**	82.6	75.5	60.7	64.5	57.2	57.6	58.0	56.0	44.0	36.7
L90	**37.0**	52.0	48.0	41.0	38.0	36.0	31.0	0.0	0.0	0.0	0.0
20:06 - 20:21											
Leq	**42.2**	62.2	54.8	47.0	43.0	39.1	37.3	33.8	25.5	0.0	0.0
Lmax	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
L90	**37.0**	50.0	49.0	42.0	39.0	36.0	31.0	0.0	0.0	0.0	0.0
20:21 - 20:36											
Leq	**44.0**	63.5	56.0	48.9	45.2	39.5	37.4	37.3	32.2	0.0	0.0
Lmax	**60.1**	85.3	72.9	66.1	64.0	55.0	56.5	54.3	50.8	42.6	31.9
L90	**37.0**	50.0	48.0	42.0	38.0	35.0	31.0	0.0	0.0	0.0	0.0
21:36 - 21:51											
Leq	**39.9**	64.7	55.5	46.5	42.0	39.0	0.0	0.0	0.0	0.0	0.0
Lmax	**53.9**	83.2	75.2	64.7	55.4	51.7	50.2	48.8	42.5	40.1	0.0
L90	**37.0**	50.0	47.0	42.0	38.0	36.0	0.0	0.0	0.0	0.0	0.0
21:51 - 22:06											
Leq	**40.5**	65.2	55.6	46.8	42.5	39.8	0.0	0.0	0.0	0.0	0.0
Lmax	**54.3**	88.0	76.9	68.0	52.1	45.9	41.1	0.0	0.0	0.0	0.0
L90	**38.0**	51.0	48.0	43.0	40.0	37.0	0.0	0.0	0.0	0.0	0.0
22:06 - 22:21											
Leq	**39.6**	62.5	54.0	45.6	41.7	39.1	0.0	0.0	0.0	0.0	0.0
Lmax	**53.8**	88.3	78.5	66.4	52.1	46.1	40.3	35.6	0.0	0.0	0.0
L90	**38.0**	48.0	47.0	42.0	39.0	37.0	0.0	0.0	0.0	0.0	0.0

22:21 - 22:36											
Leq	**40.7**	61.1	52.2	44.9	42.2	39.1	0.0	0.0	0.0	0.0	0.0
Lmax	**55.5**	75.5	61.5	53.9	50.6	47.4	47.4	53.4	45.7	40.4	0.0
L90	**39.0**	50.0	48.0	42.0	40.0	38.0	0.0	0.0	0.0	0.0	0.0
Nighttime											
23:30 - 23:35											
Leq	**41.3**	65.1	55.6	47.0	43.6	40.7	0.0	0.0	0.0	0.0	0.0
Lmax	**55.9**	80.7	71.3	59.5	51.0	56.0	53.1	49.4	47.0	44.7	34.5
L90	**38.0**	52.0	48.0	42.0	41.0	37.0	0.0	0.0	0.0	0.0	0.0
23:35 - 23:40											
Leq	**40.0**	63.0	53.9	45.7	42.8	39.8	0.0	0.0	0.0	0.0	0.0
Lmax	**49.1**	81.2	70.0	61.6	53.7	47.6	38.3	0.0	35.7	0.0	0.0
L90	**38.0**	52.0	47.0	41.0	40.0	37.0	0.0	0.0	0.0	0.0	0.0
23:40 - 23:45											
Leq	**42.5**	66.8	56.8	49.7	46.6	41.8	0.0	0.0	0.0	0.0	0.0
Lmax	**52.6**	86.0	76.1	60.3	58.7	53.7	40.4	0.0	0.0	0.0	0.0
L90	**37.0**	54.0	49.0	42.0	39.0	36.0	0.0	0.0	0.0	0.0	0.0
23:45 - 23:50											
Leq	**48.7**	62.9	54.8	49.5	44.4	43.9	44.6	42.0	38.0	0.0	0.0
Lmax	**70.0**	77.5	70.0	68.5	61.3	64.8	67.2	62.8	58.7	53.2	42.3
L90	**37.0**	53.0	48.0	41.0	39.0	36.0	0.0	0.0	0.0	0.0	0.0
23:50 - 23:55											
Leq	**39.4**	65.4	55.2	46.1	42.1	38.5	0.0	0.0	0.0	0.0	0.0
Lmax	**49.3**	86.4	74.5	58.2	50.0	45.6	40.2	0.0	0.0	0.0	0.0
L90	**37.0**	52.0	47.0	41.0	39.0	36.0	0.0	0.0	0.0	0.0	0.0
23:55 - 00:00											
Leq	**39.9**	64.6	54.6	45.6	42.3	39.2	0.0	0.0	0.0	0.0	0.0
Lmax	**47.7**	81.7	72.0	59.9	49.1	44.6	38.6	0.0	0.0	0.0	0.0
L90	**38.0**	52.0	48.0	41.0	40.0	37.0	0.0	0.0	0.0	0.0	0.0
00:00 - 00:05											
Leq	**50.5**	65.5	57.3	54.6	49.0	45.9	45.5	43.8	39.7	0.0	0.0
Lmax	**70.6**	82.7	74.3	75.5	70.8	66.4	66.3	63.4	59.8	52.3	42.5
L90	**39.0**	54.0	49.0	42.0	41.0	38.0	0.0	0.0	0.0	0.0	0.0
00:05 - 00:10											
Leq	**47.5**	62.7	55.1	51.3	45.0	43.2	41.5	41.7	36.3	0.0	0.0
Lmax	**64.2**	77.9	70.8	67.3	59.2	59.5	60.1	58.3	54.0	49.8	36.7
L90	**37.0**	52.0	47.0	41.0	39.0	36.0	0.0	0.0	0.0	0.0	0.0
00:10 - 00:15											
Leq	**39.7**	59.2	51.5	43.9	42.7	39.7	0.0	0.0	0.0	0.0	0.0
Lmax	**46.1**	75.3	63.1	54.7	51.6	47.4	36.8	0.0	0.0	0.0	0.0
L90	**38.0**	52.0	47.0	41.0	40.0	37.0	0.0	0.0	0.0	0.0	0.0
00:15 - 00:20											
Leq	**41.5**	57.6	56.1	52.3	43.3	40.7	0.0	0.0	0.0	0.0	0.0
Lmax	**48.7**	70.6	68.7	64.5	54.7	48.8	39.3	0.0	0.0	0.0	0.0
L90	**39.0**	52.0	49.0	44.0	41.0	38.0	0.0	0.0	0.0	0.0	0.0
00:20 - 00:25											
Leq	**39.4**	58.5	50.8	44.6	41.6	39.4	0.0	0.0	0.0	0.0	0.0
Lmax	**44.3**	72.6	61.6	52.4	46.6	45.6	38.3	0.0	0.0	0.0	0.0
L90	**37.0**	52.0	47.0	42.0	39.0	37.0	0.0	0.0	0.0	0.0	0.0
00:25 - 00:30											
Leq	**43.1**	55.2	50.5	45.1	43.6	42.9	37.8	0.0	0.0	0.0	0.0
Lmax	**54.5**	67.4	59.3	53.3	50.5	50.6	49.9	49.3	44.8	35.8	0.0
L90	**39.0**	52.0	47.0	43.0	40.0	39.0	0.0	0.0	0.0	0.0	0.0
01:36 - 01:41											
Leq	**41.6**	68.5	59.1	49.5	44.6	39.6	34.0	28.8	0.0	0.0	0.0
Lmax	**58.5**	86.4	75.0	64.5	56.1	49.9	54.2	53.3	50.0	39.0	29.4
L90	**37.0**	53.0	48.0	43.0	39.0	36.0	30.0	0.0	0.0	0.0	0.0
01:41 - 01:46											
Leq	**40.1**	67.0	57.4	48.0	42.9	38.5	32.6	24.8	0.0	0.0	0.0
Lmax	**51.7**	84.7	74.6	64.3	53.0	49.0	42.2	33.0	27.2	26.6	25.8
L90	**36.0**	49.0	47.0	42.0	38.0	35.0	30.0	0.0	0.0	0.0	0.0

01:46 - 01:51											
Leq	**42.1**	66.8	57.4	49.7	45.7	40.8	34.2	27.9	0.0	0.0	0.0
Lmax	**53.3**	85.1	75.5	63.8	59.3	51.5	42.3	37.9	38.0	33.5	27.8
L90	**38.0**	50.0	49.0	44.0	41.0	37.0	32.0	0.0	0.0	0.0	0.0
01:51 - 01:56											
Leq	**54.7**	71.3	66.3	59.7	58.2	55.6	53.1	51.1	48.1	45.1	42.6
Lmax	**86.1**	93.2	94.4	88.5	87.6	85.1	81.9	80.7	78.5	75.3	72.6
L90	**38.0**	50.0	48.0	43.0	40.0	37.0	31.0	0.0	0.0	0.0	0.0
01:56 - 02:01											
Leq	**45.0**	72.6	64.2	57.7	53.4	48.9	45.8	42.6	39.3	36.3	33.7
Lmax	**57.2**	87.3	87.4	89.0	85.7	81.2	78.4	75.7	72.7	69.8	67.1
L90	**40.0**	56.0	51.0	45.0	42.0	39.0	33.0	26.0	0.0	0.0	0.0
02:01 - 02:06											
Leq	**50.1**	72.0	63.6	58.5	56.7	52.8	50.6	46.5	43.8	40.7	38.2
Lmax	**82.0**	92.1	86.7	88.5	86.5	82.5	81.5	75.9	73.8	70.7	68.2
L90	**41.0**	57.0	51.0	45.0	43.0	39.0	34.0	27.0	0.0	0.0	0.0
02:06 - 02:11											
Leq	**50.2**	73.2	65.6	58.9	55.1	52.6	50.5	47.1	43.6	40.7	38.5
Lmax	**81.8**	93.8	91.3	88.2	84.4	81.6	79.8	75.8	72.7	69.9	67.4
L90	**40.0**	53.0	50.0	45.0	43.0	39.0	33.0	26.0	0.0	0.0	0.0
02:11 - 02:16											
Leq	**43.7**	72.1	64.0	59.7	54.3	51.8	48.4	45.2	42.2	39.2	36.7
Lmax	**56.6**	92.4	88.8	89.6	84.5	82.2	78.6	75.6	72.6	69.7	67.0
L90	**39.0**	55.0	50.0	44.0	41.0	38.0	32.0	0.0	0.0	0.0	0.0
02:16 - 02:21											
Leq	**44.0**	64.6	54.8	47.4	44.5	41.8	37.8	34.9	33.5	27.1	0.0
Lmax	**53.2**	78.3	64.5	54.1	48.5	47.9	48.9	44.8	46.1	41.6	32.0
L90	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
03:33 - 03:38											
Leq	**40.9**	58.3	50.5	44.4	41.5	37.9	34.3	33.2	30.6	25.0	0.0
Lmax	**57.6**	79.0	71.8	59.8	61.5	53.0	49.4	53.6	50.7	46.3	34.4
L90	**36.0**	46.0	45.0	40.0	38.0	35.0	29.0	0.0	0.0	0.0	0.0
03:38 - 03:43											
Leq	**36.7**	54.6	47.8	41.9	39.3	35.6	30.3	0.0	0.0	0.0	0.0
Lmax	**45.4**	75.6	66.5	55.4	47.3	42.7	41.0	39.5	36.1	28.9	0.0
L90	**34.0**	46.0	44.0	39.0	36.0	33.0	27.0	0.0	0.0	0.0	0.0
03:43 - 03:48											
Leq	**36.8**	55.7	48.7	42.2	39.5	35.7	30.5	0.0	0.0	0.0	0.0
Lmax	**43.5**	77.0	69.0	51.7	46.0	41.7	38.6	36.5	32.1	26.5	0.0
L90	**34.0**	46.0	44.0	39.0	36.0	33.0	27.0	0.0	0.0	0.0	0.0
03:48 - 03:53											
Leq	**36.3**	57.7	48.9	42.1	38.9	35.1	29.7	0.0	0.0	0.0	0.0
Lmax	**46.3**	80.9	68.5	58.0	47.9	41.4	37.5	37.1	33.7	26.6	0.0
L90	**34.0**	46.0	45.0	39.0	36.0	33.0	27.0	0.0	0.0	0.0	0.0
03:53 - 03:58											
Leq	**54.2**	58.1	59.4	55.9	50.0	49.4	49.1	48.4	43.5	36.2	27.3
Lmax	**75.2**	80.3	80.5	77.5	71.5	69.7	70.4	70.3	64.4	56.4	48.2
L90	**36.0**	47.0	46.0	41.0	38.0	35.0	30.0	0.0	0.0	0.0	0.0
03:58 - 04:03											
Leq	**39.2**	56.9	49.6	44.1	41.9	37.8	33.1	28.1	0.0	0.0	0.0
Lmax	**48.1**	77.4	67.8	58.2	49.1	43.4	43.1	42.1	38.7	31.2	26.6
L90	**35.0**	47.0	46.0	40.0	38.0	34.0	29.0	0.0	0.0	0.0	0.0
04:03 - 04:08											
Leq	**35.9**	55.4	48.9	41.2	38.2	34.8	29.5	0.0	0.0	0.0	0.0
Lmax	**45.7**	80.6	69.5	56.1	44.3	40.8	36.7	32.0	31.1	25.6	28.4
L90	**34.0**	45.0	45.0	39.0	35.0	32.0	27.0	0.0	0.0	0.0	0.0
04:08 - 04:13											
Leq	**39.8**	54.4	49.4	45.4	45.4	39.3	28.8	0.0	0.0	0.0	0.0
Lmax	**54.1**	78.5	67.3	59.9	59.2	57.3	36.1	27.8	0.0	0.0	0.0
L90	**33.0**	46.0	45.0	38.0	35.0	32.0	26.0	0.0	0.0	0.0	0.0

04:13 - 04:18											
Leq	**36.1**	55.7	48.7	41.8	38.8	35.3	29.4	0.0	0.0	0.0	0.0
Lmax	**45.1**	75.9	70.5	55.8	45.5	40.6	34.2	32.8	28.2	0.0	0.0
L90	**33.0**	46.0	44.0	39.0	36.0	33.0	27.0	0.0	0.0	0.0	0.0
04:18 - 04:23											
Leq	**38.4**	55.9	50.3	43.7	39.5	36.6	31.9	28.2	26.0	0.0	0.0
Lmax	**57.8**	74.4	76.8	69.6	55.6	55.2	52.0	47.8	49.0	41.4	32.4
L90	**35.0**	48.0	45.0	40.0	36.0	34.0	28.0	0.0	0.0	0.0	0.0
05:30 - 05:35											
Leq	**54.6**	57.4	64.7	56.1	49.3	49.2	49.1	49.3	43.4	36.4	25.6
Lmax	**77.8**	78.0	89.2	77.7	72.8	73.2	73.4	72.6	65.6	58.7	49.4
L90	**36.0**	49.0	47.0	41.0	37.0	35.0	30.0	0.0	0.0	0.0	0.0
05:35 - 05:40											
Leq	**37.8**	55.2	50.1	45.0	41.1	37.6	29.9	0.0	0.0	0.0	0.0
Lmax	**51.5**	74.1	66.2	56.4	57.5	54.2	34.2	28.6	0.0	0.0	0.0
L90	**34.0**	50.0	46.0	40.0	35.0	33.0	29.0	0.0	0.0	0.0	0.0
05:40 - 05:45											
Leq	**36.4**	57.9	52.5	44.4	38.6	35.1	29.8	0.0	0.0	0.0	0.0
Lmax	**46.2**	74.7	67.2	57.4	52.6	45.1	32.7	28.8	0.0	0.0	0.0
L90	**34.0**	49.0	47.0	40.0	35.0	33.0	28.0	0.0	0.0	0.0	0.0
05:45 - 05:50											
Leq	**38.5**	51.2	48.9	49.6	43.4	36.7	29.2	0.0	0.0	0.0	0.0
Lmax	**53.1**	57.5	55.1	64.5	61.3	51.3	36.5	0.0	26.8	0.0	0.0
L90	**34.0**	48.0	46.0	39.0	35.0	33.0	27.0	0.0	0.0	0.0	0.0
05:50 - 05:55											
Leq	**35.7**	50.1	52.8	45.2	37.7	34.0	28.0	0.0	0.0	0.0	0.0
Lmax	**40.2**	65.7	57.7	49.7	47.1	39.2	31.3	0.0	0.0	0.0	0.0
L90	**34.0**	47.0	47.0	40.0	36.0	32.0	27.0	0.0	0.0	0.0	0.0
05:55 - 06:00											
Leq	**47.4**	54.0	56.9	49.3	43.6	41.8	43.0	40.7	37.5	32.2	0.0
Lmax	**68.8**	72.4	74.3	67.2	62.4	61.9	65.5	63.5	59.6	54.0	43.9
L90	**36.0**	47.0	53.0	45.0	37.0	34.0	28.0	0.0	0.0	0.0	0.0
06:00 - 06:05											
Leq	**53.6**	55.3	54.9	49.7	49.4	46.9	50.0	47.7	41.4	33.9	24.9
Lmax	**75.5**	73.8	71.9	69.9	68.2	67.4	72.9	68.8	63.5	58.1	48.3
L90	**37.0**	47.0	52.0	44.0	38.0	35.0	30.0	0.0	0.0	0.0	0.0
06:05 - 06:10											
Leq	**45.1**	56.6	54.3	53.5	51.0	43.6	32.3	0.0	0.0	0.0	0.0
Lmax	**62.6**	79.9	65.0	69.3	69.1	62.7	46.9	34.8	30.2	0.0	0.0
L90	**37.0**	48.0	52.0	45.0	39.0	35.0	29.0	0.0	0.0	0.0	0.0
06:10 - 06:15											
Leq	**38.0**	52.5	53.1	45.7	40.2	37.2	31.2	0.0	0.0	0.0	0.0
Lmax	**43.2**	73.2	63.4	51.1	46.9	43.7	36.7	27.3	0.0	0.0	0.0
L90	**37.0**	48.0	52.0	44.0	38.0	35.0	29.0	0.0	0.0	0.0	0.0
06:15 - 06:20											
Leq	**39.0**	53.9	53.3	46.1	40.9	38.1	32.0	0.0	0.0	0.0	0.0
Lmax	**49.5**	72.6	65.0	52.1	46.0	43.2	43.4	42.4	46.8	30.4	0.0
L90	**38.0**	49.0	52.0	45.0	39.0	37.0	31.0	0.0	0.0	0.0	0.0
06:20 - 06:25											
Leq	**42.4**	54.1	53.5	47.0	42.6	39.7	35.9	33.9	32.2	27.4	0.0
Lmax	**57.2**	67.0	63.6	55.8	61.0	55.7	49.3	54.0	49.5	49.2	43.5
L90	**38.0**	51.0	52.0	45.0	39.0	37.0	32.0	0.0	0.0	0.0	0.0
07:39 - 07:54											
Leq	**43.3**	58.8	54.4	51.8	43.6	40.6	37.7	34.0	28.8	0.0	0.0
Lmax	**64.9**	83.4	73.9	69.6	65.4	60.4	61.1	60.7	50.5	45.8	33.4
L90	**39.0**	52.0	50.0	46.0	39.0	37.0	32.0	0.0	0.0	0.0	0.0
07:54 - 08:09											
Leq	**43.9**	57.1	54.2	48.9	42.1	40.4	37.8	35.8	34.0	32.7	0.0
Lmax	**70.9**	78.4	71.3	63.5	57.0	59.7	60.8	68.4	63.4	59.4	52.3
L90	**39.0**	51.0	50.0	45.0	39.0	38.0	33.0	0.0	0.0	0.0	0.0
08:09 - 08:24											
Leq	**42.2**	57.3	57.7	56.4	50.3	48.7	45.3	42.1	39.7	36.8	33.3
Lmax	**59.6**	83.0	88.7	89.6	83.6	82.1	78.8	75.7	72.7	69.8	67.3
L90	**38.0**	51.0	51.0	45.0	38.0	37.0	32.0	0.0	0.0	0.0	0.0