APPENDIX 13.1: NOISE AND VIBRATION

1. GLOSSARY OF ACOUSTIC TERMS

1.1.1 Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

1.1.2 Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source.

1.1.3 The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq}, L_{A90} etc., according to the parameter being measured.

1.1.4 The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

1.1.5 Terminology relating to noise is provided in **Table 1-1**.

Table 1-1 – Terminology

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

Term	Description
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5 m.
Façade	At a distance of 1 m in front of a large sound reflecting object such as a building façade.
Fast/Slow Time Weighting	Averaging times used in sound level meters.
Octave Band	A range of frequencies whose upper limit is twice the frequency of the lower limit.
Sound power level, L_W	Sound power measured on a decibel scale, relative to a reference value of 10^{-12} W.
Specific sound source	The sound level attributed to the industrial noise source under consideration alone.
Ambient Sound	Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far.
Residual Sound	Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.
Residual Sound Level $L_r = L_{Aeq,Tr}$	Equivalent continuous A-weighted sound pressure level of the residual sound at the assessment, T.
Rating Level $L_{Ar,Tr}$	Specific sound level plus any adjustment for the characteristic features of the sound.
Background sound level	The sound level in the absence of the industrial source noise under consideration, measured in L_{A90}.

2. POLICY

2.1 National Planning Policy

National Planning Framework 4 (NPF4) (Scottish Government, 2023)

2.1.1 NPF4 sets out the Government's planning policies for Scotland and how these are expected to be applied. Policy 11 which supports opportunities for renewable energy development, including new and replacement transmission and distribution structure. Policy 11 states:

> *"e) In addition, project design and mitigation will demonstrate how the following impacts are addressed:*
>
> > *i. impacts on communities and individual dwellings, including, residential amenity, visual impact, noise and shadow flicker; ..."*

2.1.2 Policy 23 helps to protect health and wellbeing, including ensuring noise pollution is taken into account, and by planning and managing development to take hazards into account. Policy 23 states:

> *"e) Development proposals that are likely to raise unacceptable noise issues will not be supported. The agent of change principle applies to noise sensitive development. A Noise Impact Assessment may be required where the nature of the proposal or its location suggests that significant effects are likely.*

Planning Advice Note (PAN) 1/2011: Planning and Noise

2.1.3 PAN 1/2011, published by the Scottish Government, provides advice on the role of the planning system in helping to prevent and limit adverse effects related to noise.

Technical Advice Note (TAN): Assessment of Noise

2.1.4 TAN accompanies the PAN document and provides information and advice on noise assessment methods. TAN contain details of the legislation, technical standards and codes of practice for specific noise issues. Aberdeenshire Council Environmental Health Department discourage the use of TAN, hence further information is not provided.

2.2 Local Planning Policy

Aberdeenshire Local Development Plan (January 2023)

2.2.1 Aberdeenshire Council Local Development Plan 2023 sets out long term policies for future development. Pertinent to this development, and with regards to noise and vibration, is Policy P4.1 Pollution, which states the following:

> *"We will refuse development, even infill development, if there is a risk that it could cause significant pollution, create a significant nuisance (for example through impacts on air quality or noise), or present an unacceptable danger to the public or the environment. This includes developments we are told by the Health and Safety Executive or the Competent Authority to be near facilities they have identified as hazardous. Pipelines, agricultural buildings, wastewater treatment plants, waste disposal/treatment facilities and heavy industrial uses are all examples of development that could create a nuisance, pollution or hazard. In any circumstances where development of this kind is, on balance, considered acceptable by the appropriate authorities, satisfactory steps must be taken to mitigate any residual negative development impacts."*

3. BASELINE NOISE SURVEY DETAILS

3.1.1 Baseline noise surveys have been undertaken at four measurement locations considered to be representative of the receivers described in **Table 13-12** of **Volume 2, Chapter 13: Noise and Vibration** as described below and shown in **Volume 3, Figure 13.1: Baseline Measurement Positions and Noise Sensitive Receptors**:

- **Measurement Position 1 (MP1):** The measurement position was situated within the land adjacent to Newton (i.e. NSR1). Continuous measurements were carried out between 09:30 on Tuesday 19 March 2024 until 11:15 on Tuesday 26 March 2024.
- **Measurement Position 2 (MP2):** The measurement position was situated within the land adjacent to Torridon (i.e. NSR2). Continuous measurements were carried out between 10:00 on Tuesday 19 March 2024 until 10:30 on Tuesday 26 March 2024.
- **Measurement Position 3 (MP3):** The measurement position was situated within the land adjacent to the Greenford (i.e. NSR3). Continuous measurements were carried out between 10:45 on Tuesday 19 March 2024 until 09:45 on Tuesday 26 March 2024.
- **Measurement Position (MP4):** The measurement position was situated within the land adjacent to the Upper Greenfield (i.e. NSR4). Continuous measurements were carried out between 11:00 on Tuesday 19 March 2024 until 09:30 on Tuesday 26 March 2024.

3.1.2 The measurements were carried out in accordance with BS 7445:2003 as defined in BS 61672:2023[1]. The meters were installed on tripods approximately 1.5 m in height from the ground and in free field conditions.

3.1.3 The noise climate at the measurement positions was noted to be influenced by road traffic noise during the daytime at a low level, typical of a rural context.

3.1.4 **Section 13.5** of **Volume 2, Chapter 13: Noise and Vibration** provides further details on the baseline conditions and methodology. Full details of the obtained measurement results are provided on the following pages.

3.1.5 **Figure 3-1** shows a summary of the day and night-time measured noise levels at Measurement Position 1 (MP1) during the survey, depicting the L_{Aeq} and L_{A90} values over a seven day period.

[1] British Standards Institution (2023) BS 61672 – Electroacoustics. Sound level meters. Parts 1 to 3. London: BSi

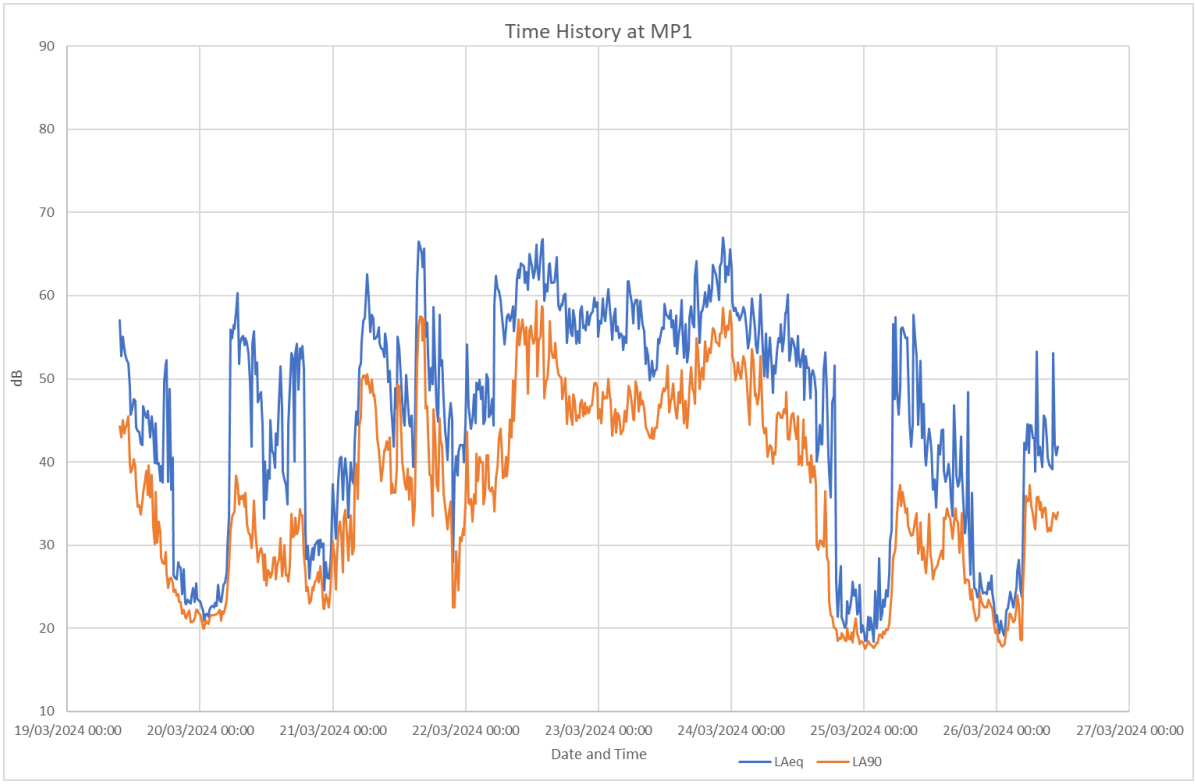

Figure 3-1 – MP1 Noise Levels dB

3.1.6 **Figure 3-2** shows a summary of the day and night-time measured noise levels at Measurement Position 2 (MP2) during the survey, depicting the L_{Aeq} and L_{A90} values over a seven day period.

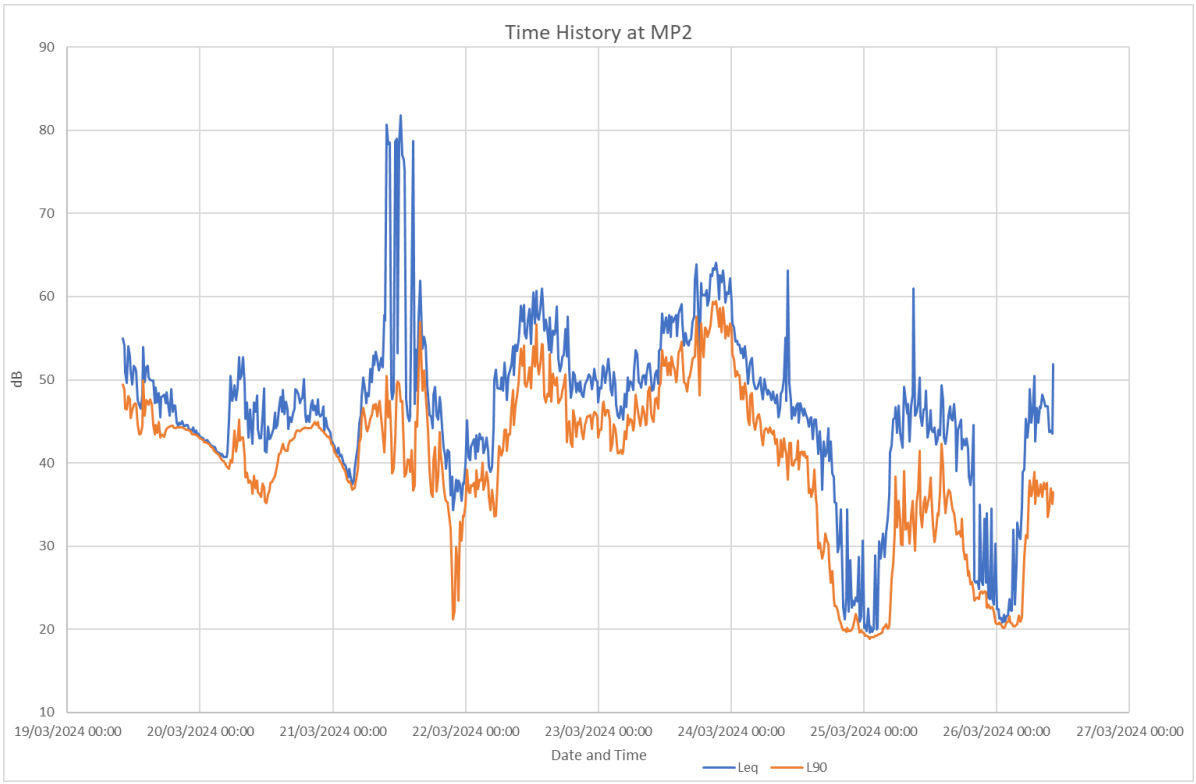

Figure 3-2 – MP2 Noise Levels dB

3.1.7 **Figure 3-3** shows a summary of the day and night-time measured noise levels at Measurement Position 3 (MP3) during the survey, depicting the L_{Aeq} and L_{A90} values over a seven day period.

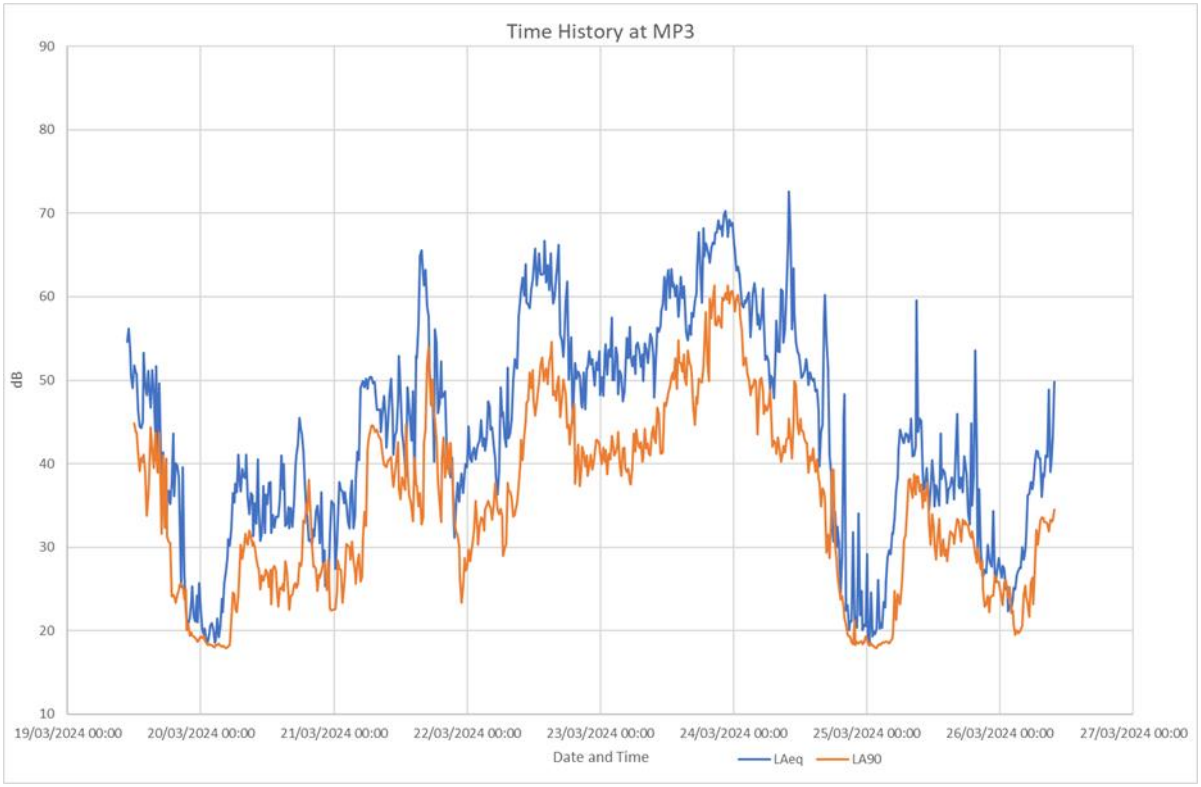

Figure 3-3 – MP3 Noise Levels

3.1.8 **Figure 3-4** shows a summary of the day and night-time measured noise levels at Measurement Position 4 (MP4) during the survey, depicting the L_{Aeq} and L_{A90} values over a seven day period.

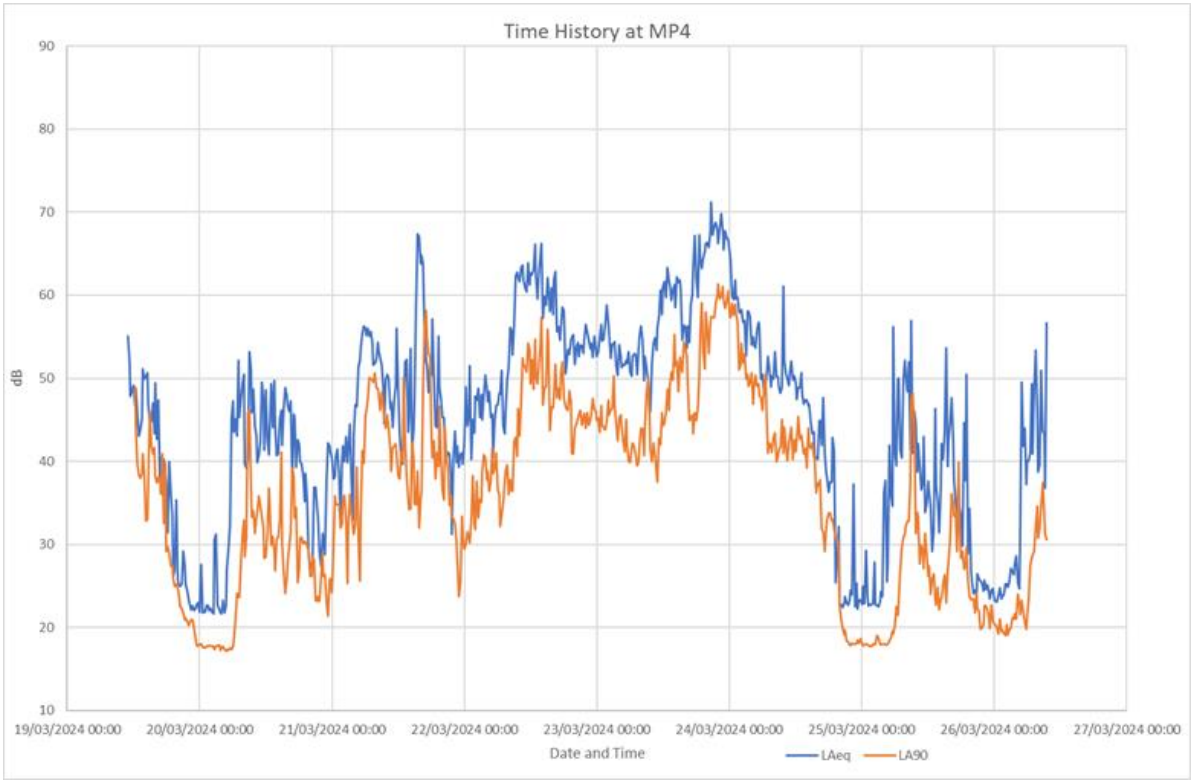

Figure 3-4 – MP4 Noise Levels dB

3.2 Background Sound Level Data Analysis

3.2.1 The measured noise levels have been analysed to determine the day and night-time background sound level for weekday and weekend periods. The methodology used follows the statistical approach presented in BS 4142[2].

3.2.2 The measured levels in conjunction with the spread of noise levels, are used to determine the representative background sound level.

3.2.3 Histogram charts showing the spread of the background noise levels over the measurement period at:

- MP1 during the daytime and night-time respectively are shown in **Figure 3-5** and **Figure 3-6**;
- MP2 during the daytime and night-time respectively are shown in **Figure 3-7** and **Figure 3-8**;
- MP3 during the daytime and night-time respectively are shown in **Figure 3-9** and **Figure 3-10**; and
- MP4 during the daytime and night-time respectively are shown in **Figure 3-11** and **Figure 3-12**.

[2] British Standards Institution (2014), BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound. London: BSi.

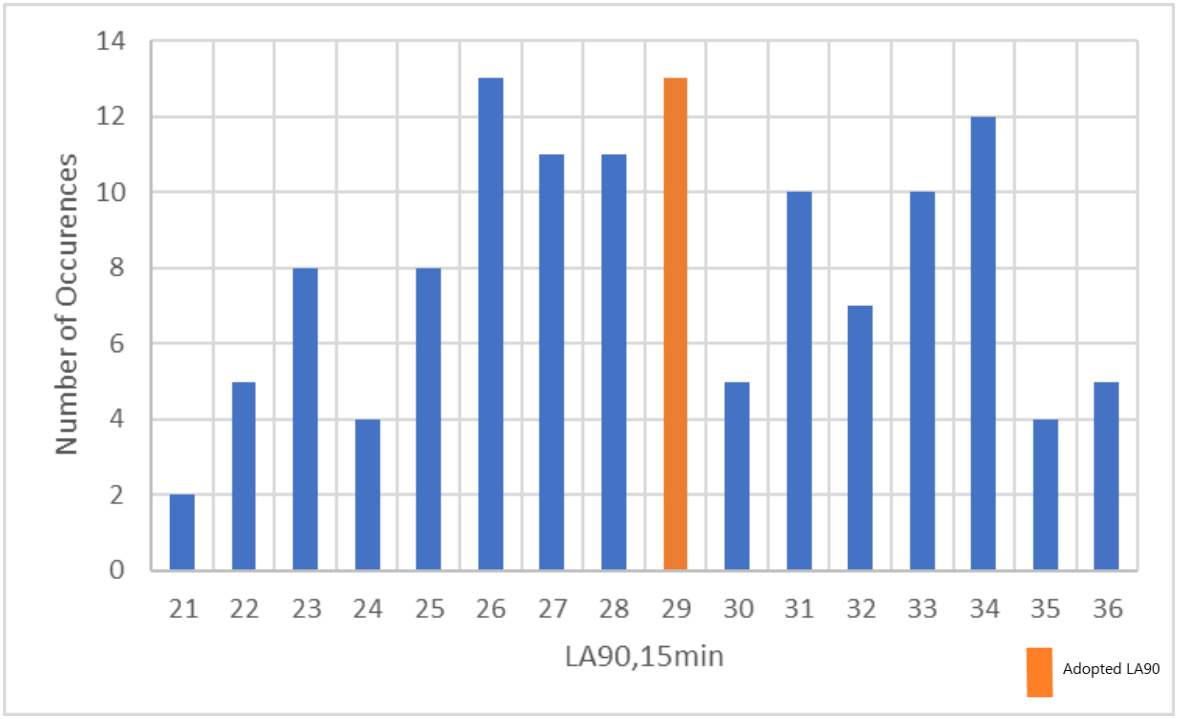

Figure 3-5 – MP1 Daytime (07:00 – 23:00) $L_{A90,15min}$ (dB) Histogram

3.2.4 As seen in **Figure 3-5**, 29 dB $L_{A90, 15min}$ (shown in orange) is the most commonly occurring daytime background sound level at MP1 for the duration of the survey period. Therefore, this can be considered as representative of the daytime background sound level for this assessment.

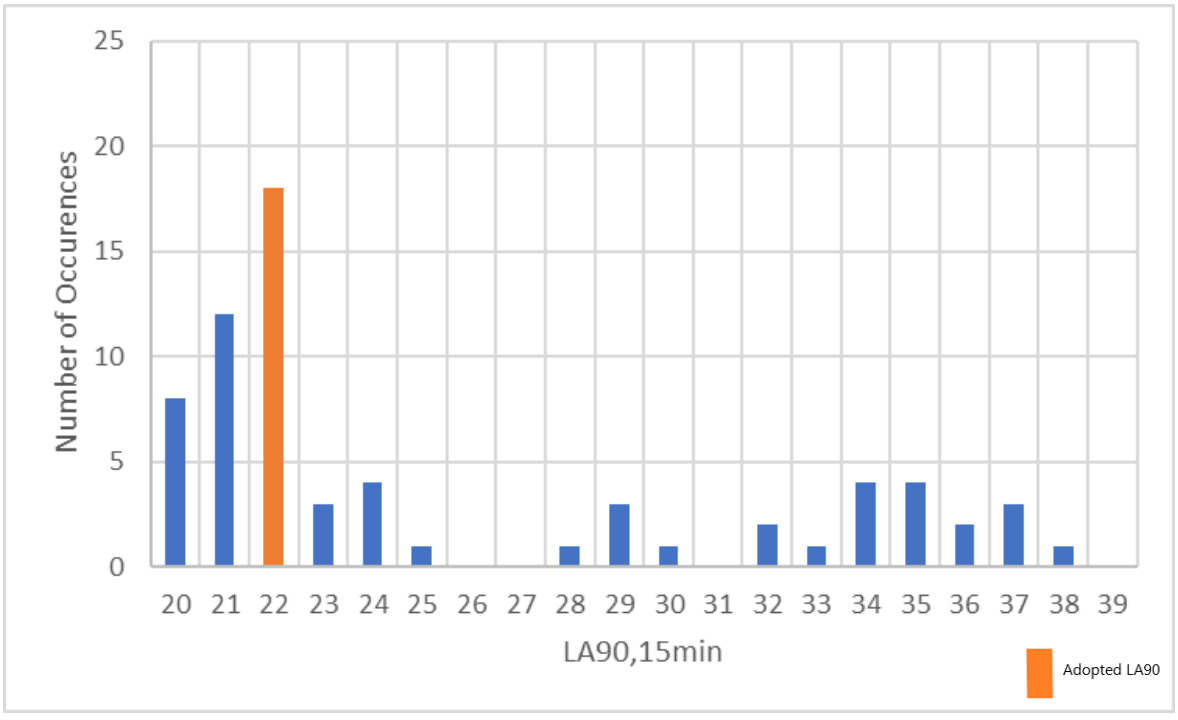

Figure 3-6 – MP1 Night-time (23:00 – 07:00) $L_{A90,15min}$ (dB) Histogram

3.2.5 As seen in **Figure 3-6**, 22 dB $L_{A90, 15min}$ (shown in orange) is the most commonly occurring night-time background sound level at MP1 for the duration of the survey period. Therefore, this can be considered as representative of the night-time background sound level for this assessment.

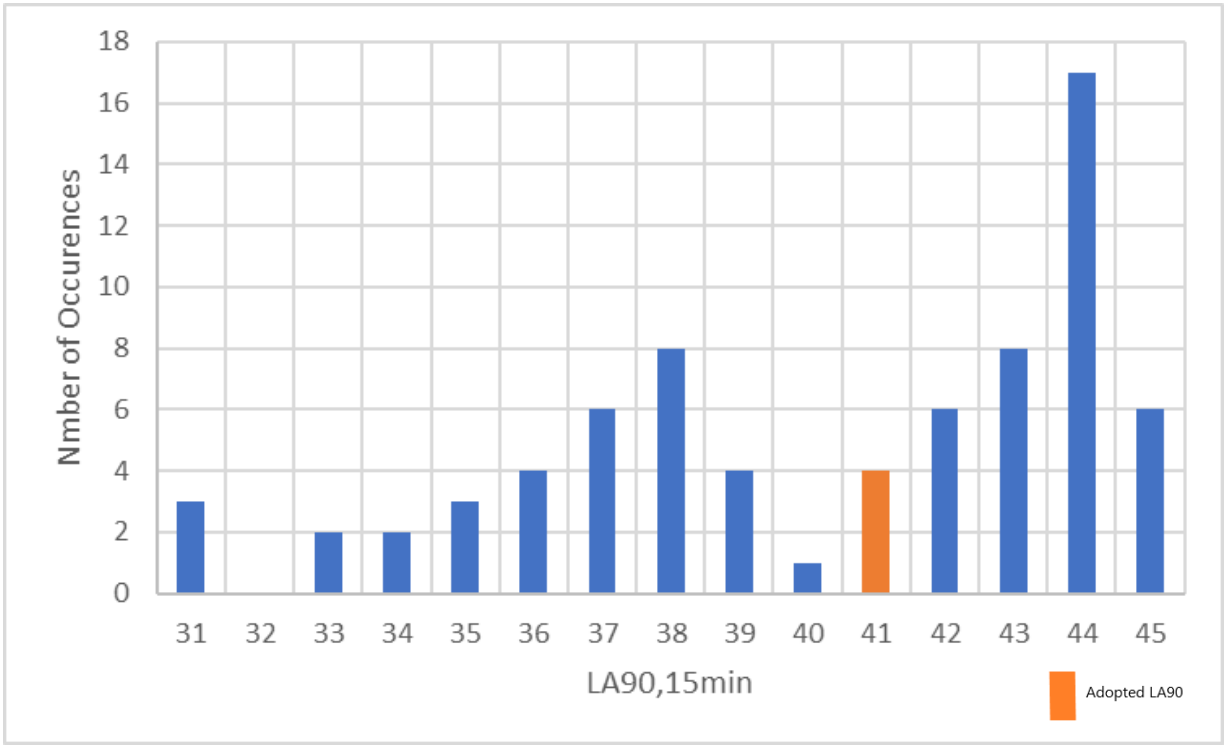

Figure 3-7 – MP2 Daytime (07:00 – 23:00) $L_{A90,15min}$ (dB) Histogram

3.2.6 As seen in **Figure 3-7**, 44 dB $L_{A90, 15min}$ is the most commonly occurring daytime background sound level at MP2 for the duration of the survey period. However, the average background sound level is 41 dB (shown in orange), and this has been adopted as a conservative representative of the daytime background sound level for this assessment.

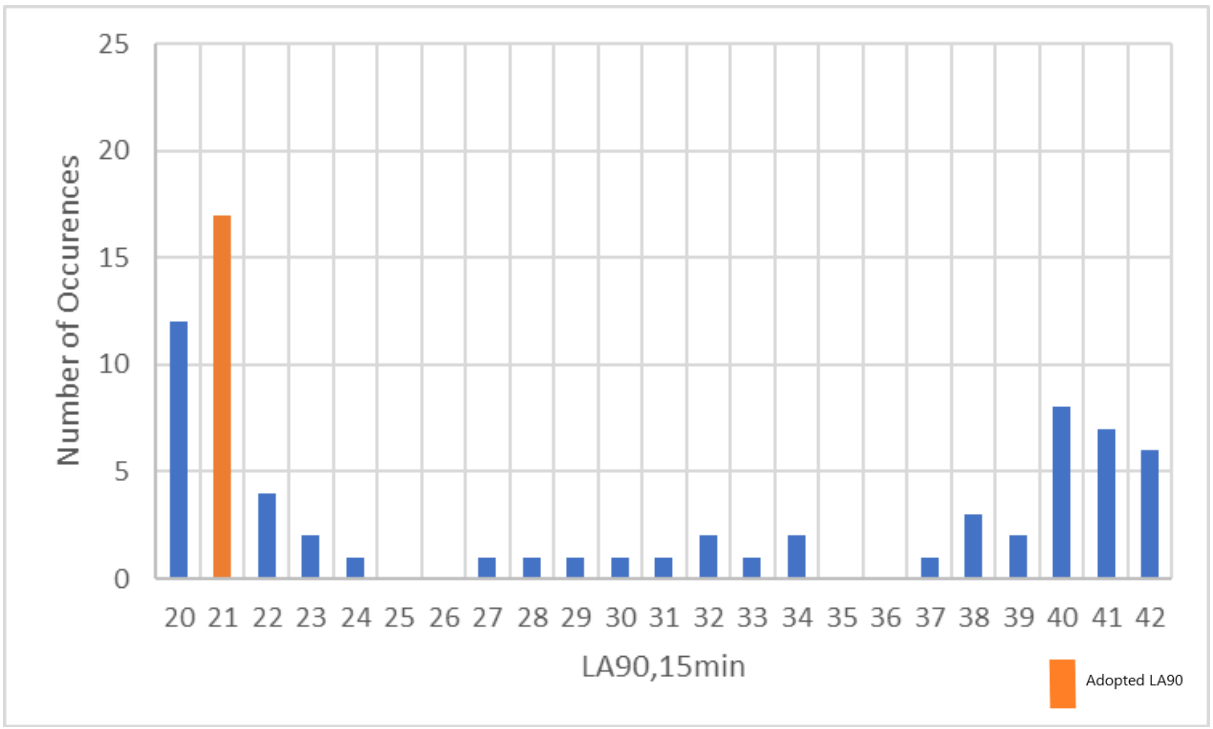

Figure 3-8 – MP2 Night-time (23:00 – 07:00) $L_{A90,15min}$ (dB) Histogram

3.2.7 As seen in **Figure 3-8**, 21 dB $L_{A90, 15min}$ (shown in orange) is the most commonly occurring night-time background sound level at MP2 for the duration of the survey period. Therefore, this can be considered as representative of the night-time background sound level for this assessment.

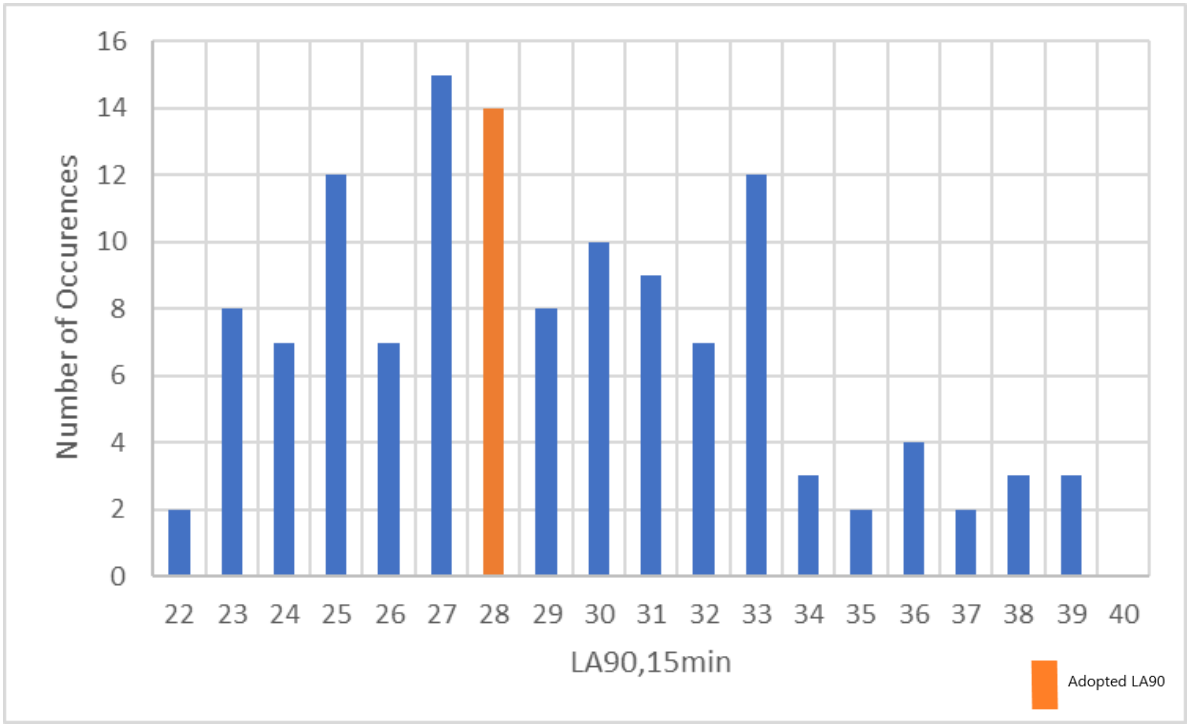

Figure 3-9 – MP3 Daytime (07:00 – 23:00) $L_{A90,15min}$ (dB) Histogram

3.2.8 As seen in **Figure 3-9**, 27 dB $L_{A90, 15min}$ is the most commonly occurring daytime background sound level at MP3 for the duration of the survey period. However, the average background sound level is 29 dB and there are a high number of occurrences at 33 dB. As a conservative assessment, 28 dB (shown in orange) has been adopted as representative of the daytime background sound level.

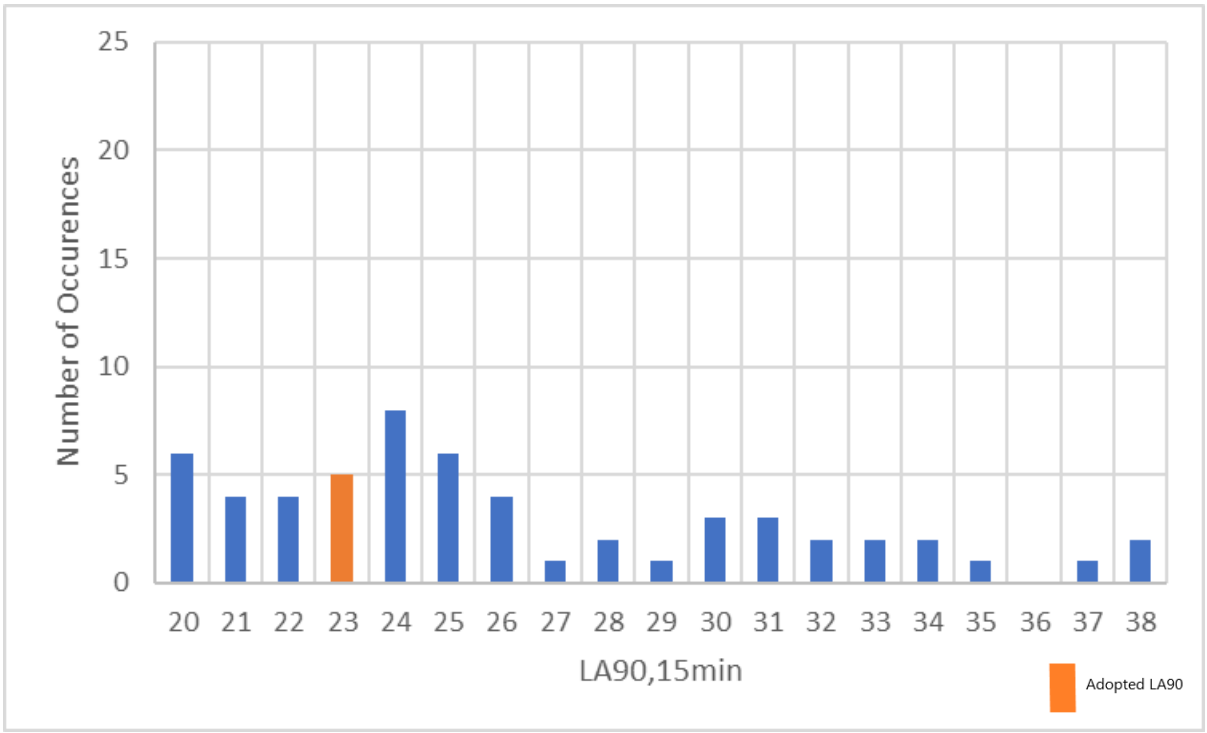

Figure 3-10 – MP3 Night-time (23:00 – 07:00) $L_{A90,15min}$ (dB) Histogram

3.2.9 As seen in **Figure 3-10**, 24 dB $L_{A90, 15min}$ is the most commonly occurring night-time background sound level at MP3 for the duration of the survey period. However, the average background sound level is 23 dB (shown in

orange), so this has been adopted for a conservative assessment, representative of the night-time background sound level for this assessment.

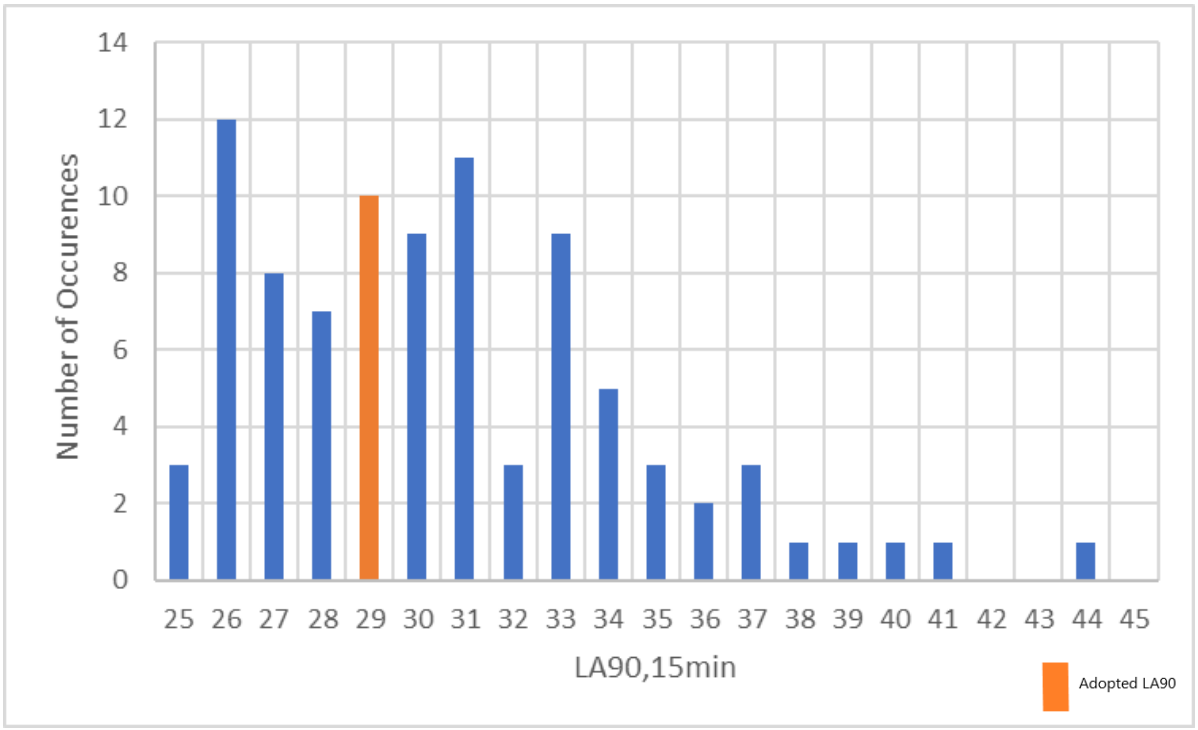

Figure 3-11 – MP4 Daytime (07:00 – 23:00) $L_{A90,15min}$ (dB) Histogram

3.2.10 As seen in **Figure 3-11**, 26 dB $L_{A90, 15min}$ is the most commonly occurring daytime background sound level at MP4 for the duration of the survey period. However, the average background sound level is 29 dB and there are a high number of occurrences at 31 dB and 33 dB. As a conservative assessment, 29 dB (shown in orange) has been adopted as representative of the daytime background sound level.

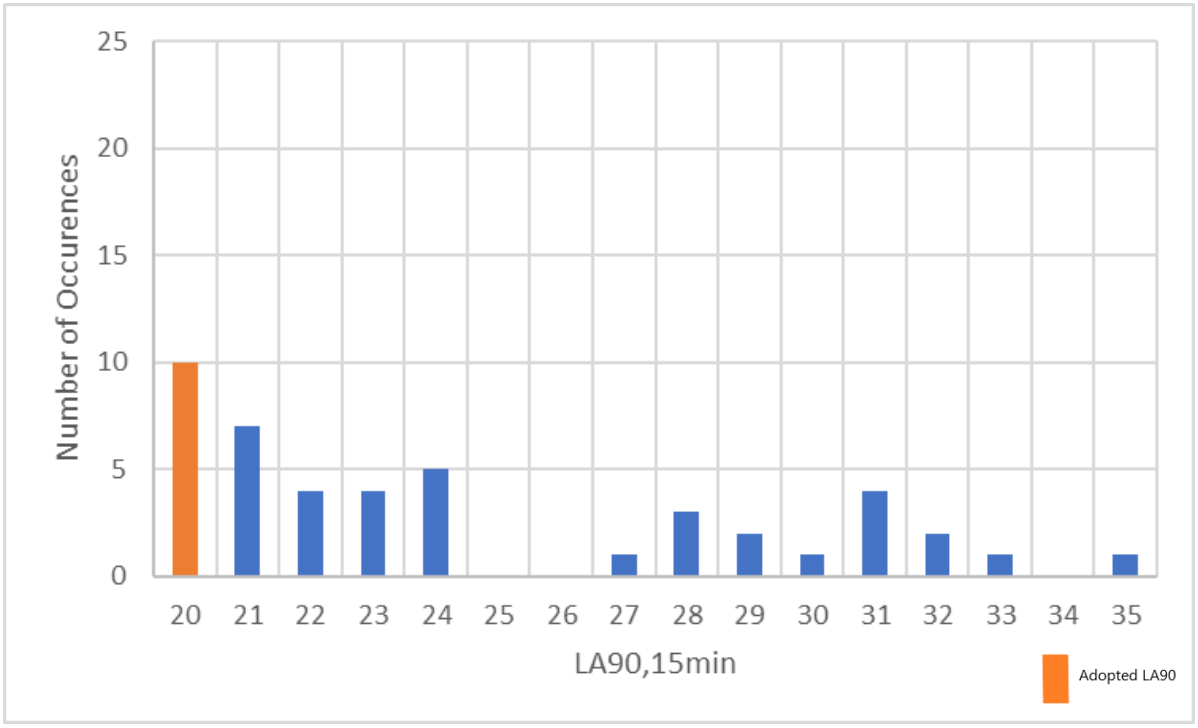

Figure 3-12 – MP4 Night-time (23:00 – 07:00) $L_{A90,15min}$ (dB) Histogram

3.2.11 As seen in **Figure 3-12**, 20 dB $L_{A90, 15min}$ (shown in orange), is the most commonly occurring night-time background sound level at MP4 for the duration of the survey period. Therefore, this can be considered as representative of the night-time background sound level for this assessment.