



PREPARED: Thursday, 11 April 2024

# CAPITAL HOUSE, EASTLEIGH PLANT NOISE IMPACT ASSESSMENT

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|                                                  |                   |                                                                                                                                                                                |                               |
|--------------------------------------------------|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| Project Ref:                                     | AS13308           | Title:                                                                                                                                                                         | Capital House, Eastleigh      |
| Report Ref:                                      | AS13308.240325.R1 | Title:                                                                                                                                                                         | Plant Noise Impact Assessment |
| Client Name:                                     | R&B MEP Ltd       |                                                                                                                                                                                |                               |
| Project Manager:                                 | Daniel Saunders   |                                                                                                                                                                                |                               |
| Report Author:                                   | Michael Symmonds  |                                                                                                                                                                                |                               |
| Clarke Saunders Acoustics<br>Winchester SO22 5BE |                   | This report has been prepared in response to the instructions of our client. It is not intended for and should not be relied upon by any other party or for any other purpose. |                               |

## 1.0 EXECUTIVE SUMMARY

- 1.1 Clarke Saunders Acoustics has conducted a noise impact assessment, to support the planning application for new roof mounted building services plant at Capital House, Eastleigh.
- 1.2 Environmental noise survey data recorded at the application site and acoustic data for the proposed roof mounted plant have been used to demonstrate that the requirements of Eastleigh Borough Council are achieved.
- 1.3 No specific mitigation measures are required for the control of external plant noise emissions.

## 2.0 INTRODUCTION

- 2.1 Clarke Saunders Acoustics (CSA) has been appointed to conduct an acoustic assessment of proposed mechanical plant on the roof of Capital House, 100 Southampton Road, Eastleigh, SO50 5PB.
- 2.2 Environmental noise survey data has been recorded, which have been used to set atmospheric noise emissions criteria, in accordance with the requirements of Eastleigh Borough Council.
- 2.3 Noise levels generated by the proposed plant installation will be calculated at noise sensitive residential receptors, with mitigation measures proposed, as necessary.
- 2.4 A summary of the acoustic terminology used in this report is provided at Appendix A.

## 3.0 DESCRIPTION OF SITE AND PROPOSALS

- 3.1 Capital House is located in central Eastleigh, facing the A335 (Southampton Road) and, beyond this, National Rail lines.
- 3.2 To the rear of the site is a car park, accessed off Mitchell Road. On the other side of Mitchell Road are buildings with residential dwellings at upper floor levels.
- 3.3 The proposed plant will be installed at fourth floor roof level of Capital House.
- 3.4 The site and surroundings are shown on site plan AS13308/SP1.

## 4.0 ENVIRONMENTAL NOISE SURVEY

### 4.1 PROCEDURE AND EQUIPMENT

- 4.1.1 A survey of existing noise levels was undertaken at the ground floor level position shown in the attached site plan AS13308/SP1.
- 4.1.2 Measurements of consecutive 5-minute  $L_{Aeq}$ ,  $L_{Amax}$ ,  $L_{A10}$  and  $L_{A90}$  sound pressure levels were taken between 09:25 hours on Tuesday 26<sup>th</sup> March and 09:05 hours on Thursday 28<sup>th</sup> March 2024.

4.1.3 The following equipment was used during the course of the survey:

- 1 no. Rion sound level meter type NL32;
- 1 no. Rion sound level calibrator type NC74.

4.1.4 The calibration of the sound level meter was verified before and after use. No significant calibration drift was detected. All CSA equipment has current certified laboratory calibration which is available for inspection on request.

4.1.5 There were sufficient periods of suitable weather during the survey for the measurement of average and typical lowest background noise levels. A period of heavy rain on the night of Wednesday 27<sup>th</sup> March has been excluded from the analysis.

4.1.6 Measurements were made following procedures in BS 7445-2:1991 (ISO1996-2:1987) *Description and measurement of environmental noise – Part 2: Acquisition of data pertinent to land use*.

## 4.2 SURVEY RESULTS

4.2.1 Figures AS13308/TH1-TH3 show the  $L_{Aeq}$ ,  $L_{Amax}$ ,  $L_{A10}$  and  $L_{A90}$  sound pressure levels as time histories at the monitoring location.

4.2.2 The table below provides a summary of the typical lowest background (derived as the 10<sup>th</sup> percentile of the relevant  $L_{A90}$  dataset) and average ambient noise levels at the monitoring location during the survey.

| MONITORING PERIOD   | TYPICAL LOWEST BACKGROUND $L_{A90,5min}$ | AVERAGE AMBIENT $L_{Aeq,T}$ |
|---------------------|------------------------------------------|-----------------------------|
| 07:00 – 23:00 hours | 52 dB                                    | 63 dB                       |
| 23:00 – 07:00 hours | 45 dB                                    | 57 dB                       |

Table 4.1 – Environmental noise survey results [dB ref. 20µPa]

4.2.3 The background sound climate in the site vicinity is primarily determined by road traffic on Southampton Road, with contributions from Mitchell Road and Wells Place.

## 5.0 PLANT NOISE CRITERIA

5.1 Eastleigh Borough Council typically require external plant noise emissions to be controlled to a level at least 10dB below the pre-existing background sound level. On this basis, Table 5.1 confirms the external plant noise criteria for this application.

| MONITORING PERIOD   | PLANT NOISE CRITERIA $L_{Aeq,T}$ |
|---------------------|----------------------------------|
| 07:00 – 23:00 hours | 42 dB                            |
| 23:00 – 07:00 hours | 35 dB                            |

Table 5.1 – External plant noise criteria [dB ref. 20µPa]

## 6.0 PLANT NOISE ASSESSMENT

### 6.1 PROPOSED PLANT

- 6.1.1 Four condensers will be installed at roof level, at the approximate position shown in site plan AS13308/SP1.
- 6.1.2 The plant to be installed has been confirmed by the M&E engineer as follows:
- 2 no. Mitsubishi condensing unit type PURY-P200YNW-A2;
  - 2 no. Mitsubishi condensing unit type PURY-P250YNW-A2.
- 6.1.3 The manufacturer has confirmed the following sound pressure levels are generated by the units, when at maximum duty on cooling and heating modes.

| FREQUENCY (HZ)                 | 63 | 125 | 250 | 500 | 1K | 2K | 4K | 8K | dB(A) |
|--------------------------------|----|-----|-----|-----|----|----|----|----|-------|
| PURY-P200YNW-A2 (cooling mode) | 77 | 61  | 61  | 58  | 51 | 47 | 44 | 42 | 59    |
| PURY-P200YNW-A2 (heating mode) | 69 | 61  | 61  | 58  | 52 | 48 | 48 | 43 | 59    |
| PURY-P250YNW-A2 (cooling mode) | 78 | 63  | 62  | 59  | 52 | 49 | 49 | 43 | 60    |
| PURY-P250YNW-A2 (heating mode) | 69 | 63  | 62  | 60  | 54 | 50 | 51 | 44 | 61    |

Table 6.1 – Condenser sound pressure levels [ $L_p$  @ 1m, dB ref. 20 $\mu$ Pa]

### 6.2 PREDICTED NOISE LEVELS

- 6.2.1 Acoustic calculations have been conducted, to predict the plant noise levels at the residential receptors on Mitchell Road. These calculations have incorporated distance propagation losses, but have not included any screening losses on the basis that the first floor windows may have line of sight to the condensers.
- 6.2.2 Table 6.2 shows the predicted noise levels against both the daytime and night-time criteria.

| PREDICTED PLANT NOISE LEVEL                              | CRITERIA                                                    |
|----------------------------------------------------------|-------------------------------------------------------------|
| Cooling: $L_{Aeq,T}$ 31 dB<br>Heating: $L_{Aeq,T}$ 32 dB | Daytime: $L_{Aeq,T}$ 42 dB<br>Night-time: $L_{Aeq,T}$ 35 dB |

Table 6.2 – Predicted plant noise levels and criteria [dB ref. 20 $\mu$ Pa]

- 6.2.3 The criteria are achieved without any specific acoustic mitigation measures.
- 6.2.4 Ventilation plant, such as air handling units, can be appropriately attenuated by means of in-line duct silencers. The required insertion losses for these silencers can be specified at technical design stage, once final selections have been made, in order to achieve the cumulative plant noise emissions criteria.

## 7.0 CONCLUSIONS

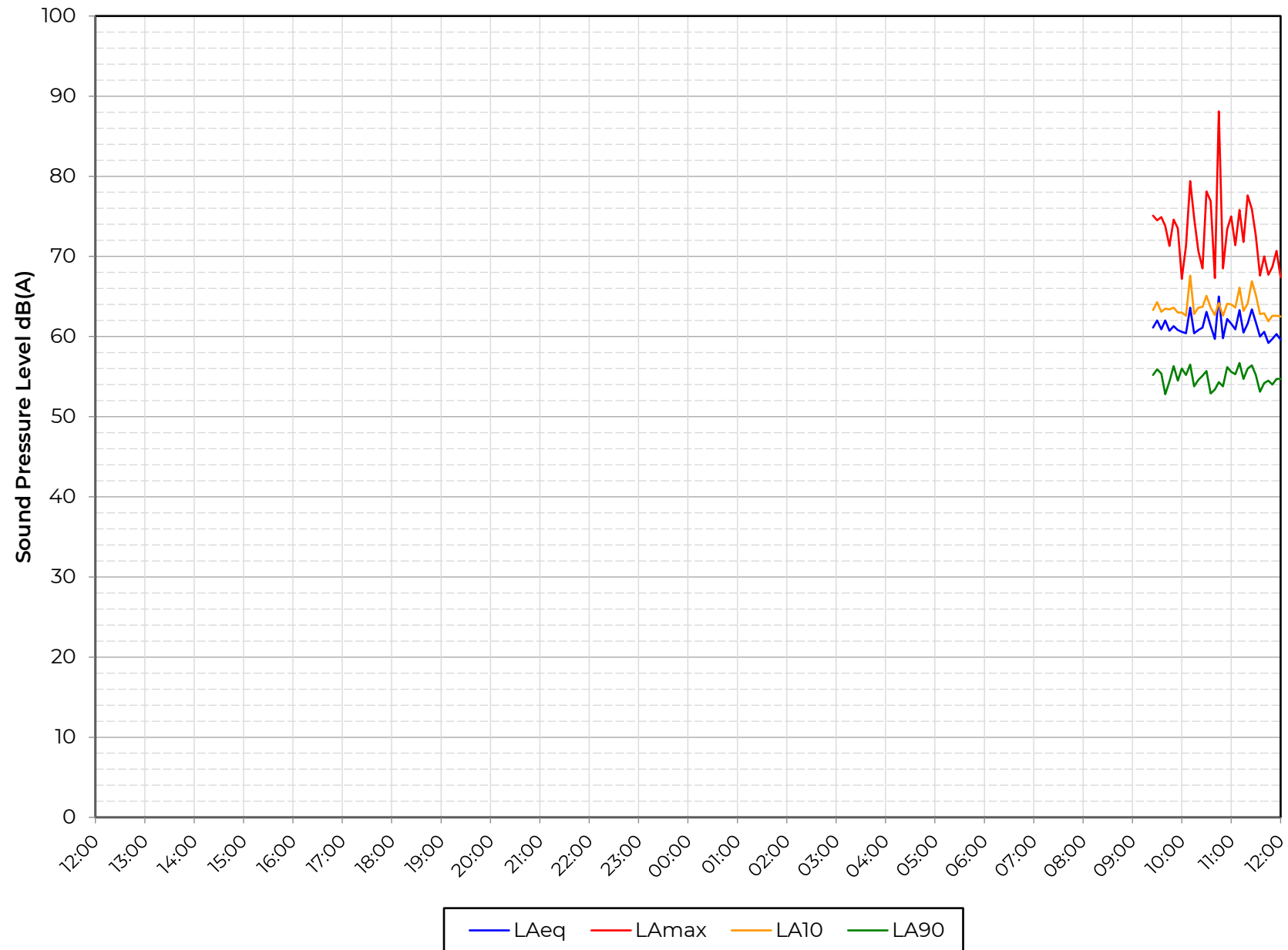
- 7.1 Clarke Saunders Acoustics has conducted a noise impact assessment, to support the planning application for new roof-mounted building services plant at Capital House, 100 Southampton Road, Eastleigh, SO50 5PB.
- 7.2 An environmental noise impact assessment has been conducted, from which criteria have been set in line with the typical requirements of Eastleigh Borough Council.
- 7.3 Acoustic data for the proposed plant, provided by the manufacturer, have been used in calculations, demonstrating that the requirements of Eastleigh Borough Council are achieved.
- 7.4 No specific mitigation measures are required for the control of external plant noise emissions.



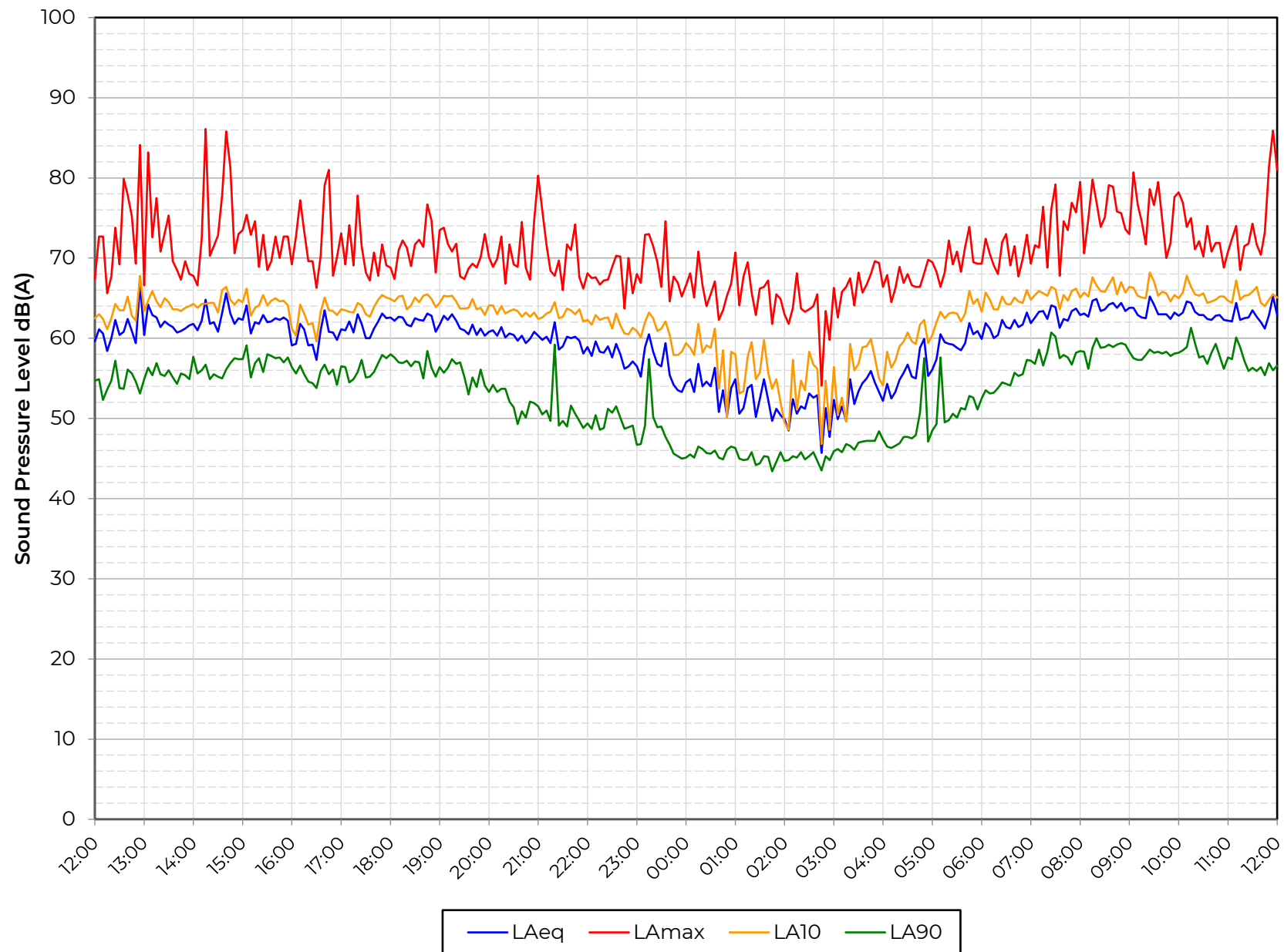
Michael Symmonds MIOA  
CLARKE SAUNDERS ACOUSTICS



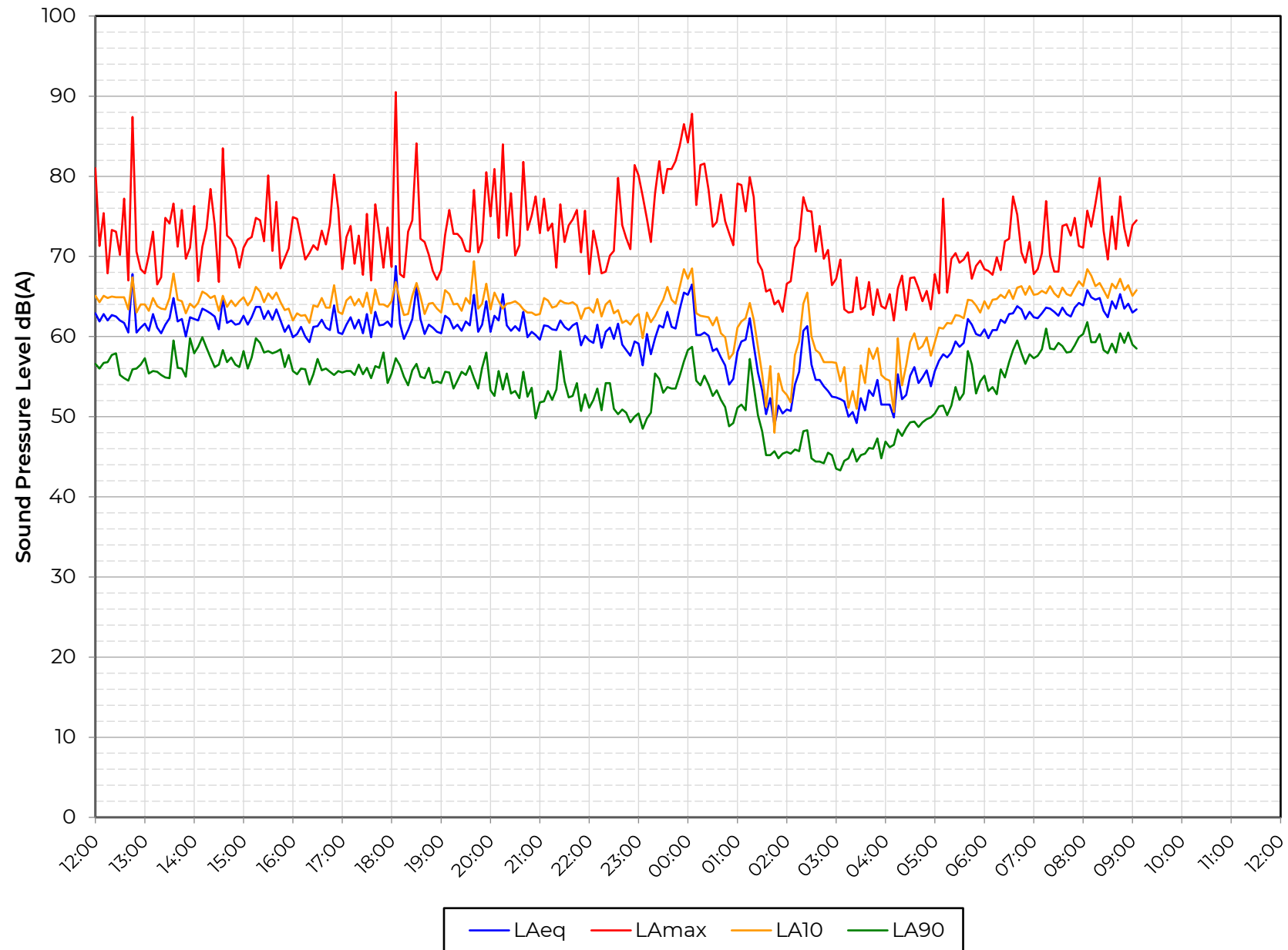
**Position 1**



**Position 1**



**Position 1**



### Acoustic Terminology

The human impact of sounds is dependent upon many complex interrelated factors such as 'loudness', its frequency (or pitch) and variation in level. In order to have some objective measure of the annoyance, scales have been derived to allow for these subjective factors.

|                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Sound</b>                                          | Vibrations propagating through a medium (air, water, etc.) that are detectable by the auditory system.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Noise</b>                                          | Sound that is unwanted by or disturbing to the perceiver.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Frequency</b>                                      | The rate per second of vibration constituting a wave, measured in Hertz (Hz), where 1Hz = 1 vibration cycle per second. The human hearing can generally detect sound having frequencies in the range 20Hz to 20kHz. Frequency corresponds to the perception of 'pitch', with low frequencies producing low 'notes' and higher frequencies producing high 'notes'.                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>dB(A):</b>                                         | Human hearing is more susceptible to mid-frequency sounds than those at high and low frequencies. To take account of this in measurements and predictions, the 'A' weighting scale is used so that the level of sound corresponds roughly to the level as it is typically discerned by humans. The measured or calculated 'A' weighted sound level is designated as dB(A) or $L_A$ .                                                                                                                                                                                                                                                                                                                                                                                        |
| <b><math>L_{eq}</math>:</b>                           | <p>A notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (e.g. 8 hour, 1 hour, etc).</p> <p>The concept of <math>L_{eq}</math> (equivalent continuous sound level) has primarily been used in assessing noise from industry, although its use is becoming more widespread in defining many other types of sounds, such as from amplified music and environmental sources such as aircraft and construction.</p> <p>Because <math>L_{eq}</math> is effectively a summation of a number of events, it does not in itself limit the magnitude of any individual event, and this is frequently used in conjunction with an absolute sound limit.</p> |
| <b><math>L_{10}</math> &amp; <math>L_{90}</math>:</b> | <p>Statistical <math>L_n</math> indices are used to describe the level and the degree of fluctuation of non-steady sound. The term refers to the level exceeded for n% of the time. Hence, <math>L_{10}</math> is the level exceeded for 10% of the time and as such can be regarded as a typical maximum level. Similarly, <math>L_{90}</math> is the typical minimum level and is often used to describe background noise.</p> <p>It is common practice to use the <math>L_{10}</math> index to describe noise from traffic as, being a high average, it takes into account the increased annoyance that results from the non-steady nature of traffic flow.</p>                                                                                                          |
| <b><math>L_{max}</math>:</b>                          | The maximum sound pressure level recorded over a given period. $L_{max}$ is sometimes used in assessing environmental noise, where occasional loud events occur which might not be adequately represented by a time-averaged $L_{eq}$ value.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

### Octave Band Frequencies

In order to determine the way in which the energy of sound is distributed across the frequency range, the International Standards Organisation has agreed on "preferred" bands of frequency for sound measurement and analysis. The widest and most commonly used band for frequency measurement and analysis is the Octave Band.

In these bands, the upper frequency limit is twice the lower frequency limit, with the band being described by its "centre frequency" which is the average (geometric mean) of the upper and lower limits, e.g. 250 Hz octave band extends from 176 Hz to 353 Hz. The most commonly used octave bands are:

|                                    |    |     |     |     |      |      |      |      |
|------------------------------------|----|-----|-----|-----|------|------|------|------|
| Octave Band Centre<br>Frequency Hz | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |
|------------------------------------|----|-----|-----|-----|------|------|------|------|

Human Perception of Broadband Noise

Because of the logarithmic nature of the decibel scale, it should be borne in mind that sound levels in dB(A) do not have a simple linear relationship. For example, 100dB(A) sound level is not twice as loud as 50dB(A). It has been found experimentally that changes in the average level of fluctuating sound, such as from traffic, need to be of the order of 3dB before becoming definitely perceptible to the human ear. Data from other experiments have indicated that a change in sound level of 10dB is perceived by the average listener as a doubling or halving of loudness. Using this information, a guide to the subjective interpretation of changes in environmental sound level can be given.

INTERPRETATION

| Change in<br>Sound Level dB | Subjective Impression                             | Human Response   |
|-----------------------------|---------------------------------------------------|------------------|
| 0 to 2                      | Imperceptible change in loudness                  | Marginal         |
| 3 to 5                      | Perceptible change in loudness                    | Noticeable       |
| 6 to 10                     | Up to a doubling or halving of loudness           | Significant      |
| 11 to 15                    | More than a doubling or halving of loudness       | Substantial      |
| 16 to 20                    | Up to a quadrupling or quartering of loudness     | Substantial      |
| 21 or more                  | More than a quadrupling or quartering of loudness | Very Substantial |

Earth Bunds and Barriers - Effective Screen Height

When considering the reduction in sound level of a source provided by a barrier, it is necessary to establish the "effective screen height". For example if a tall barrier exists between a sound source and a listener, with the barrier close to the listener, the listener will perceive the sound as being louder if he climbs up a ladder (and is closer to the top of the barrier) than if he were standing at ground level. Equally if he sat on the ground the sound would seem quieter than if he were standing. This is explained by the fact that the "effective screen height" is changing with the three cases above. In general, the greater the effective screen height, the greater the perceived reduction in sound level.

Similarly, the attenuation provided by a barrier will be greater where it is aligned close to either the source or the listener than where the barrier is midway between the two.

**APPENDIX B**  
**AS13308 Capital House, Eastleigh**  
**PLANT SOUND CALCULATIONS**

| Cooling Mode                            |                 | 63 Hz     | 125 Hz    | 250 Hz    | 500 Hz    | 1 kHz     | 2 kHz     | 4 kHz     | 8 kHz     | dB(A)     |
|-----------------------------------------|-----------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| PURY-P200YNW-A2 cooling                 | Lp @ 1m         | 77        | 61        | 61        | 58        | 51        | 47        | 44        | 42        | 59        |
| Number of                               | 2no             | 3         | 3         | 3         | 3         | 3         | 3         | 3         | 3         |           |
| Screening Loss                          | No Scree        | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         |           |
| Distance Loss                           | 54m             | -35       | -35       | -35       | -35       | -35       | -35       | -35       | -35       |           |
|                                         | <b>Subtotal</b> | <b>45</b> | <b>29</b> | <b>29</b> | <b>26</b> | <b>19</b> | <b>15</b> | <b>12</b> | <b>10</b> | <b>27</b> |
| PURY-P250YNW-A2 cooling                 | Lp @ 1m         | 78        | 63        | 62        | 59        | 52        | 49        | 49        | 43        | 60        |
| Number of                               | 2no             | 3         | 3         | 3         | 3         | 3         | 3         | 3         | 3         |           |
| Screening Loss                          | No Scree        | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         |           |
| Distance Loss                           | 54m             | -35       | -35       | -35       | -35       | -35       | -35       | -35       | -35       |           |
|                                         | <b>Subtotal</b> | <b>46</b> | <b>31</b> | <b>30</b> | <b>27</b> | <b>20</b> | <b>17</b> | <b>17</b> | <b>11</b> | <b>29</b> |
| <b>Specific sound level at receptor</b> |                 | <b>49</b> | <b>33</b> | <b>32</b> | <b>30</b> | <b>23</b> | <b>19</b> | <b>18</b> | <b>14</b> | <b>31</b> |

Daytime Criterion,  $L_{Aeq,T}$  42dBNight-time Criterion,  $L_{Aeq,T}$  35dB

| Heating Mode                            |                 | 63 Hz     | 125 Hz    | 250 Hz    | 500 Hz    | 1 kHz     | 2 kHz     | 4 kHz     | 8 kHz     | dB(A)     |
|-----------------------------------------|-----------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| PURY-P200YNW-A2 heating                 | Lp @ 1m         | 69        | 61        | 61        | 58        | 52        | 48        | 48        | 43        | 59        |
| Number of                               | 2no             | 3         | 3         | 3         | 3         | 3         | 3         | 3         | 3         |           |
| Screening Loss                          | No Scree        | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         |           |
| Distance Loss                           | 54m             | -35       | -35       | -35       | -35       | -35       | -35       | -35       | -35       |           |
|                                         | <b>Subtotal</b> | <b>37</b> | <b>29</b> | <b>29</b> | <b>26</b> | <b>20</b> | <b>16</b> | <b>16</b> | <b>11</b> | <b>28</b> |
| PURY-P250YNW-A2 heating                 | Lp @ 1m         | 69        | 63        | 62        | 60        | 54        | 50        | 51        | 44        | 61        |
| Number of                               | 2no             | 3         | 3         | 3         | 3         | 3         | 3         | 3         | 3         |           |
| Screening Loss                          | No Scree        | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         |           |
| Distance Loss                           | 54m             | -35       | -35       | -35       | -35       | -35       | -35       | -35       | -35       |           |
|                                         | <b>Subtotal</b> | <b>37</b> | <b>31</b> | <b>30</b> | <b>28</b> | <b>22</b> | <b>18</b> | <b>19</b> | <b>12</b> | <b>29</b> |
| <b>Specific sound level at receptor</b> |                 | <b>40</b> | <b>33</b> | <b>33</b> | <b>30</b> | <b>24</b> | <b>20</b> | <b>21</b> | <b>15</b> | <b>32</b> |

Daytime Criterion,  $L_{Aeq,T}$  42dBNight-time Criterion,  $L_{Aeq,T}$  35dB