

## **River Academy**

### **Planning Condition 9 – Mechanical Plant Noise Mitigation Acoustic Report**

**0049847**

22 July 2024

Revision P01

| Revision | Description | Issued by | Date       | Checked |
|----------|-------------|-----------|------------|---------|
| P01      | For Issue   | DH        | 22/07/2024 | RB      |

https://burohappold.sharepoint.com/sites/049847/02\_Documents/41\_Acoustics/03 Reports/10 - CPs/02.Reports/z.  
Condition 9 Plant Noise Breakout/04 Issue/River Academy Reading - Condition 9 Mechanical Plant Noise Mitigation -  
Acoustic Report.docx

Report Disclaimer

This Report was prepared by Buro Happold Limited ("BH") for the sole benefit, use and information of Client name for Purpose of Report. BH assumes no liability or responsibility for any reliance placed on this Report by any third party for any actions taken by any third party in reliance of the information contained herein. BH’s responsibility regarding the contents of the Report shall be limited to the purpose for which the Report was produced and shall be subject to the express contract terms with Client name. The Report shall not be construed as investment or financial advice. The findings of this Report are based on the available information as set out in this Report.

author Daniel Hawe

date 22/07/2024

approved Robert Burrell

signature 

date 22/07/2024

..

Contents

|          |                                                              |          |
|----------|--------------------------------------------------------------|----------|
| <b>1</b> | <b>Introduction</b>                                          | <b>5</b> |
| 1.1      | Overview                                                     | 5        |
| 1.2      | Planning Condition 9                                         | 5        |
| 1.3      | Scope of Work                                                | 5        |
| 1.4      | Description of the Proposed Development                      | 5        |
| <b>2</b> | <b>Design Criteria – Plant Noise</b>                         | <b>6</b> |
| 2.1      | Relevant Guidance Documentation                              | 6        |
| 2.2      | Local Planning Condition Guidance                            | 6        |
| <b>3</b> | <b>Noise Survey</b>                                          | <b>7</b> |
| 3.1      | Introduction                                                 | 7        |
| 3.2      | Description of the Site                                      | 7        |
| 3.3      | Noise Survey Methodology                                     | 7        |
| 3.3.1    | Weather conditions                                           | 7        |
| 3.3.2    | Measurement indices                                          | 7        |
| 3.4      | Design Noise Level Discussion                                | 7        |
| <b>4</b> | <b>Plant Noise Breakout - Desktop Noise Model Assessment</b> | <b>9</b> |
| 4.1      | Introduction                                                 | 9        |
| 4.2      | Condition 9 – Design Levels                                  | 9        |
| 4.3      | Desktop Noise Model Methodology                              | 9        |
| 4.4      | Limitations                                                  | 9        |
| 4.5      | Mechanical Equipment                                         | 9        |
|          | Me                                                           | 9        |
| 4.5.1    | chanical Equipment – Sound Data                              | 9        |
|          | VES Kitchen Extract Fan (EF-R1-01)                           | 9        |
|          | VES Kitchen Supply Fan (SF-R1-01)                            | 9        |
|          | Main Hall/Sports Hall AHU                                    | 10       |
|          | ELTA Fans                                                    | 10       |
|          | Safe Lab Fume Extract                                        | 10       |
|          | Condensers                                                   | 10       |

|          |                                                 |           |
|----------|-------------------------------------------------|-----------|
| 4.6      | Rating level                                    | 10        |
| 4.7      | Desktop Noise Model Results                     | 11        |
| <b>5</b> | <b>Conclusions</b>                              | <b>12</b> |
|          | <b>Appendix A Hann-Tucker Noise Survey Data</b> | <b>13</b> |

Table of Tables

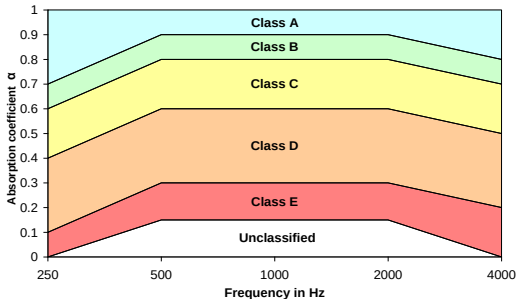
|                                                                                                                        |            |
|------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Table 3—1 Noise survey measurement results (Source: Hann Tucker, Environmental Noise Survey Report, 27338/ENS1)</b> | <b>89</b>  |
| <b>Table 4—1 Limiting plant rating noise levels</b>                                                                    | <b>910</b> |

Table of Figures

|                                                                                                                                                         |           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>Figure 1—1 Image of River Academy (Source: Jestico+Whiles)</b>                                                                                       | <b>5</b>  |
| <b>Figure 2—1 Reading Borough Council’s local planning policy. EN17: Noise Generating Equipment background level limits.</b>                            | <b>6</b>  |
| <b>Figure 2—2 Site plan schematic indicating the development site and residential NSR locations (Source: GoogleEarthPro, Image Landsat, Copernicus)</b> | <b>6</b>  |
| <b>Figure 3—1 Site plan showing the unattended (long-term) noise monitoring positions (Source: GoogleEarthPro, Image Landsat, Copernicus)</b>           | <b>8</b>  |
| <b>Figure 4—1 CadnaA 3D model with Plant Noise Sources</b>                                                                                              | <b>11</b> |
| <b>Figure 4—2 Calculated L<sub>Ar,Tr</sub> dB ambient noise levels at River Academy site boundary and NSRs – with safe fume vent extracts</b>           | <b>11</b> |
| <b>Figure 4—3 Calculated L<sub>Ar,Tr</sub> dB ambient noise levels at River Academy site boundary and NSRs - without safe fume vent extracts</b>        | <b>11</b> |

Glossary

| Term                                                     | Definition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $\alpha$ ( $\alpha_w$ )                                  | Sound Absorption Coefficient (Weighted Sound Absorption Coefficient) is a measure of the effectiveness of materials as sound absorbers as defined in BS EN ISO 11654:1997. It is the ratio of the sound energy absorbed or transmitted (i.e. not reflected) by a surface to the total sound energy incident upon that surface. The value of the coefficient varies from 0 (perfect reflector) to 1 (perfect absorber).                                                                                                                                                                                                                                                                                                                                                                                                               |
| A ( $A_T$ )                                              | Absorption Area (Total Absorption Area) is equal to the product of multiplying the surface area of a construction (in m <sup>2</sup> ) and its Sound Absorption Coefficient ( $\alpha$ ).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Ambient Noise<br>(as defined in BS 4142:2014+A1 2019)    | Totally encompassing noise in a given situation at a given time; it is usually composed of noise from many sources, near and far.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Background Noise<br>(as defined in BS 4142:2014+A1 2019) | A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90% of a given time interval, T, measured using the Fast time weighting and quoted to the nearest whole number of decibels.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| C <sub>tr</sub>                                          | Spectrum adaptation term calculated using traffic noise as described in BS EN ISO 717-1:2020. This term is provided with weighted single values such as D <sub>nT,w</sub> or R <sub>w</sub> to match particular requirements (building acoustic or traffic noise spectrum).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Decibel, dB                                              | Decibel (dB) is a dimensionless unit commonly used to demonstrate sound levels. It is derived from the logarithm of the ratio between the measured level and the reference value. For sound pressure level (L <sub>p</sub> ) the reference value is 2x10 <sup>-5</sup> pascals. For sound power (L <sub>w</sub> ) reference value is 1x10 <sup>-12</sup> Watts.                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| D <sub>n,f,w</sub>                                       | The weighted transmission of sound energy from a source room to a receiving room via structural (vibrational) paths in the construction mainly, e.g. walls, floors, and ceilings.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| D <sub>nT,w</sub>                                        | The Weighted Standardised Level Difference (D <sub>nT,w</sub> ) is defined in BS EN ISO 140-4:1998 (superseded by BS EN ISO 16283-1:2014+A1:2017 but still cited in The Building Regulations) BS EN ISO 717-1:2020. This performance describes the installed site performance of the composite separating constructions, including the partition element performance, the flanking path transmission and the reception room reverberation time factors. D <sub>nT,w</sub> target leads to a selection of adequate construction elements and methods to build the partition that is rated using weighted sound reduction index R <sub>w</sub> . It is typically standardised to a reverberation time (T <sub>0</sub> ) of 0.5 seconds. In the instance of testing in schools, T <sub>0</sub> is taken as the room's T <sub>mf</sub> . |
| D <sub>w</sub>                                           | Weighted Level Difference: Single-number quantity that characterizes airborne sound insulation between rooms, but which is not adjusted to reference conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Flanking Noise                                           | The transmission of sound around the perimeter or through holes within partitions (or barriers) that reduces the otherwise obtained sound transmission loss of a partition. Examples of flanking paths within buildings are ceiling plenum above partitions or raised floor cavities, ductwork, piping, and electrical conduit penetrations through partitions, back to back electrical boxes within partitions, window mullions, etc.                                                                                                                                                                                                                                                                                                                                                                                               |
| Frequency                                                | Number of cycles per second, measured in hertz (Hz), related to sound pitch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| IANL                                                     | Indoor Ambient Noise Level. For schools, Table 1 in BB93 (2015) specifies the upper limit for indoor ambient noise levels within teaching areas. The design criteria is set for a 30-minute average level (i.e. L <sub>Aeq,30mins</sub> ). However, where there is negligible change in the noise level, BB93 states that a much shorter time period (e.g. L <sub>Aeq,5min</sub> ) can be used. BB93 also states that for rooms identified as having limits of L <sub>eq,30min</sub> 35 dBA or less, the noise should not regularly exceed L <sub>1,30min</sub> 55 dBA.                                                                                                                                                                                                                                                              |
| L <sub>90,T</sub> (L <sub>A90,T</sub> )                  | The sound pressure level exceeded for 90% of the measurement period. Referred to as background noise level.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| L <sub>A,r,T</sub>                                       | Rating Noise Level (as defined in BS 4142:2014+A12019), the specific noise level plus any adjustment for the characteristic features of the noise.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

|                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| L <sub>eq,T</sub> (L <sub>Aeq,T</sub> )                      | The equivalent continuous noise level of a time-varying noise. It is the steady noise level that, over the period under consideration, contains the same amount of sound energy as the time-varying noise over the same period.                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| L <sub>Fmax,T</sub> (L <sub>Afmax,T</sub> )                  | The maximum sound pressure level measured during the measurement period T using the fast time constant.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| L' <sub>nT,w</sub>                                           | Weighted Standardized Impact Sound Pressure Level: a single-figure value of impact sound insulation performance. This European index is described in BS EN ISO 140-7:1998 (superseded by BS EN ISO 16283-2:2015 but still cited in The Building Regulations) and BS EN ISO 717-2:2020, used for comparing and rating floors and based on the values of L' <sub>nT</sub> at different frequencies. L' <sub>nTw</sub> target leads to a selection of adequate construction elements and methods to build the floor that are rated using weighted normalized impact sound pressure level L <sub>n,w</sub> . The lower the L' <sub>nT,w</sub> the better the performance |
| L <sub>n,w</sub>                                             | Weighted Normalized Impact Sound Pressure Level: European single figure rating for transmission loss of impact sound through building elements as described in BS EN ISO 10140-3:2021 and BS EN ISO 717-2:2020. The lower the L <sub>n,w</sub> the better the performance.                                                                                                                                                                                                                                                                                                                                                                                           |
| L <sub>p</sub>                                               | The sound pressure level, in decibels, of a sound is 20 times the logarithm to the base of 10 of the ratio of the sound pressure to the reference pressure (2x10 <sup>-5</sup> pascals). The reference pressure shall be explicitly stated and is defined by standard.                                                                                                                                                                                                                                                                                                                                                                                               |
| Noise Rating (NR)                                            | Curves developed by the International Organization for Standardization (ISO) to determine the acceptable indoor environment for hearing preservation, speech communication and annoyance. These can be compared to NC curves and also can be approximated to equivalent dBA levels.                                                                                                                                                                                                                                                                                                                                                                                  |
| Reverberation Time (RT)                                      | Time required for the steady sound pressure level in an enclosed space to decay by 60 dB, measured from the moment the sound source is switched off. Reverberation time is described in ISO 354:2003.                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| R <sub>w</sub> (C, C <sub>tr</sub> )                         | Weighted Sound Reduction Index: Single-figure value of sound reduction according to BS EN ISO 10140-2:2021 used for rating partition systems, door-sets or glazing, based on the values of the sound reduction index R at different frequencies. The higher the R <sub>w</sub> the better the performance.                                                                                                                                                                                                                                                                                                                                                           |
| Sound absorption classes                                     | <p>Sound absorption performance characteristics are defined by a class. Below is a diagram of the different classes of absorption available, taken from BS EN ISO 11654:1997. The y-axis is the absorption coefficient of the material with one being total absorption and zero being no absorption. The x-axis is the frequency of the sound.</p>                                                                                                                                                                                                                              |
| Specific Noise Level<br>(as defined in BS 4142:2014+A1 2019) | The equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| T <sub>mf</sub>                                              | Mid Frequency Reverberation Time: Within BB93, the reverberation time criteria are set in terms of the averaged value of the 500 Hz, 1000 Hz and 2000 Hz frequency bands. The various levels for T <sub>mf</sub> are specified within Table 6 of BB93 (2015) and are generally upper limits. Usually, the specified mid-frequency reverberation times are for 'finished but unoccupied and unfurnished rooms'.                                                                                                                                                                                                                                                       |
| Weightings<br>(as defined in BS EN 61672:2013):              | <p>A-Weighting: Frequency weighting devised to attempt to take into account the fact that human response to sound is not equally sensitive to all frequencies; it consists of an electronic filter in a sound level meter, which attempts to build in this variability into the indicated noise level reading so that it will correlate, approximately, with human response.).</p> <p>C-Weighting: One of the frequency weightings corresponding to the 100-phon contour and the closest to the linear or unweighted value.</p>                                                                                                                                      |

# 1 Introduction

## 1.1 Overview

Buro Happold have been appointed by Bowmer & Kirkland to provide on-going design assistance for the architectural and mechanical design for the proposed new River Academy School (hereinafter referred to as “the School”).

This report provides an assessment of noise egress from mechanical services to demonstrate compliance with the requirements of the Maiden Erlegh Trust Planning Condition #9.

## 1.2 Planning Condition 9

Planning Condition 9 states the following:

*No mechanical plant shall be installed until a noise assessment of the proposed mechanical plant has been submitted and approved by the Local Planning Authority. The assessment shall be carried out in accordance with BS4142:2014+A1:2019 methodology.*

*The predicted specific sound level ( $L_{Aeq,Tr}$ ) (with reference to BS:4142) as measured at a point 1 metre external to the nearest noise-sensitive facade shall be at least 10dB below the pre-existing background sound level,  $L_{A90,T}$  when all plant/equipment (or any part of it) is in operation.*

*The predicted rating level,  $L_{A,r,Tr}$  (specific sound level plus any adjustment for the characteristic features of the sound) as measured at a point 1 metre external to the nearest noise-sensitive facade (habitable window of a dwelling) shall not exceed the pre-existing background sound level,  $L_{A90,T}$  when all plant/equipment (or any part of it) is in operation.*

*The plant shall thereafter only be installed in accordance with the assessment and shall thereafter be maintained so that it operates to the same standard.*

## 1.3 Scope of Work

The assessment details the potential noise impact mechanical plant upon existing NSRs and noise environment. The report covers the following:

- Acoustic criteria, set by pertinent planning conditions and British standards, as proposed within Acoustic Contractor Proposal submission documents.
- Environmental acoustic survey results, outlining existing baseline conditions at the site and surrounding area.
- Description of plant and attenuation items as per db's Mechanical engineering schedules, layouts, and manufacturer data sheets.
- Desktop noise model assessment.
- Discussion of cumulative plant noise breakout results.

## 1.4 Description of the Proposed Development

The proposed development is understood to include a new three-story secondary school building with associated access, landscaping, and outdoor sports provision.

Located in Reading, Berkshire, the new secondary school is targeted to support 1500 pupils.

The new building is understood to comprise mainly of general teaching and Science Classrooms on the first and second floors. Ground-level spaces include a Main Hall, Sports Hall, Activity and Drama Studios, ICT Rooms, Music Rooms, and SEN rooms.



Figure 1—1 Image of River Academy (Source: Jestico+Whiles)

## 2 Design Criteria – Plant Noise

### 2.1 Relevant Guidance Documentation

This report is informed by the following standards and guidelines:

- Maiden Erlegh Trust Planning Condition (#9) Requirements.
- BS 4142:2014+A1:2019, Methods for rating and assessing commercial and industrial sound.

### 2.2 Local Planning Condition Guidance

The design of the development is informed by the Maiden Erlegh Trust Planning Condition (#9) Requirements..

The Maiden Erlegh Trust Planning Condition (#9) requires the ‘specific’ sound level is as a minimum 10dB below the background noise level at the curtilage of NSR and that the ‘rating’ sound level, that includes corrections for attention catching characteristics, is no greater than the background noise level.

As shown in Figure 2—1, noise-sensitive NSRs are located over 400m away from the development. As such additional consideration is given to mitigating noise levels such that they do not adversely impact the development itself including the external amenity spaces.



Figure 2—1 Site plan schematic indicating the development site and residential NSR locations  
(Source: GoogleEarthPro, Image Landsat, Copernicus)

### 3 Noise Survey

#### 3.1 Introduction

The following section is provided as per the Contract Proposal submission FS0949-BHE-ZZ-ZZ-RP-Y-0004 (issued 1<sup>st</sup> April 2022).

An environmental noise survey was undertaken by Hann Tucker Associates in January 2020. The purpose of the survey was to identify environmental noise levels around the development site.

The noise survey information detailed within this section was taken from the following report:

Hann Tucker Associates  
River Academy, Reading  
Environmental Noise Survey Report  
27338/ENS1  
22<sup>nd</sup> January 2020  
For: Mace Ltd., 155 Moorgate, London, EC2M 6XB.

#### 3.2 Description of the Site

The proposed development is located at Richfield Avenue in Reading (RG1 8EQ). The site falls within Reading Borough Council’s jurisdiction.

The proposed site is bounded by the following:

- **North:** Rivermead Park, and residential properties on The Warren across the River Thames.
- **East:** Rivermead Leisure Centre
- **South:** Richfield Avenue, and Caversham Bridge Garden Centre
- **West:** Open land beyond Cow Lane.

The residential properties on The Warren to the north of the site are considered to be the closest Noise Sensitive Receptors (NSRs). This has been illustrated in Figure 2—1, which presents a red line location of the proposed school, NSRs, and the nearby roads as described above.

#### 3.3 Noise Survey Methodology

The noise survey was conducted between 12:30 hours on the 13<sup>th</sup> and 12:30 hours on the 14<sup>th</sup> of January 2020. The survey comprised of 2 unattended long-term (24-hour) measurements, recording A-weighted (dB)  $L_{A90,T}$ ,  $L_{Aeq,T}$ , and  $L_{AF,max}$ , sound pressure levels over 15-minute periods.

Figure 3—1 illustrates the noise monitoring positions around the existing site, in relation to the nearest NSRs.

Measurement Position 1 (MP1), the microphone was positioned at a height of approximately 2.5 m above ground and attached to a fence at the west boundary of the site.

Measurement Position 2 (MP2), the microphone was positioned at a height of approximately 4.0 m above ground and attached to a fence approximately 30m from the southeast boundary of the site and approximately 55 m from Richfield Avenue.

##### 3.3.1 Weather conditions

The weather conditions throughout the survey measurements were described as follows (Source: Hann Tucker, Environmental Noise Survey Report, 27338/ENS1).

*“During the periods we were on site the wind conditions were moderate and from approximately a southerly direction. The sky was generally patchy cloud. There was no rain at the beginning or end of the survey. These conditions are considered suitable for obtaining representative measurement results.”*

It is considered that on this basis, weather conditions at the time of measurement are suitable.

##### 3.3.2 Measurement indices

The definition of the measurement indices are as follows:

- **$L_{Aeq,T}$**  – the average A-weighted sound pressure level within a time period ‘T’  
  
Typically thought of as the average ambient noise level at a particular time, and likely to be due to a combination of various noise sources, near and far.
- **$L_{AF,max}$**  – the maximum instantaneous A-weighted sound pressure level measured typically during a measurement period.  
  
Typically corresponds to a short-duration event with a very high sound pressure level (SPL), for example, a motorbike passing by, a car horn etc.
- **$L_{A90,T}$**  – the A-weighted sound pressure level exceeded for 90% of the measurement period, i.e. a level which would be perceived as a constant, background noise level.  
  
Typically, largely unaffected by local traffic pass-bys or by transient events. More usually attributable to constantly running building services plant or distant road traffic (e.g. what you would hear when there are no local traffic pass-bys present (or other readily identifiable noise sources).

BB93 requires assessment of regular discrete noise events to see that students are not unduly distracted by impulsive events such as aeroplanes. In BB93, the requirement is that ambient noise levels inside classrooms should not exceed  $L_{A1,30min}$  60 dB. The survey measurements for this assessment, do not include  $L_{A1,T}$  results. However, as a worst-case assessment, Buro Happold have adopted  $L_{AF,max} \leq 60$  dB as an alternative target – as  $L_{AF,max}$  results should be (minimum) equivalent to  $L_{A1,T}$  and are typically greater.

3.4 Design Noise Level Discussion

The Hann Tucker noise survey output results are shown in Table 3—1.

Ambient noise levels presented as  $L_{Aeq,30min}$  dB values over the daytime period (07:00 – 23:00 hours), are understood to be representative of typical conditions throughout the school day.

The maximum noise levels present representative values for the  $L_{AF,max}$  measurements recorded during the Hann Tucker survey. These were read from graphical survey results, which have been extracted and referenced in Appendix A.

The background noise levels presented are understood to represent the lowest  $L_{A90,15min}$  dB value from 15-minute logging measurements captured continuously throughout the daytime period. The lowest of the levels have been used to set the  $L_{Ar,tr}$  noise breakout criteria for the development based on the planning conditions in the following report section.

Night-time background noise levels have not been included given the school is not understood to operate during the night-time and therefore mechanical plant items should also not operate.

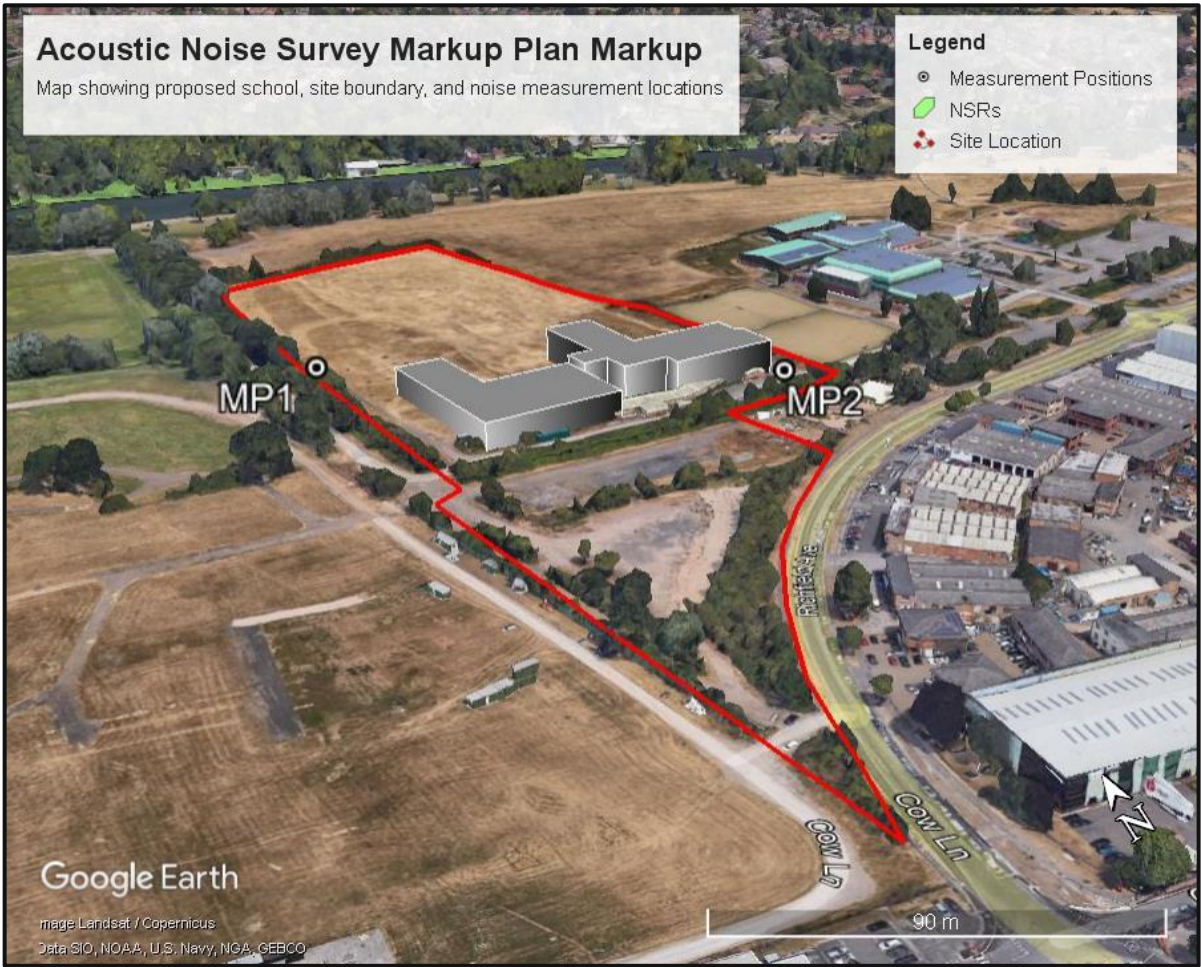


Figure 3—1 Site plan showing the unattended (long-term) noise monitoring positions (Source: GoogleEarthPro, Image Landsat, Copernicus)

Table 3—1 Noise survey measurement results (Source: Hann Tucker, Environmental Noise Survey Report, 27338/ENS1)

| Measurement Position | L <sub>Aeq,30min</sub> sound pressure levels – dB             |                                  |
|----------------------|---------------------------------------------------------------|----------------------------------|
|                      | Daytime<br>(12:30 – 23:00 hours)                              | Daytime<br>(07:00 – 12:30 hours) |
| 1                    | 54                                                            | 55 <sup>1</sup>                  |
| 2                    | 58                                                            | 62 <sup>1</sup>                  |
| Measurement Position | Lowest L <sub>A90,15min</sub> sound pressure levels – dB      |                                  |
|                      | Daytime (07:00 – 23:00 hours)                                 |                                  |
| 1                    | 43                                                            |                                  |
| 2                    | 45                                                            |                                  |
| Measurement Position | Representative L <sub>AF,max</sub> sound pressure levels – dB |                                  |
|                      | Daytime (07:00 – 23:00 hours)                                 |                                  |
| 1                    | 73                                                            |                                  |
| 2                    | 79                                                            |                                  |

<sup>1</sup> Adopted design noise level for noise model calibration.

4 Plant Noise Breakout - Desktop Noise Model Assessment

4.1 Introduction

This section details the plant noise limits for controlling noise break-out to nearby NSRs, to see that the acoustic amenity of the surrounding area is not compromised by the operation of the newly installed plant. The assessment focuses on the planning requirements.

As per Condition 9 (Section 2.2), no mechanical plant shall be installed until a noise assessment of the proposed mechanical plant has been submitted and approved by the Local Planning Authority. The following section outlines the noise modelling exercise undertaken to predict the likely noise levels with all River Academy plant operational, to see that a rating noise limit ( $L_{A,r,Tr}$  dB) is 5 dB below the existing background noise level ( $L_{A90,T}$  dB) at the boundary of the River Academy site (uplift on Condition 9 requirements as per 2.2).

4.2 Condition 9 – Design Levels

Table 4—1 presents the rating limits ( $L_{A,r,Tr}$ ) relative to the lowest  $L_{A90,15min}$  design levels, which was recorded at Noise Survey measurement position 1 (See Section 3.3).

Table 4—1 Limiting plant rating noise levels

|                                      | The typical measured existing background noise level( $L_{A90,15 min,r}$ dB) | Limiting plant noise level at NSR Locations ( $L_{A,r,Tr}$ dB) |
|--------------------------------------|------------------------------------------------------------------------------|----------------------------------------------------------------|
| Typical school hours (08:00 – 17:00) | 43                                                                           | 33                                                             |

4.3 Desktop Noise Model Methodology

CadnaA® is a three-dimensional noise modelling software package that predicts noise levels based on the appropriate input data e.g. location and orientation of equipment and sound power data. The software package can consider a variety of information about the site including topography, buildings, and potential noise sources.

The following noise mapping assumptions have been made when producing the noise models for the proposed development:

- Buildings around the proposed development were input based on Open Street Map geodata.
- A worst-case ground absorption coefficient of 0 has been modelled (assuming hard reflective ground). This is a worst-case assessment condition.
- Air temperature and relative humidity have been assumed to be at typical CadnaA input levels of 10°C and 70%. CadnaA software calculates air absorption according to ISO 9613-1:1993.

4.4 Limitations

The assessment has been based on the results produced through a noise modelling exercise, which provides predictions on the likely future noise levels. Typically, an uncertainty within a range of approximately +/- 3 dB could be expected from computer noise modelling software.

4.5 Mechanical Equipment

The following section provides an overview of manufacturer noise data for MEP plant items provided by the project Mechanical Engineering Design team for inclusion within the desktop noise model assessment considering the potential for Tonality, impulsivity, and Intermittence.

4.5.1 Mechanical Equipment – Sound Data

VES Kitchen Extract Fan (EF-R1-01)

| Plant Unit Reference             | Sound Power Level (dB)<br>at octave band centre frequencies (Hz)           |     |     |     |    |    |    | Broadband Sound Power (dB(A)) |
|----------------------------------|----------------------------------------------------------------------------|-----|-----|-----|----|----|----|-------------------------------|
|                                  | 63                                                                         | 125 | 250 | 500 | 1K | 2k | 4k |                               |
| EF-R1-01                         | 81                                                                         | 85  | 89  | 88  | 84 | 80 | 76 | 89                            |
| Attenuator                       | Insertion Loss (dB)<br>at octave band centre frequencies (Hz)              |     |     |     |    |    |    |                               |
|                                  | 63                                                                         | 125 | 250 | 500 | 1K | 2k | 4k |                               |
| ATT-R1-02                        | 5                                                                          | 10  | 17  | 23  | 28 | 20 | 18 |                               |
| Resultant level post attenuation | Resultant Sound Power Level (dB)<br>at octave band centre frequencies (Hz) |     |     |     |    |    |    | Broadband Sound Power (dB(A)) |
|                                  | 63                                                                         | 125 | 250 | 500 | 1K | 2k | 4k |                               |
| EF-R1-01                         | 76                                                                         | 75  | 72  | 65  | 56 | 60 | 58 | 68                            |

VES Kitchen Supply Fan (SF-R1-01)

| Plant Unit Reference             | Sound Power Level (dB)<br>at octave band centre frequencies (Hz)           |     |     |     |    |    |    | Broadband Sound Power (dB(A)) |
|----------------------------------|----------------------------------------------------------------------------|-----|-----|-----|----|----|----|-------------------------------|
|                                  | 63                                                                         | 125 | 250 | 500 | 1K | 2k | 4k |                               |
| SF-R1-01 (Outlet)                | 78                                                                         | 84  | 78  | 79  | 75 | 73 | 70 | 80                            |
| Attenuator                       | Insertion Loss (dB)<br>at octave band centre frequencies (Hz)              |     |     |     |    |    |    |                               |
|                                  | 63                                                                         | 125 | 250 | 500 | 1K | 2k | 4k |                               |
| ATT-R1-03                        | 5                                                                          | 10  | 17  | 23  | 28 | 20 | 18 |                               |
| Resultant level post attenuation | Resultant Sound Power Level (dB)<br>at octave band centre frequencies (Hz) |     |     |     |    |    |    | Broadband Sound Power (dB(A)) |
|                                  | 63                                                                         | 125 | 250 | 500 | 1K | 2k | 4k |                               |
| SF-R1-01 (Outlet)                | 73                                                                         | 74  | 61  | 56  | 47 | 53 | 52 | 62                            |

Main Hall/Sports Hall AHU

| Plant Unit Reference             | Sound Power Level (dB)<br>at octave band centre frequencies (Hz)           |     |     |     |    |    |    | Broadband Sound Power (dB(A)) |
|----------------------------------|----------------------------------------------------------------------------|-----|-----|-----|----|----|----|-------------------------------|
|                                  | 63                                                                         | 125 | 250 | 500 | 1K | 2k | 4k |                               |
| AHU's (Supply)                   | 81                                                                         | 86  | 83  | 84  | 80 | 77 | 74 | 86                            |
| AHU's (Exhaust)                  | 81                                                                         | 86  | 83  | 84  | 80 | 77 | 74 | 86                            |
| Attenuator                       | Insertion Loss (dB)<br>at octave band centre frequencies (Hz)              |     |     |     |    |    |    | Broadband Sound Power (dB(A)) |
|                                  | 63                                                                         | 125 | 250 | 500 | 1K | 2k | 4k |                               |
| ATT-01-(61)(63)                  | 2                                                                          | 4   | 8   | 12  | 13 | 9  | 6  |                               |
| Resultant level post attenuation | Resultant Sound Power Level (dB)<br>at octave band centre frequencies (Hz) |     |     |     |    |    |    | Broadband Sound Power (dB(A)) |
|                                  | 63                                                                         | 125 | 250 | 500 | 1K | 2k | 4k |                               |
| AHU-01-01                        | 79                                                                         | 82  | 75  | 72  | 67 | 68 | 68 | 75                            |
| AHU-02-01                        | 79                                                                         | 82  | 75  | 72  | 67 | 68 | 68 | 75                            |

ELTA Fans

Note: Only fans with an output Sound Pressure Level above the target level have been included in the assessment.

| Plant Unit Reference             | Sound Power Level (dB)<br>at octave band centre frequencies (Hz)           |     |     |     |    |    |    | Broadband Sound Power (dB(A)) |
|----------------------------------|----------------------------------------------------------------------------|-----|-----|-----|----|----|----|-------------------------------|
|                                  | 63                                                                         | 125 | 250 | 500 | 1K | 2k | 4k |                               |
| EF-01-03                         | 74                                                                         | 77  | 63  | 58  | 55 | 56 | 48 | 64                            |
| EF-01-05                         | 74                                                                         | 78  | 64  | 58  | 55 | 57 | 49 | 65                            |
| E1-R1-01                         | 76                                                                         | 80  | 84  | 84  | 80 | 75 | 71 | 85                            |
| Attenuator                       | Insertion Loss (dB)<br>at octave band centre frequencies (Hz)              |     |     |     |    |    |    | Broadband Sound Power (dB(A)) |
|                                  | 63                                                                         | 125 | 250 | 500 | 1K | 2k | 4k |                               |
| ATT-01-(38)(42)                  | 5                                                                          | 14  | 17  | 26  | 26 | 24 | 27 |                               |
| ATT-R1-04                        | 5                                                                          | 10  | 17  | 23  | 28 | 20 | 15 |                               |
| Resultant level post attenuation | Resultant Sound Power Level (dB)<br>at octave band centre frequencies (Hz) |     |     |     |    |    |    | Broadband Sound Power (dB(A)) |
|                                  | 63                                                                         | 125 | 250 | 500 | 1K | 2k | 4k |                               |
| EF-01-03                         | 69                                                                         | 63  | 46  | 32  | 29 | 32 | 21 | 49                            |
| EF-01-05                         | 69                                                                         | 64  | 47  | 32  | 29 | 33 | 22 | 50                            |
| E1-R1-01                         | 71                                                                         | 70  | 67  | 61  | 52 | 55 | 56 | 64                            |

Safe Lab Fume Extract

Note: These units are intended to be used sparingly and only when required for safety purposes of removing hazardous gases.

| Plant Unit Reference | Sound Power Level (dB)<br>at octave band centre frequencies (Hz) |     |     |     |    |    |    | Broadband Sound Power (dB(A)) |
|----------------------|------------------------------------------------------------------|-----|-----|-----|----|----|----|-------------------------------|
|                      | 63                                                               | 125 | 250 | 500 | 1K | 2k | 4k |                               |
| ST10                 | 82                                                               | 79  | 72  | 61  | 59 | 47 | 40 | 68*                           |
| S25                  | 78                                                               | 81  | 82  | 80  | 78 | 73 | 69 | 82*                           |
| S20                  | 72                                                               | 75  | 76  | 74  | 71 | 66 | 62 | 76*                           |

\*No Attenuation Specified for these units

Condensers

Outdoor units external to ICT spaces are provided with broadband sound power levels. These have been inputted and broadband spectrums as per typical frequency responses for these systems.

| Plant Unit Reference | Sound Power Level (dB)<br>at octave band centre frequencies (Hz) |     |     |     |    |    |    | Broadband Sound Power (dB(A)) |
|----------------------|------------------------------------------------------------------|-----|-----|-----|----|----|----|-------------------------------|
|                      | 63                                                               | 125 | 250 | 500 | 1K | 2k | 4k |                               |
| ICT-HUB-Rm 0.49      | -                                                                | -   | -   | -   | -  | -  | -  | 69*                           |
| ICT Server Rm 0.116  | -                                                                | -   | -   | -   | -  | -  | -  | 69*                           |

\*No Attenuation Specified for these units

4.6 Rating level

As per BS 4142, once the specific sound level has been determined, it must be corrected in terms of the need to consider the subjective prominence of the impact of the sound on noise-sensitive receivers, and the extent to which acoustically distinctive characteristics will attract attention.

BS 4142 states that this is normally possible to carry out a subjective assessment of characteristics, based on the following correction guidelines:

- **Tonality:** +2 dB for a ‘just perceptible’ tone, +4 dB for ‘clearly perceptible’, and rising to +6 dB for ‘highly perceptible’ tones
- **Impulsivity (rapidity of change and overall chance in level):** +3 dB for ‘just perceptible’ impulsivity, +6 dB for ‘clearly perceptible’, rising to +9 dB for ‘highly perceptible’ impulsivity.
- **Intermittency:** if the on/off-time of the specific sound is readily distinctive at the noise-sensitive receivers, +3 dB
- Given that noise from plant is to be designed to be 10 dB below the background noise level, tones, impulsivity and intermittency characteristics from the proposed mechanical services plant are unlikely to be noticeable when assessed at the nearest noise sensitive receptors.

4.7 Desktop Noise Model Results

The CadnaA desktop noise model and external mechanical plant locations/terminations are shown in Figure 4—1.

The noise model results shown in Figure 4—2 indicate the following

- noise levels of  $L_{Aeq} \leq 27$  dB is calculated at the nearest NRSs at The Warren (approx. 400m to the north of the site)
- noise levels of  $L_{Aeq}$  31-40 dB is calculated at the sit boundary
- noise levels of  $L_{Aeq} \leq 40$  dB is calculated at the external amenity areas of the school (e.g. sports pitches)

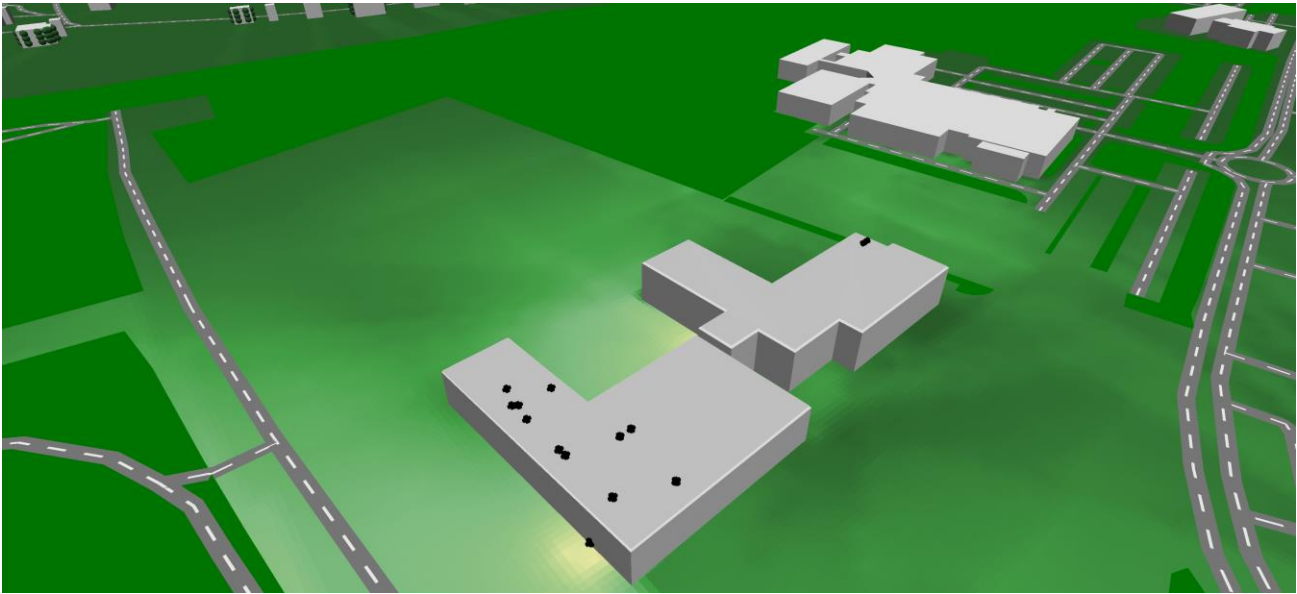


Figure 4—1 CadnaA 3D model with Plant Noise Sources



Figure 4—2 Calculated noise levels  $L_{Aeq}$  dB at River Academy site boundary and NRSs

## 5 Conclusions

Condition 9 requires the predicted specific sound level ( $L_{Aeq}$ ) as measured at a point 1 metre external to the nearest noise-sensitive facade to be at least 10 dB below the pre-existing background sound level,  $L_{A90,T}$  when all plant/equipment (or any part of it) is in operation.

The typical existing background noise levels measured during the noise survey was  $L_{A90}$  43 dB. Based on the planning condition requirement noise from plant must not exceed  $L_{Aeq}$  33 dB.

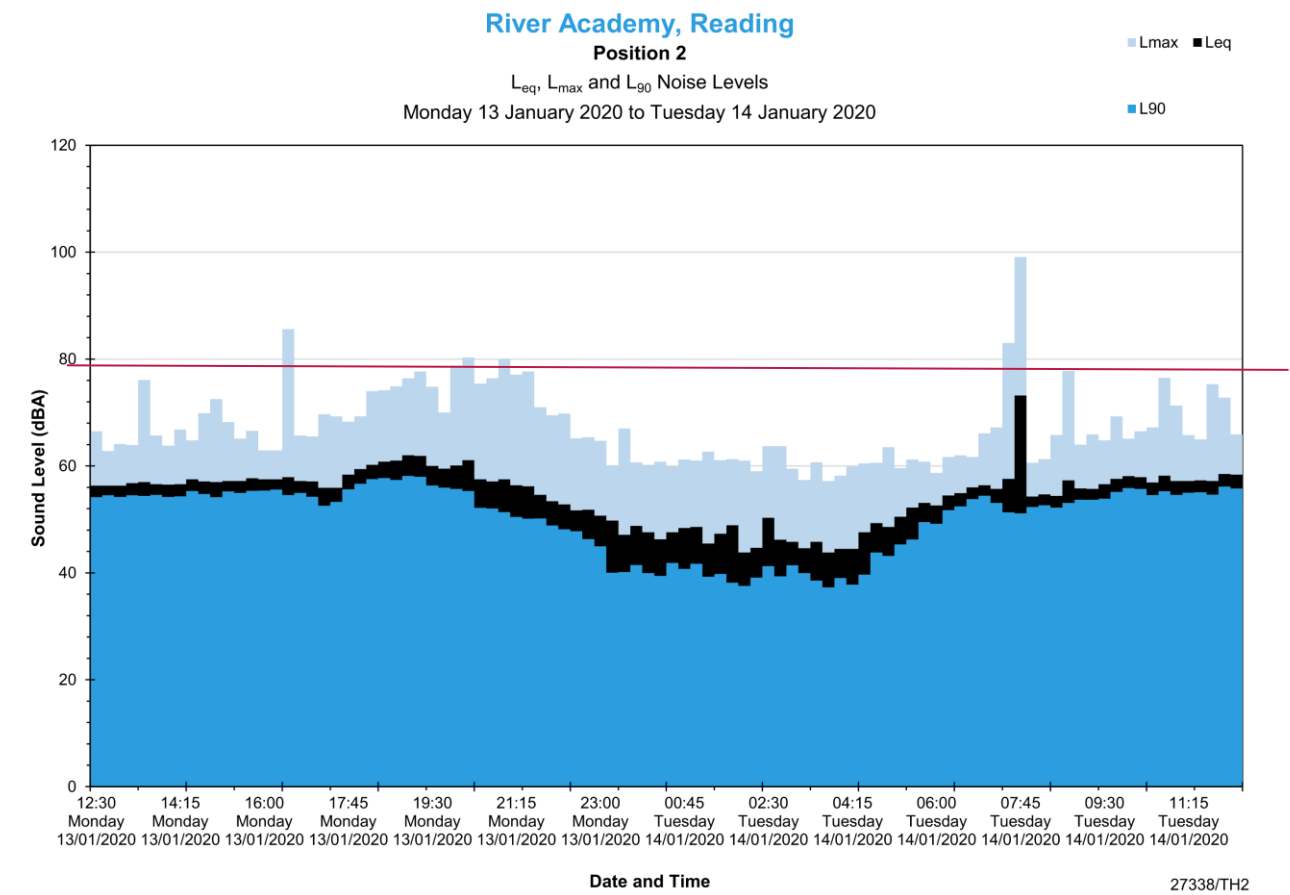
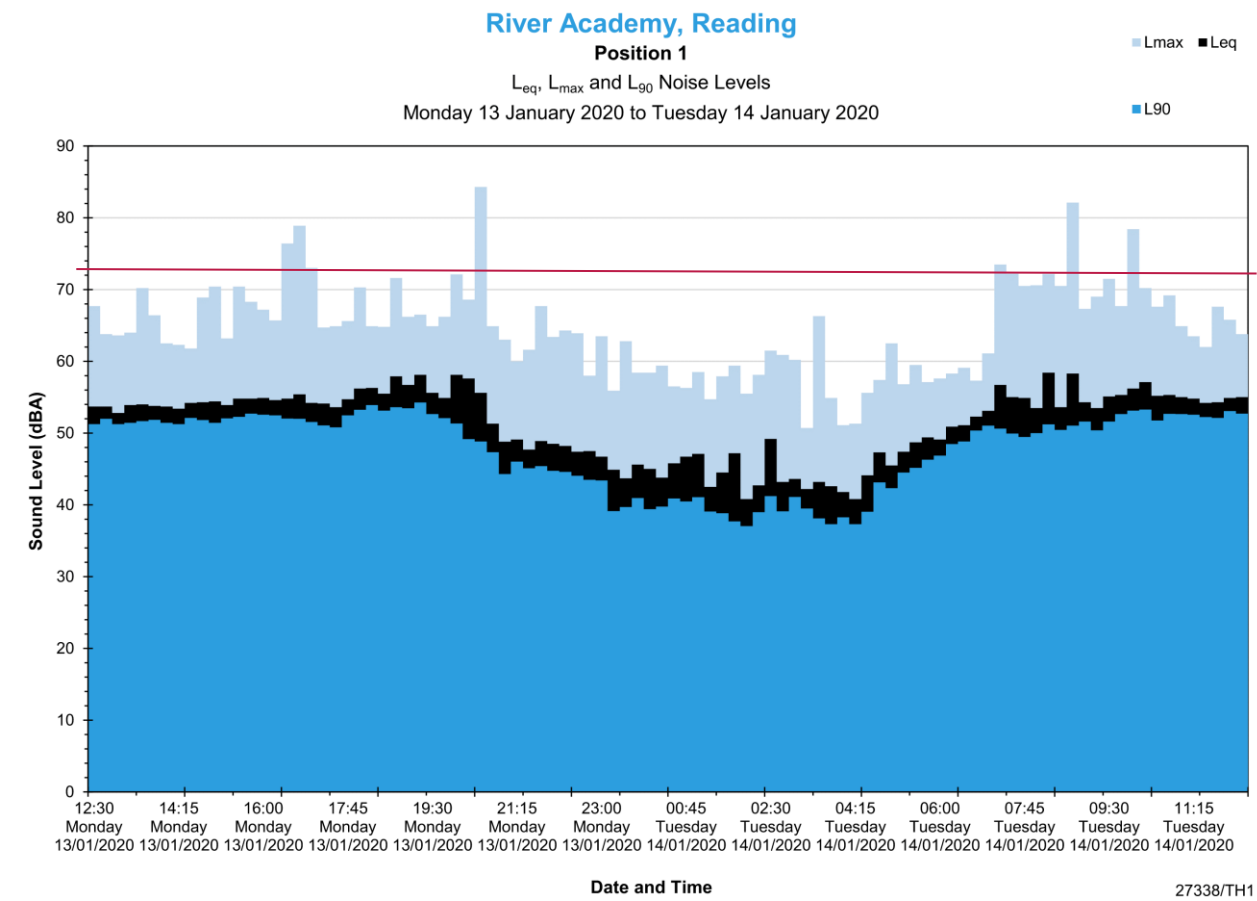
The desktop noise model calculated maximum noise levels of  $L_{Aeq}$  27 dB at these sensitive receivers.

As the predicted noise levels from plant are 16 dB below the typical background noise levels, it is expected that attention catching characteristics such as tonality, impulsivity and intermittency will not be noticeable.

The noise modelling exercise demonstrates that the criteria set out in Planning Condition 9 can be achieved by the proposed plant and attenuation selections for the River Academy development.

Appendix A Hann-Tucker Noise Survey Data

L<sub>AF,max</sub> design level indicated by red line.



[Click here to enter text.](#)

Daniel Hawe  
Buro Happold Limited  
17 Newman Street  
London  
W1T 1PD  
UK  
  
T: +44 (0)207 927 9700  
F: +44 (0)870 787 4145  
Email: [leo.fernandezrodriguez@burohappold.com](mailto:leo.fernandezrodriguez@burohappold.com)