PLANNING NOISE ASSESSMENT

PINN RIVER SCHOOL

KIER CONSTRUCTION LTD

NOVEMBER 2022

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Our Ref: **5638_002R_1-0_JE.docx**

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Date:	**11 November 2022**
Project No:	**5638**
Status:	**Final**

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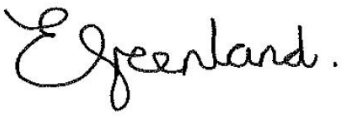
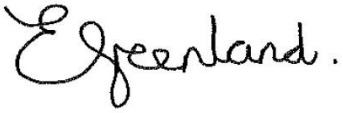
Reviewed	**Emma Greenland** **Principal Consultant** **PhD BEng (Hons) MIOA**		**11 November 2022**
Approved	**Emma Greenland** **Principal Consultant** **PhD BEng (Hons) MIOA**		**11 November 2022**

REVISION HISTORY

Version	Date	Comments	Changes made by	Approved by
1-0	11/11/2022	First issued version	JE	EG

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1 INTRODUCTION

Anderson Acoustics Ltd has been commissioned by Kier Construction Ltd to undertake a noise impact assessment in support of a planning application for the installation of external plant alongside a Multi-Use Games Area (MUGA) at the proposed Pinn River School project (part of the Eden Academy Free School project).

The project involves the demolition of existing buildings on the former Grangewood Schools site, Fore Street, Pinner HA5 2JQ and construction of a new 4,680 m^2 SEND all through (age 4-19) school.

The school will offer an inclusive environment for a wide range of SEND pupils and cater for 180 pupils with Severe Learning Difficulties (SLD) including those on the Autistic Spectrum Continuum (ASC) and pupils with multi-sensory (hearing and visual) impairments (MSI) including those with Profound and Multiple Learning Difficulties (SLD/PMLD). The school also includes a hydrotherapy pool and external play areas.

An assessment has been made to determine the suitability of proposed rooftop plant and emergency plant to serve the new school. The assessment has been carried out to:

a) evaluate the existing acoustic environment and background sound levels at nearby noise sensitive receptors;

b) establish the plant noise emission limits outside noise sensitive receptors; and

c) provide an outline prediction of noise emission levels from the proposed installation at sensitive receptors and provide mitigation advice where required to comply with the proposed noise emission limits

d) discuss the potential impacts and mitigation/management of MUGA noise

This report presents the results of an environmental noise survey and impact assessment in the context of the baseline conditions. An assessment of impacts from construction noise and vibration is excluded from this report.

Environmental noise criteria relevant to the assessment have been presented and briefly discussed in Section 2.

A brief description of the proposed development is given in Section 3.

The noise impact assessment is presented in Section 4.

An assessment and discussion of MUGA noise is presented in Section 5.

The report is summarised in Section 6.

Results and methodology of the environmental noise survey are presented in Appendix A.

National planning policy guidance and an assessment of uncertainty is provided in Appendix B.

Further details of acoustics metrics can be found at AndersonAcoustics.co.uk/resources/acoustics-glossary.

2 DESIGN CRITERIA

Assessment guidance for the proposed external plant and multi-use games area (MUGA) is summarised below. These should be read in conjunction with the government's overarching planning principles with respect to noise including: Noise Policy Statement for England [1]; National Planning Practice Framework [2] and Planning Practice Guidance – Noise [3]. These documents are summarised in Appendix A along with a description of relevant acoustic terminology.

2.1 Planning Guidance – External Plant Noise

2.1.1 London Borough of Hillingdon – Supplementary Planning Document

The London Boroughs of: Hillingdon, Hounslow and Richmond Upon Thames Supplementary Planning Document – Development Control of Noise Generating and Noise Sensitive Development 2014 provides guidance for new industrial and commercial developments. The following is considered to be relevant to the proposed external plant:

"All industrial and commercial development with the potential to generate noise will be assessed and, where relevant, controlled by planning conditions in order to protect residential amenity. Conditions may be used, for example, to restrict noise levels and to control hours of operation. The most relevant standard for assessing new industrial and commercial development is BS4142:2014…

…As a general rule, the Boroughs will seek to achieve the external noise standards detailed in Table 2 below (all terms are as defined in BS4142)."

Table 2 from the supplementary planning document is reproduced in Table 2-1 below.

Table 2-1: New Industrial and Commercial Development – External Noise Standards

Noise impact from relevant proposed industrial or commercial premises or plant	Development outcome
Rating Level ($L_{Ar,Tr}$) is at least 5 dB(A) below the Background Level L_{A90}	Normally Acceptable
Rating Level ($L_{Ar,Tr}$) is no more than 5 dB(A) above the Background Level L_{A90}	Acceptable only if there are overriding economic or social reasons for development to proceed
Rating Level ($L_{Ar,Tr}$) is more than 5 dB(A) above the Background Level L_{A90}	Normally unacceptable

2.1.2 The London Plan

The London Plan [4] Policy D14 Noise states: *In order to reduce, manage and mitigate noise to improve health and quality of life, residential and other non-aviation development proposals should manage noise by:*

- avoiding significant adverse noise impacts on health and quality of life
- reflecting the Agent of Change principle as set out in Policy D13 Agent of Change
- mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on existing noise-generating uses
- improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity)

- separating new noise-sensitive development from major noise sources (such as road, rail, air transport and some types of industrial use) through the use of distance, screening, layout, orientation, uses and materials – in preference to sole reliance on sound insulation
- where it is not possible to achieve separation of noise-sensitive development and noise sources without undue impact on other sustainable development objectives, then any potential adverse effects should be controlled and mitigated through applying good acoustic design principles
- promoting new technologies and improved practices to reduce noise at
- source, and on the transmission path from source to receiver.

Section 3.14.3 of the plan states *"The management of noise also includes promoting good acoustic design of the inside of buildings. Section 5 of BS 8223:2014 provides guidance on how best to achieve this. BS4214 provides guidance on monitoring noise issues in mixed residential/industrial areas"*.

It is therefore considered acceptable to refer to guidance detailed in BS 4142 to ensure that noise from the proposed plant satisfies local authority criteria.

2.1.3 BS 4142

BS 4142 [5] provides methods for rating and assessing sound/noise of an industrial or commercial nature in relation to residential premises, hence its relevance here. The assessment methodology evaluates the "specific sound level" of each industrial or commercial sound source, corrects for distinguishable features to derive the "rating level", and compares this with the "background sound level".

The advice is that the background sound level ($L_{AF90,T}$) should be derived from continuous measurement of normally not less than 15 minute intervals over the period of interest, and that it should not be the lowest level, but representative of typical conditions at the noise-sensitive receiver(s) relevant to the periods of operation.

The specific sound level ($L_{Aeq,T}$) is obtained (by measurement or calculation) over a reference period of 1 hour in terms of the daytime (07:00 to 23:00) and 15 minutes during the night-time (23:00 to 07:00).

The rating level ($L_{Ar,Tr}$) is the specific sound level corrected to account for any acoustic features present in the sound in question, as experienced at the receptor, such as distinguishable, discrete, continuous note (a whine, hiss, screech or hum etc.) or distinct impulses (bangs, clatters or thumps etc.). Where no correction is warranted, the rating level is equal to the specific level.

The "subjective method" to calculate the rating level incorporates the following corrections (particularly appropriate for new sources that cannot be measured in-situ):

- Up to +6 dB due to tonality, subjectively this might be +2 for a tone that is just perceptible, +4 where it is clearly perceptible and +6 where it is highly perceptible.

- Up to+9 dB for impulsivity, subjectively this might be +3 for impulsivity that is just perceptible, +6 where it is clearly perceptible and +9 where it is highly perceptible; and

- Up to +3 dB for other acoustic features that are neither tonal nor impulsive, though readily distinctive at the receptor.

An "initial estimate" of the impact of the specific sound is calculated by subtracting the measured background sound level from the rating level. The following advice applies:

a) Typically, the greater this difference, the greater the magnitude of the impact.

b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur.

Where the initial estimate of the impact needs to be modified due to the context, the assessment should take into account all pertinent factors, including:

- the absolute level of sound;
- the character and level of the residual sound compared to the character and level of the specific sound; and
- the sensitivity of the receptor and whether dwellings will already incorporate design measures that secure good internal and/or outdoor acoustic conditions.

Helpfully, BS 4142 includes some example assessments. In one example, it is concluded that:

> "Although the plant noise is somewhat different in character to the residual acoustic environment the rating level of 30 dB is low and will have little impact on residents using their patio during the evening."

Under similar conditions it is stated:

> "In addition to the rating/background sound level comparison…" where "the primary concern is the potential for disturbance of residents who could be sleeping with open bedroom windows… Other guidance, such as BS 8233, might also be applicable in this instance."

Another example concludes that:

> "…the residual acoustic environment varies considerably with time, which also tends to mask sound from the source, reducing its relative significance…"

An assessment, therefore, is effectively in two parts. The first part results in an initial indication of the impact, which is subsequently considered in terms the context unique to the situation at hand; and where this second part may require consideration of alternative guidance and metrics. Alternatively, the context can be considered upfront and a specific threshold (or set of thresholds) determined accordingly in place of the default values presented in points a) to d) quoted above.

2.1.4 Emergency Plant

An emergency generator is proposed within the rooftop enclosure. Typically, an increase in noise rating level of up to 10 dB above the background sound level is normally considered acceptable, provided regular testing only takes place during the daytime on a weekday. For further context and evidence of use, this criterion is also detailed within the Westminster City Council Planning Noise Criteria.

Therefore, a Rating Level of no greater than +10 dB above the typical background sound level is recommended (this should be confirmed by the Local Authority). This recommended criterion should be agreed with the Environmental Health Officer.

It is assumed that the proposed generator would only operate in the event of a power failure or a fire. It is recommended that testing of emergency plant should only occur for up to 1 hour per calendar month and during the daytime period (07:00 to 23:00) of Monday to Friday only, excluding public holidays, to limit the impact of emergency plant during sensitive periods.

2.2 Planning Guidance – Multi Use Games Area

2.2.1 London Borough of Hillingdon – Supplementary Planning Document

The London Boroughs of: Hillingdon, Hounslow and Richmond Upon Thames Supplementary Planning Document – Development Control of Noise Generating and Noise Sensitive Development 2014 provides guidance for new industrial and commercial developments. The following is considered to be relevant to the proposed MUGA.

> *"The Boroughs would expect that in most cases for any new or modified MUGA's or AGP's the Sport England guidance is applied and the application should demonstrate that these levels can be complied with both internally and externally…"*

Guidance detailed within Sport England is presented below.

2.2.2 Sport England – Artificial Grass Pitch (AGP) Acoustics – Planning Implications Guide

Sport England's Design Guidance Note *Artificial Grass Pitch (AGP) Acoustics – Planning Implications New Guidance for 2015 guidance* has been applied to determine the potential noise impact of the proposed pitches. This refers to the National Planning Policy Framework and Local planning authority planning policies.

Two assessment methods are proposed in the guidance document. Firstly, a maximum specific free field noise target of 50 dB $L_{Aeq,1hour}$ at 1m outside the nearest residential property is recommended in line with the recommendations detailed in the WHO Guidelines for Community Noise. It is suggested that an assessment is undertaken across 1-hour periods rather than the 16-hour assessment period typically used for assessing daytime L_{Aeq} noise levels. The MUGAs are assumed to be operational within the daytime period of 07:00-23:00 hrs as a robust assessment (actual operational hours are likely to be well within this time period).

An open window provides around 15 dB attenuation from external noise, therefore, an external MUGA activity noise level of 50 dB(A) would result in an internal noise level of around 35 dB(A). This level is in accordance with the guideline daytime indoor ambient noise levels in BS 8233:2014 (see Table 2-2).

Table 2-2: BS 8233 Indoor ambient noise levels for dwellings

Activity	Location	07:00-23:00 (Daytime)
Resting	Living room	35 dB $L_{Aeq,16h}$
Dining	Dining room/area	40 dB $L_{Aeq,16h}$
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16h}$

The guide states that '*it is not necessarily the case that where these levels are exceeded, the noise will adversely affect nearby residential properties*', therefore the guide sets out a second assessment method to provide further context, where the AGP specific L_{Aeq} noise level is compared to the existing ambient L_{Aeq} noise level. The

guidance states that a slight impact is considered for an increase of up to 3 dB, as generally considered to be the minimum perceptible change under normal conditions.

The maximum recommended change in noise level of 3 dB can be reasonably considered to be the No Observed Adverse Effect Level (NOAEL), at which noise can be heard, but does not cause any change in behaviour, attitude or other psychological response, and as such no specific mitigation measures are likely to be required.

Compliance with these proposed criteria is therefore considered to comply with national policy (detailed in Appendix A) to prevent an adverse impact.

3 THE PROPOSED DEVELOPMENT

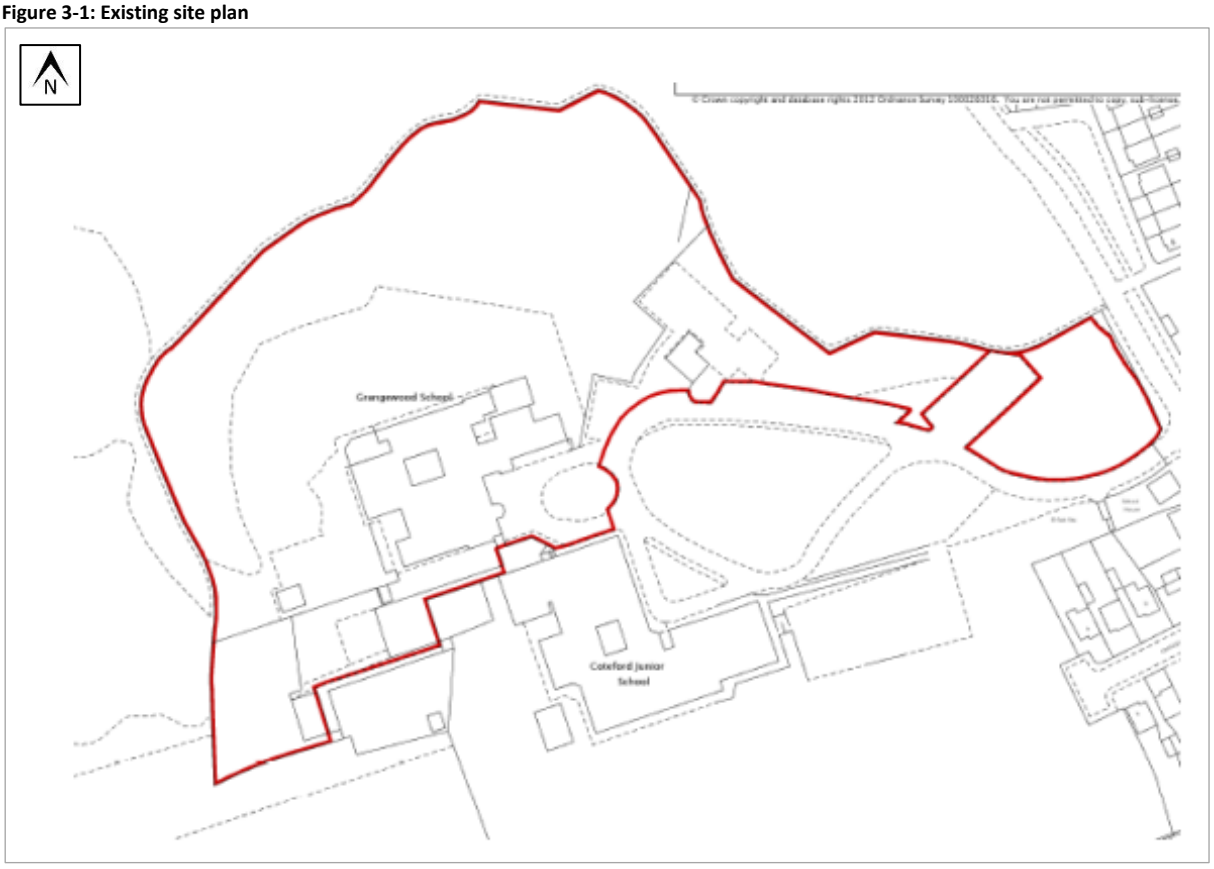
The site is located on the former Grangewood School site, Pinner HA5 2JQ (see Figure 3-1). The area surrounding the building mainly comprises woodland to the north/north east/west/south west, with residential to the south east and east.

The nearest residential premises is 118A Fore Street located approximately 100 m to the east of the site. Other residential receptors to the south east this will be partially screened by Coteford Junior School which is a low rise single storey building. Both locations suggest a low risk of noise impact from new fixed plant or the MUGA, given their distance from the proposed school.

Coteford Junior School is located immediately to the south of the site boundary which will remain in-situ and operational throughout the duration of the Pinn River construction programme. Therefore, the noise impact assessment will be carried out for this nearest noise sensitive receptor.

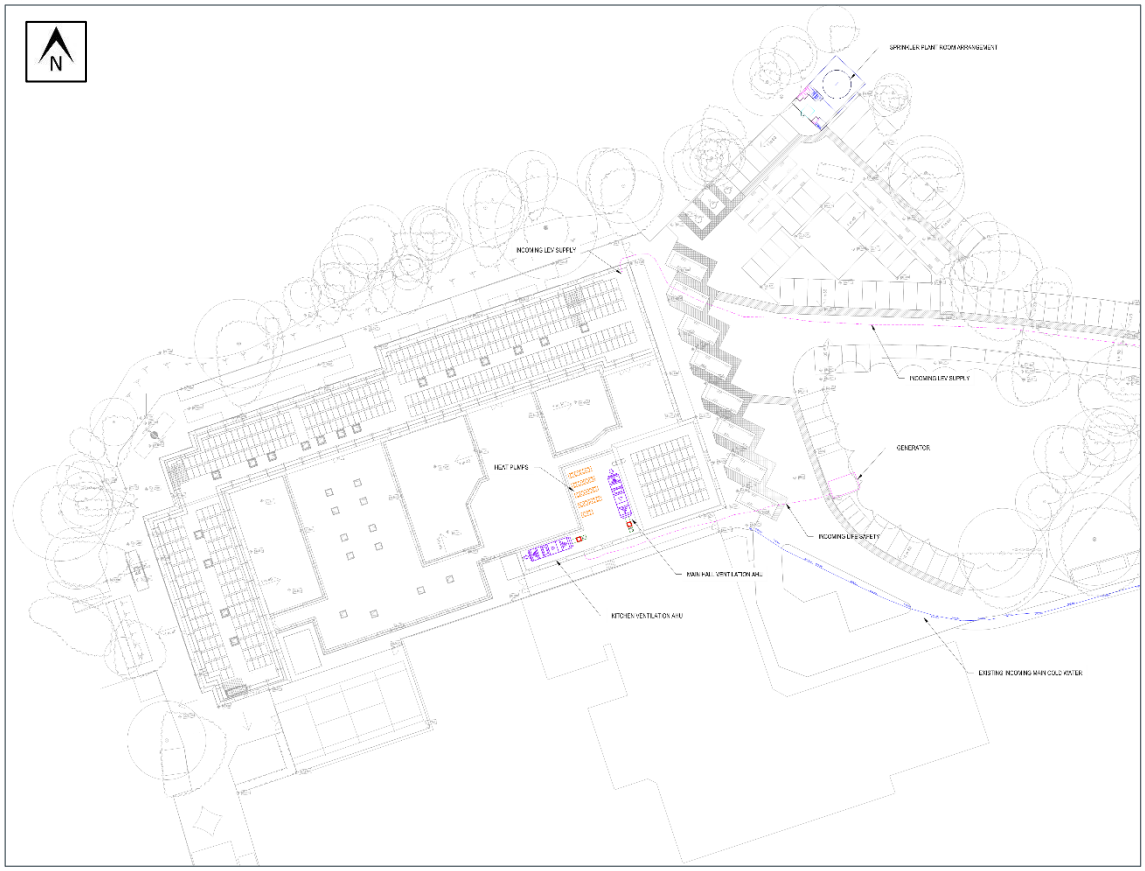
Existing ambient noise sources on site include birdsong, distant road traffic and occasional playground noise from Coteford Junior School.

Figure 3-1: Existing site plan



The proposed site plan is shown in Figure 3-2.

Figure 3-2: Proposed Site Plan



4 PLANT NOISE EMISSIONS

4.1 Proposed Plant Items

4.1.1 Ventilation Plant

Ventilation to the main hall and general classrooms will be provided using a roof mounted air handling unit. A dedicated kitchen exhaust and supply air handling unit is also proposed at roof level. No selection has been confirmed for the proposed AHU's, therefore, a limit has been set for these items at both the inlet and exhaust locations. A spectrum for a similar unit has been adjusted to allow for inclusion within the prediction model. Atmosphere side attenuators are to be provided at the unit inlet and exhaust to achieve the noise criteria.

9 no. ASHP's are proposed at roof level. It is understood that each unit has an overall Sound Power Level of 64 dBA, however, no spectral data has been provided. Therefore, for this assessment, a spectrum for a similar unit has been adjusted to allow for inclusion within the prediction model.

Table 4-1 details the spectral data used within the prediction model for both the ASHP's and the AHU's. These units have been considered as part of the "Daily Operated Plant" assessment. The location of the ventilation plant is shown in Figure 3-2.

4.1.2 Generators

Equipment requiring a stand-by generation includes evacuation lifts and potential smoke vents for life safety purposes only. The generator is proposed towards the east of the proposed school building, as shown in Figure 3-2. The proposed plant may be operational during the daytime or night-time period.

No selection has been confirmed for the proposed Generator, therefore, a limit has been set for this item to ensure that the proposed noise criteria is not exceeded. A spectrum for a similar unit has been adjusted to allow for inclusion within the outline prediction model, as detailed in Table 4-1.

This has been considered as part of the "Emergency Plant" assessment.

4.1.3 Sprinkler Tank

The proposed Sprinkler Tank will require twin diesel pumps to operate and will be located within a solid masonry building towards the north of the site. The Tank is located at least 100 m from the nearest residential premises (118A Fore Street to the east). The location of the Sprinkler Tank is detailed in Figure 3-2. The proposed plant may need to be operational during the daytime or night-time period. As selections have not been confirmed, it is assumed that the Sprinkler Tank compound will be specified to control external noise levels to no greater than 45 dBA at 1 m from the compound entrance doors.

This has been considered as part of the "Emergency Plant" assessment.

4.1.4 Substation

It is understood that a new 450 kVA substation is proposed in the north-east corner of the site boundary. The nearest noise sensitive receptor is located at least 100 m to the east (118A Fore Street). Based on manufacturer data for a 800 kVA unit, a maximum sound power level of 55 dBA is assumed for a 450 kVA unit. The transformer will also be housed in a GRP enclosure with anti-vibration pads installed as standard.

4.1.5 Input Plant Data

The schedule of plant and source sound power level data used in the assessment is presented in Table 4-1 below. Spectral data has been taken from manufacturer data for the representative units. The spectral data has been rounded to the nearest dB. It should be noted that if proposed plant items and associated noise data changes significantly, mitigation measures such as enclosures or screens may need to be considered. However no screens have been assumed for the purpose of this outline assessment.

Table 4-1: Spectral data of proposed plant items

Plant Item	No. Items	Sound Power Levels, dB								
		L_{wA}	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
ASHP [a]	9	64	67	57	56	51	45	43	40	-
AHU – Supply [b]	2	75	73	83	76	72	68	67	62	59
AHU – Exhaust [b]	2	75	69	79	72	70	70	69	66	60
Generator [c]	1	85	79	78	76	78	80	80	75	73
Sprinkler Tank	1	56	-	-	-	-	-	-	-	-
Substation	1	55	-	-	-	-	-	-	-	-

Notes
[a] Spectral data for PURY-EP500YNW-A1 unit adjusted
[b] Spectral data for Airflex 39 F AHU unit adjusted
[c] 660 kVA Diesel Generator spectrum adjusted

4.2 Assessment Criteria

4.2.1 Daily operated plant

On the basis of the above, the rating level of the plant that will be in regular operation, when measured in accordance with BS 4142:2014, is proposed to be no greater than 5 dB below the typical background sound level when measured in accordance with BS 4142:2014+A1:2019, where practicable at 1 m from the nearest noise sensitive premises.

Table 4-2 details the established typical background sound level at the assessment position (using the method described in BS 4142:2014) and the maximum Rating Level required to ensure compliance with the local authority guidance. It is assumed that the Daily Operated Plant will not operate during the night-time period (23:00 – 07:00).

Table 4-2: Design criteria at receiver locations: Daily Operated Plant

Typical Daily (modal) background sound level dBA	Target maximum rating level, dB $L_{Ar,T}$r – Daytime [a]
36	31 – 35 [a]

Notes

[a] Typical background sound levels are very low and designing plant to achieve such low levels at nearest noise sensitive receptors can be impractical and, indeed, unnecessary. In this regard, it is stated in BS 4142 Annex A (informative) that: *"in addition to the rating/background sound level comparison, the primary concern is the potential for disturbance of residents who could be sleeping with open bedroom windows. Other guidance, such as BS 8233, might also be applicable in this instance."*

BS 8233 indicates that, based on the assumption of a partially open window may provide 10-15 dB attenuation, a level of 30-35 dBA outside equates to an internal level of approximately 20 dBA, which is well below the target ambient noise levels for bedrooms.

Therefore, based on the guidance in BS 4142 and BS 8233, the target rating levels are limited to 31 – 35 dBA during both the daytime period. This would ensure that internal ambient noise levels within sensitive receptors are not undermined whilst balancing the practicalities of specifying the proposed fixed plant.

4.2.2 Emergency Plant

As detailed in Section 2.1.4, the rating level of emergency plant, when measured in accordance with BS 4142:2014, is proposed to be no greater than 10 dB above the typical background sound level when measured in accordance with BS 4142:2014+A1:2019, where practicable.

Table 4-3 details the measured typical background sound level at the assessment position and the maximum Rating Level in accordance with the proposed assessment criterion. It is assumed that emergency plant may be operational during the daytime or night-time periods. For the night time period, the guidance ins BS 8233 has also been considered, see Table notes.

Table 4-3: Design criteria at receiver locations: Emergency Plant

Typical (modal) background sound level, dBA		Target maximum rating level, dB $L_{Ar,Tr}$	
Daytime	Night-time	Daytime, $L_{Ar,1hr}$	Night time $L_{Ar,15min}$
36	25	46	40 [a]

Notes

[a] An operational noise limit below 30 dB LAeq was considered low by the old BS4142: 1997 Rating industrial noise affecting mixed residential and industrial areas, which despite being superseded by the 2014 and 2019 versions, is still mentioned in several Local Authority policy documents and generally referenced when background or rating noise levels are very low. The scope of the superseded standard (Section 1) stated that the method described therein was not suitable when background and rating noise levels were both very low (below about 30 and 35 dB, respectively). It is stated in BS 4142 Annex A (informative) that: *"in addition to the rating/background sound level comparison, the primary concern is the potential for disturbance of residents who could be sleeping with open bedroom windows. Other guidance, such as BS 8233, might also be applicable in this instance."*

BS 8233 indicates that, based on the assumption of a partially open window may provide 10-15 dB attenuation, a level of 30-35 dBA outside equates to an internal level of approximately 20 dBA, which is well below the target ambient noise levels for bedrooms. It is therefore considered reasonable to establish emergency plant noise emissions criteria to generally be limited up to 40 dB at the nearest residential window. This would equate to an internal level of approximately 30 dBA, which meets the BS8233 indoor noise targets for a bedroom at night.

4.3 External Plant Noise Assessment

4.4 Assessment Methodology

Calculations are based on the information supplied by Kier Construction and Ridge and Partners LLP. Manufacturers published sound power levels corresponding to the proposed plant has been included within the prediction model.

DataKustik's "CadnaA" modelling software has been used to determine the specific sound levels at 1 m from the nearest dwelling. The assessment has been made over a 1-hour period during the daytime (07-23) and a

15-minute during the night-time (23-07), in keeping with the assessment period specified for daytime-based assessments within BS 4142.

Predictions have been carried out in accordance with the ISO 9613-2 [3] prediction methodologies, which allow consideration of the effects of the acoustic screening provided by the existing buildings surrounding the application site, the topographical conditions throughout the area, ground absorption, atmospheric absorption, acoustic reflections and acoustic screening, as well as applying a light downwind propagation correction to represent a worst-case. Calculated levels have been assessed against the design targets indicated.

Modelling software has been used to predict the cumulative specific noise level of proposed rooftop plant associated with the new development as well as to set limits to allow for attenuator specification at a time when final plant selection is completed. 3D modelling details are as follows:

- The topography across the development site and surrounding area has been rendered within the model using 1m LIDAR data provided by DEFRA
- Receivers have been set at a height of 1.5 m above local ground level. For multistorey buildings, receivers are set at a height of 1.5 m above ground level, the 3.0 m for each additional storey
- Ground modelled as soft and absorptive due to proximity of playing fields and wooded areas (i.e. G = 0.8)

BS 4142 requires that a correction is applied to the rating level if there are any tonal, impulsive or other irregular characteristics likely to attract attention present in the noise source. Based on the octave frequency band sound power data of the above plant items, it is considered that the proposed plant units are non-tonal in acoustic character. It has been assumed that the proposed rooftop plant will operate continuously, therefore no intermittency correction has been applied. The plant is also not expected to exhibit any impulsive characteristics. To provide further context, the site is currently active with existing plant operating and a number of road traffic movements (including emergency vehicles) occurring, any slight plant characteristics are unlikely to be perceptible.

The predicted uncertainty of the assessment is detailed in Appendix B.

4.5 Predicted Specific Sound Levels

Figure 4-1 and Figure 4-2 details the predicted specific sound level at the nearby residential properties around the site at the existing Coteford Junior School located adjacent to the south during the operation of “Daily Operated Plant”. Where a maximum noise level of 41-42 dBA has been predicted at 1 m from Coteford Junior School, this is not considered to be representative of a noise sensitive location as there are no windows at this location. A level of up to 35 dBA been predicted outside existing window locations.

Figure 4-1: Daily Operated Plant – Wider Site View

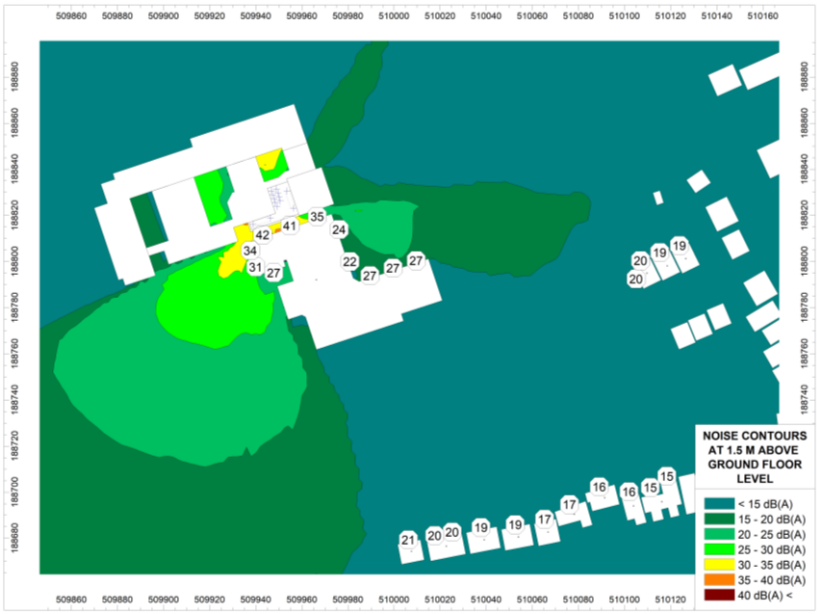


Figure 4-2: Daily Operated Plant

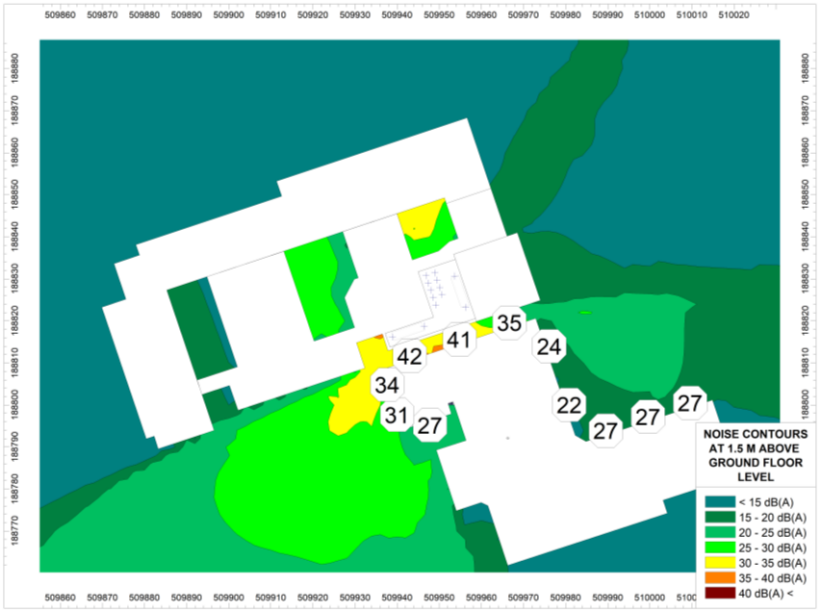
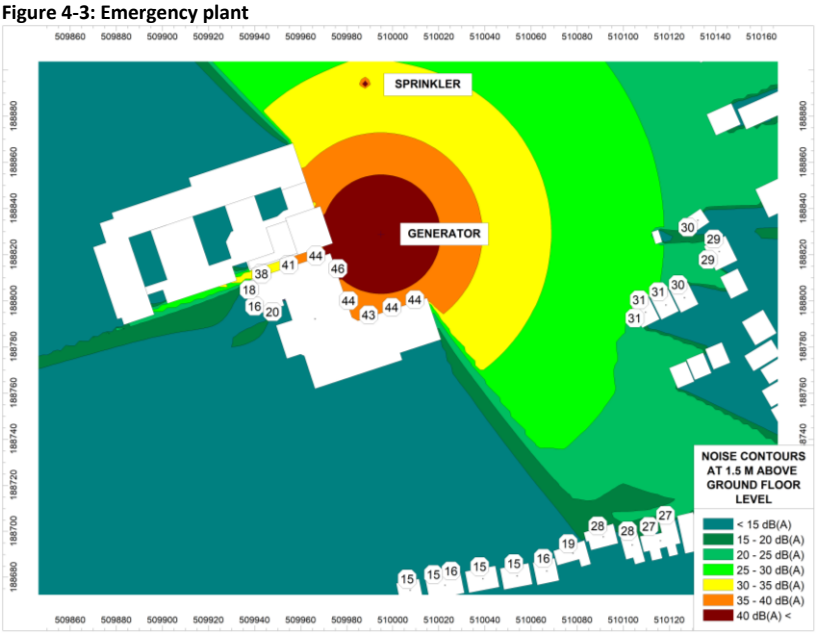


Figure 4-3 details the predicted specific sound level at the nearby receivers during the operation of "Emergency Plant". A level of up to 46 dBA is predicted at locations outside Coteford Junior School (relevant to daytime period only) and a level of up to 31 dBA is predicted outside the nearest residential receptors (day time and night time period).

Figure 4-3: Emergency plant



4.6 Noise Impact Assessment

Table 4-4 details the outline plant noise assessment. To provide a worst-case assessment, it has been assumed that all of the proposed plant will be operational during the assessment period. Plant is expected to operated continuously and without any impulsive character. Tonal elements are also not expected. Therefore, no acoustic character corrections have been applied as part of this assessment.

Table 4-4: Outline Noise Impact Assessment – Daily Operated Plant

Description	Receiver Location	
	Coteford Junior School	Residential Receptor
Outline Predicted Specific Sound Level (free field, 1m from façade)	34	21
Acoustic Penalties	0	0
Rating Level, $L_{Ar,\,Tr}$	34	21
Target Rating Level	31 – 35 (adjusted)	31 – 35
Excess of calculated Rating Level over Target Rating Level	N/A	N/A

The assessment indicates that with the proposed limits and mitigation in place, the operation of the proposed plant results in a *Low Impact* at the nearest residential receptors in accordance with BS 4142 guidance, being at least 10 dB below the background sound level.

At the nearby existing Coteford Junior School, whilst levels only 2 dB below the typical background sound level when the school is in operation ,this is still an indication of a low impact in accordance with BS4142. It can also be seen that the predicted Rating Level is below the adjusted assessment criteria of 35 dBA, taking into account BS8233 guidance to ensure suitable indoor ambient noise levels will be comfortably achieved inside classrooms (see note in Table 4-2).

Table 4-5 details the assessment of Emergency Plant. As Coteford Junior School is operational during the daytime period only, the daytime assessment criterion has been considered at this location. A daytime and night-time assessment is required at the residential receptors, therefore, compliance with the night-time

criterion will ensure that the daytime criterion can be satisfied. It can be seen that the target levels are achievable at Coteford Junior School and comfortably achieved at the nearest residential receptors.

Table 4-5: Noise Impact Assessment – Emergency Plant

Description	Receiver Location	
	Coteford Junior School (Daytime Criterion)	Residential Receptor (Night-time Criterion)
Predicted Specific Sound Level	46	31
Acoustic Penalties	0	0
Rating Level, $L_{Ar,Tr}$	46	31
Target Rating Level	46	40
Excess of calculated Rating Level over Target Rating Level	0	-9

To ensure that the assessment criteria can be achieved at both Coteford Junior School at the nearest residential receptors, the generator should be selected such that a noise level of 54 dBA at 10 m is not exceeded.

5 MUGA/PLAYGROUND NOISE EMISSIONS

5.1 Predictions

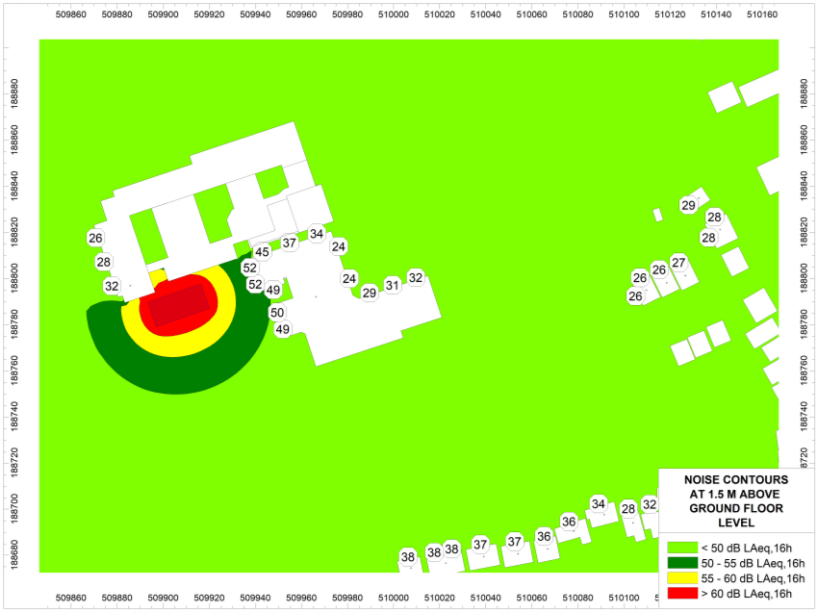
A noise assessment has been undertaken for the proposed Multi-Use Games Area (MUGA). Guidance and design considerations provided within Sport England's Artificial Grass Pitch (APG) Acoustics [7] have been used and discussed within this assessment. The Sport England guidance references an Artificial Grass Pitch (AGP) activity noise level of 58 dBA at a height of 1.5 m and 10 m from the sideline at the halfway point. This activity reference level has been determined through measurement of sessions that included *"football, hockey and rugby and participation by men, women and children. The purpose was to determine a 'typical' noise level generated from a 'typical' AGP sports session".* The reference activity noise level is typically used where MUGA's are also being proposed.

It is understood that the proposed MUGA will be operational during the daytime period only. The guidance suggests that a proposed noise limit of 50 dB $L_{Aeq,1hr}$ is desirable at the façade of the nearest noise sensitive premises, as detailed in Section 2.2.

Figure 5-1 details the predicted activity noise level from MUGA activity with the Sport England reference activity level assumed. It can be seen that a noise level of 52 dB $L_{Aeq,1hr}$ is predicted at 1 m from Coteford Junior School (located towards the East of the proposed MUGA). MUGA noise levels are predicted to be no higher than 38 dB $L_{Aeq,1hr}$ at the nearest residential properties (towards the south of the site) without any additional mitigation proposed.

The target maximum MUGA noise level of 50 dBA will be comfortably achieved at the nearest noise sensitive residential receptor, assuming worst case MUGA noise activity level of 58 dBA at 10 m. The impact of MUGA noise at Coteford Junior School does exceed the proposed 50 dB $L_{Aeq,1hr}$ noise limit. This is discussed further below.

Figure 5-1: Predicted Specific Sound Level from MUGA Activity



5.2 Discussion

It is understood that the proposed MUGA in this instance will likely be used by a small number of students at a time for relaxed play. Therefore, the Sport England guidance reference activity noise level is not expected to be representative of the MUGA activity noise level at the school in this instance.

Since it is also assumed that the school will commit to suitable management and timetabling of proposed MUGA to mitigate noise impacts on Coteford Junior School, no additional mitigation measures have been proposed. Furthermore, no community use is intended such that normal hours of use will be during the school day.

6 SUMMARY

Anderson Acoustics was commissioned by Kier Construction Ltd to conduct a noise impact assessment for the proposed rooftop plant installation at Pinn River School.

This report identifies the proposed plant items and their locations in relation to the nearest noise sensitive receptors. Calculations have been made to assess the resulting Rating Levels at the nearest noise sensitive receptors in accordance with BS 4142.

The assessment is based on plant noise data provided by the manufacturer, data captured during noise surveying by Anderson Acoustics Ltd, and relevant technical drawings for the proposal.

Providing the proposed mitigation is in place and the set plant limits are not exceeded, our assessment predicts that plant noise levels are considered to result in a 'Low' Impact in line with BS 4142 guidance (and taking into account supplementary BS8233 guidance). The typical locate authority limits of 5 dB below the background sound level are also achieved during daytime plant operation at the nearest noise sensitive residential receptors. Emergency plant is demonstrated to achieve a typical limit of up to 10 dB above background sound level.

MUGA noise is expected to have a low impact at the nearest residential receptor and MUGA noise and operation will be managed by the school to avoid any significant impact on the nearby Coteford Junior School.

7 REFERENCES

[1] Department for Environment, Food and Rural Affairs, “Noise Policy Statement for England,” DEFRA, London, 2010.

[2] C. &. L. G. Ministry of Housing, “National Planning Policy Framework,” London, 2019.

[3] Ministry of Housing, Communities & Local Government, “Planning Practice Guidance - Noise,” 2019. [Online]. Available: https://www.gov.uk/guidance/noise--2. [Accessed 2020].

[4] Mayor of London, *The London Plan - The Spatial Develop Strategy for Greater London,* London: Mayor of London, 2021.

[5] The British Standards Institution, *BS 4142:2014+A1:2019 - Methods for rating and assessing industrial and commercial sound,* London: BSI, 2014.

[6] British Standards Institution, *ISO 9613-2:1996 - Acoustics. Attenuation of sound during propagation outdoors - General method of calculation,* London: BSI, 1996.

[7] Sport England, *Artificial Grass Pitch (AGP) Acoustics - Planning Implications,* Sport England, 2015.

[8] Institute of Acoustics; Acoustics & Noise Consultants, *Acoustics of Schools: a design guide,* 2015.

[9] The British Standards Institution, *British Standard 61672 - Electroacoustics. Sound level meters. Specifications,* BSI, 2013.

APPENDIX

A ENVIRONMENTAL NOISE SURVEY

A.1 Original Noise Survey

The original noise survey (ref 11024, prepared by Ecus Ltd) was conducted on Tuesday 13 March 2018 between 09.15-13:25 hrs. The reported noise levels of 44-52 dB $L_{Aeq,30min}$ (with levels above 50 dB including playground activity noise from Coteford Junior School), suggest this is a very low noise site. The lowest background noise level recorded was 35 dB $L_{A90,5min}$, however lower levels are anticipated during night-time periods.

The survey results suggest that the following IoA/ANC Design Guide [8] recommended ambient noise levels for outdoor teaching and learning spaces would also be achieved:

- Upper limit of 60 dB L_{Aeq} at the boundary of external areas used for formal and informal outdoor teaching and recreation.
- Free-field noise levels in unoccupied playgrounds, playing fields and other outdoor areas should not exceed 55 dB L_{Aeq}
- There should be at least one area suitable for outdoor teaching activities where noise levels are below 50 dB L_{Aeq}.

A.2 Secondary Noise Survey

A subsequent noise survey was conducted during the summer holidays in August 2022 in order to capture longer term ambient $L_{Aeq,T}$ noise levels and to capture background $L_{A90,T}$ noise levels, including an overnight period, to help establish more detailed limits for fixed plant noise.

It was possible to observe the noise climate around site during both the setup and collection of the survey equipment. This has allowed for a better understanding of the non-site sources contributing to the soundscape. The noise climate was noted to be quiet, with occasional traffic movements from nearby roads.

The microphone was fitted with a windshield and set up in free-field conditions (i.e. at least 3.5m, from hard, vertical surfaces).

The site plan in Figure A-1 shows the measurement position. This position is considered to be representative of the ambient noise climate around the redevelopment site. In addition, the position is considered representative of the background noise climate at the nearest residential windows to the site (18A Fore Street and rear facing windows of houses on Grangewood Close) such that plant noise limits can be set.

Figure A-1: Plan showing unattended noise survey location

A.3 Instrumentation

All noise measurements were undertaken by a consultant certified as competent in environmental monitoring. All acoustic measurement equipment used during the noise survey conformed to Type 1 specification of British Standard 61672 [7]. A full inventory of this equipment is shown in Table A-1 below. All equipment's calibration certificates are available on request.

Table A-1: Unattended survey equipment details

Equipment (ID)	Make & Model	Serial No.	Date Laboratory Calibrated	Calibration Certification Number[a]
Sound Level Meter	Rion NL-32	00610202	22/12/2020	UCRT20/2264
	Rion NH-25	10611		
	Rion UC-59	17093		
Calibrator	Rion NC-74	34134186	04/07/2022	UCRT21/1436

Notes
[a] Certificates available on request.

The measurement chain was field-calibrated before the monitoring using the above acoustic calibrator. The level was checked at the end of the monitoring, and no significant drifts were observed.

A.4 Weather Conditions

The weather conditions were noted from www.timeanddate.com, with the conditions summarised in Table A-2.

Table A-2: Summary of online weather data (daytime only)

Date	Typical Wind Direction	Max Wind Speed (m/s)	Range in Temp (°C)	Probability of Rain	General Description
Monday 15/8/22	W	4	17-29	0	Clear sky, no rain
Tuesday 16/8/22	S	3	17-23	0	Some cloud cover, no rain
Wednesday 17/8/22	N	6	16-24	0	Cloudy, short periods of light rain

Date	Typical Wind Direction	Max Wind Speed (m/s)	Range in Temp (°C)	Probability of Rain	General Description
Thursday 18/8/22	NW	4	17-26	0	Some cloud cover, no rain
Friday 19/8/22	W	6	16-24	0	Some cloud cover, no rain

Weather conditions are not considered to have impacted measurements.

A.5 Existing Noise Climate on Site

During our time on site, the noise climate was noted to be dominated by distance-attenuated road traffic from the surrounding road network. The site is located within a quiet area, with the nearest road, Fore Street, located approximately 100 m from the east site boundary, which leads to site via a shared access road with Coteford Junior School.

Both the existing Grangewood School and the adjacent Coteford Junior School were closed throughout the survey period due it being the school summer holidays. As such, noise from outdoor play and sports area use were not prevalent. Activity noise from Coteford School has been taken into account using the previous survey and data.

As some works have started on site, some noise-generating works occurred during the survey period. As such, the daytime periods (07:00 – 23:00 hours) have been excluded from the survey period, on Wednesday 17/08/2022, where these were understood to have occurred.

A.6 Results

A summary of the daytime ambient $L_{Aeq,16hr}$ and night-time ambient $L_{Aeq,8hr}$ noise levels is presented in Table A-3 for the measurement position, along with the typical (most commonly occurring modal average) background sound levels established using the measured $L_{A90,15min}$ noise levels. BS 4142 guidance details that 1 hour time periods are used for daytime assessments, however, the use of 15 minute measurements is considered to establish a worst-case typical Daytime background sound level.

Table A-3: Summary of measured sound levels, dB (representative of nearest noise sensitive premises)

Date	Period-averaged ambient $L_{Aeq,T}$ (dB)		Typical modal background $L_{A90,15min}$ (dB)	
	Daytime (07:00-23:00)	Night-time (23:00-07:00)	Daytime (07:00-23:00)	Night-time (23:00-07:00)
Mon 15/08/2022[a]	39	33	29	24
Tue 16/08/2022	48	36	36	27
Wed 17/08/2022	-	35	-	25
Thu 18/08/2022	41	34	36	25
Fri 19/08/2022[b]	48	-	34	-
Overall [c][d]	**46**	**35**	**36**	**25**

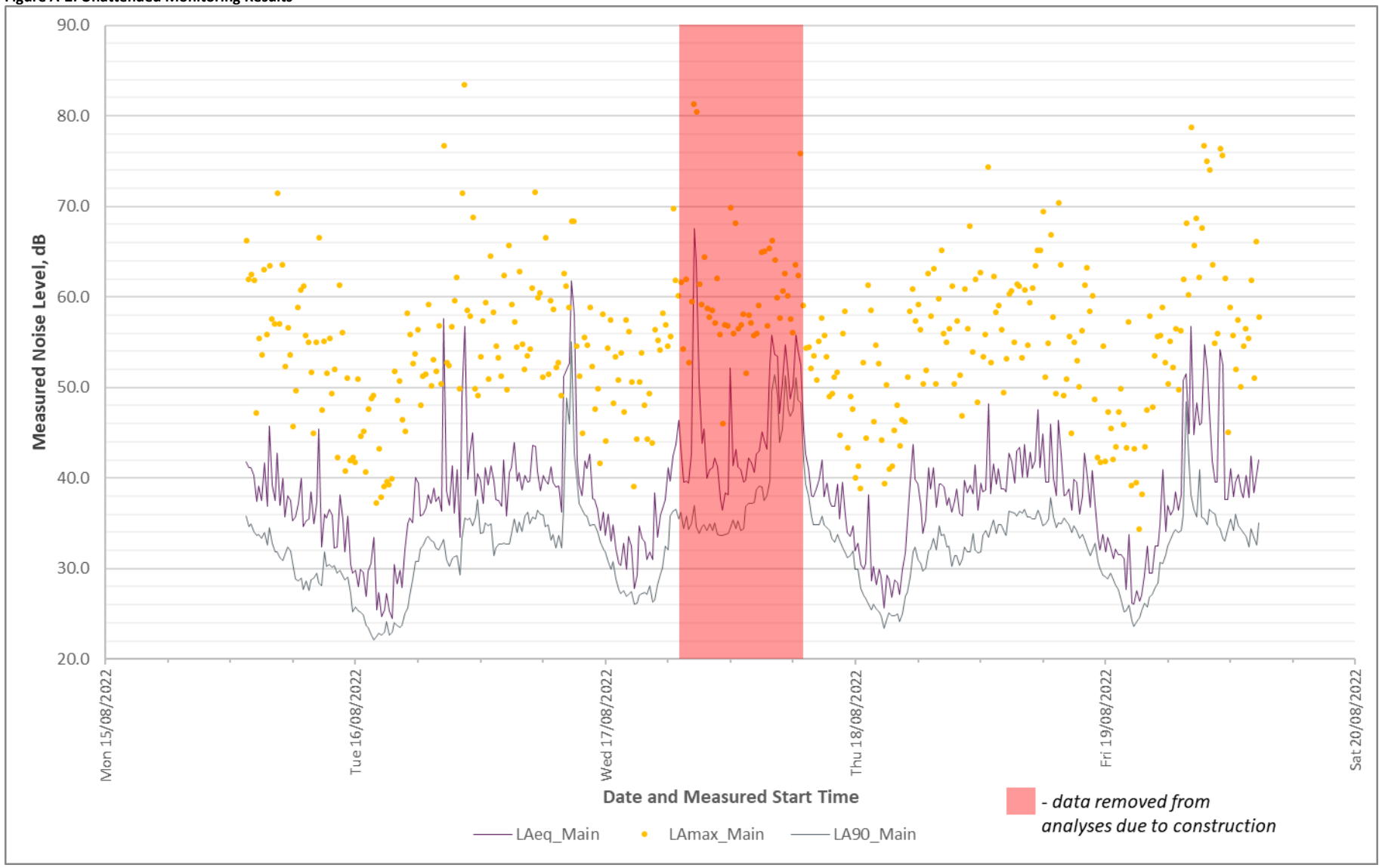
Notes
[a] Data obtained during the daytime was not a full measurement (start time = 13:30 hours)
[b] Data obtained during the daytime was not a full measurement (end time = 15:00 hours)
[c] Overall $L_{Aeq,T}$ are period-averaged over the full survey duration
[d] Overall $L_{A90,T}$ are the most commonly occurring over the full survey duration

The reported ambient $L_{Aeq,T}$ levels are low and relatively consistent during the daytime and school periods, where periods of a full daily measurement had a maximum level difference of 7 dB. The reported ambient $L_{Aeq,T}$ night-time noise levels are also notably low and are more consistent.

The reported background $L_{A90,T}$ levels are also low and relatively consistent during the daytime and school periods, where periods of a full daily measurement had a maximum level difference of 2 dB. The reported ambient $L_{Aeq,T}$ night-time noise levels are very low and are consistent.

A.7 Graphical Results

Figure A-2: Unattended Monitoring Results



APPENDIX

B ASSESSMENT OF UNCERTAINTY

B.1 Noise Policy

B.1.1 Noise Policy Statement for England (NPSE, 2010)

The NPSE is the Government's overarching statement on noise policy for England, and applies to all forms of noise other than occupational noise, setting out the long-term vision of Government noise policy, which is to:

Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.

Which is supported by the following noise policy aims:

Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

e) Avoid significant adverse impacts on health and quality of life;
f) Mitigate and minimise adverse impacts on health and quality of life; and
g) Where possible, contribute to the improvement of health and quality of life.

When discussing the meaning of significant adverse and adverse within an Explanatory Note, the NPSE states:

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

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

LOAEL – Lowest Observed Adverse Effect Level - This is the level above which adverse effects on health and quality of life can be detected.

To which the NPSE added the following related concept:

SOAEL – Significant Observed Adverse Effect Level - This is the level above which significant adverse effects on health and quality of life occur.

The Explanatory Note continues:

It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available.

The NPSE concludes by explaining in a little more detail how the LOAEL and SOAEL relate to the three aims listed above. Logically, it starts with the aim of avoiding significant adverse effects on health and quality of life, then addresses the situation where the noise impact falls between the LOAEL and the SOAEL, when *"all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development."* The final aim envisages proactive management of noise to improve health and quality of life, again taking into account the guiding principles of sustainable development.

B.1.2 National Planning Policy Framework (NPPF, 2019)

First published in 2012, and most recently updated in July 2021, the NPPF sets out the Government's planning policies for England, and how these are expected to be applied. Noise is referenced within the NPPF as follows. These are effectively the NPPF's policies on noise.

174. Planning policies and decisions should contribute to and enhance the natural and local environments by:

…e) *preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans…*

185. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) *mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life[60]…*

Reference number 60 of the above quotation points to the Explanatory Note to the NPSE (see above).

The following policy is also relevant to noise.

187. *Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.*

As mentioned above, the Government has published accompanying web-based planning guidance for a number of categories, including noise (see below).

B.1.3 NPPF Planning Practice Guidance, Noise (PPG-N, 2019)

Following initial release in 2014, the planning practice guidance now forms part of the NPPF, referred to as relevant planning practice guidance, which includes guidance on the category of Noise. The guidance is often referred to as PPG-Noise, PPG-N or PPG(N).

In keeping with the NPSE and NPPF, no values (in dB) are presented; however, plenty of guidance is provided as to the issues to consider in assessing noise and determining suitable thresholds.

A noise exposure hierarchy table is provided, which summarises the noise exposure hierarchy based on the likely average response of those affected, and is reproduced below. It includes examples of outcomes relevant to the NOEL, LOAEL and SOAEL effect thresholds described in the NPSE. These outcomes are in descriptive form; there is no numerical definition of the NOEL, LOAEL and SOAEL.

Table B-2: Noise exposure hierarchy table (as per PPG-N)

Response	Examples of outcomes	Increasing effect level	Action
No Observed Effect Level			
Not present	No effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

It is left to other guidance documents and professional opinion to determine thresholds where required.

B.2 Uncertainty

B.2.1 Measurement Location

- Attended sound level measurements were taken at a located considered to be representative of conditions at the nearest noise sensitive receptor.
- Measurements were taken under free-field conditions

B.2.2 Weather Conditions

- Weather conditions were clear throughout attended measurements and are not considered to have impacted surveys

B.2.3 Instrumentation

- An IEC 61672 Class 1 sound level monitor was used for sound level measurements
- A calibration drift of 0.1 dB, which is within normal tolerances, was observed between the start and end of the unattended survey.
- The sound level meter and field calibrator used for the unattended survey have been sent for calibration at UKAS approved laboratories within the last 12 months

B.2.4 Calculations

- Calculations completed using CadnaA modelling software and technical drawings proposed by the architect and M&E designer
- Calculations rounded up to nearest dB
- During normal operation, specific sound source is not expected to exhibit any impulsive or intermittent characteristics that would warrant a correction penalty
- Unable to validate predicted specific sound level with measurements as the plant is yet to be installed
- Assumes all plant running simultaneously throughout the assessment period to provide a worst-case
- Suitable representative spectral data has been used to determine acceptable limits for future plant specification

B.2.5 Uncertainty Summary

The effect of uncertainty on the outcome of the assessment is not considered to be significant.