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Dear Sofie

Amenity Hub Condensers, Kendrick Hall, 4 Crown Place, Reading RG1 5AE Noise Survey & Plant Noise Assessment

The installation of new mechanical services plant, in the form of 2No. condensers, is proposed to the rear of the Amenity Hub development at Homes for Students' Hendrick Hall scheme in Reading. The Local Authority, Reading Borough Council, requires an assessment of the proposed plant. Blackbird Acoustics have been appointed by ROK Planning to undertake an environmental noise survey at the site to establish the prevailing background noise levels and assess any required mitigation measures to the proposed plant to ensure the noise emissions from the proposed plant are in line with the LA's requirements. This report details the findings of the noise surveying and provides an assessment of the proposed plant.

Environmental Noise Surveying

Blackbird Acoustics attended site to undertake environmental noise surveying of the otherwise prevailing background noise levels at site. Noise monitoring was carried out over an approximate 24hr period from 11:30 hours on Thursday 5th to 10:50 hours on Friday 6th October 2023.

The survey was undertaken in general accordance with BS 7445 and the ANC's Environmental Noise Measurement Guide. Weather conditions throughout the survey were conducive with obtaining representative noise measurements, being generally dry with light winds. The measurements were made using a Type 1 sound level meter, Norsonic AS Nor140, which was calibrated both prior to and on completion of the surveying, with no significant calibration drift observed. Calibration details available upon request.

Measurements were undertaken at one free-field monitoring position, located behind the existing Marquee on the exact same site as the proposed Amenity Hub, so as to represent the nearest existing residential receptors, being the student bedrooms of Blocks on either side and No. 5 Kendrick Road on the other side of a 3m high brickwork wall to the rear, as indicated on the below site plan.



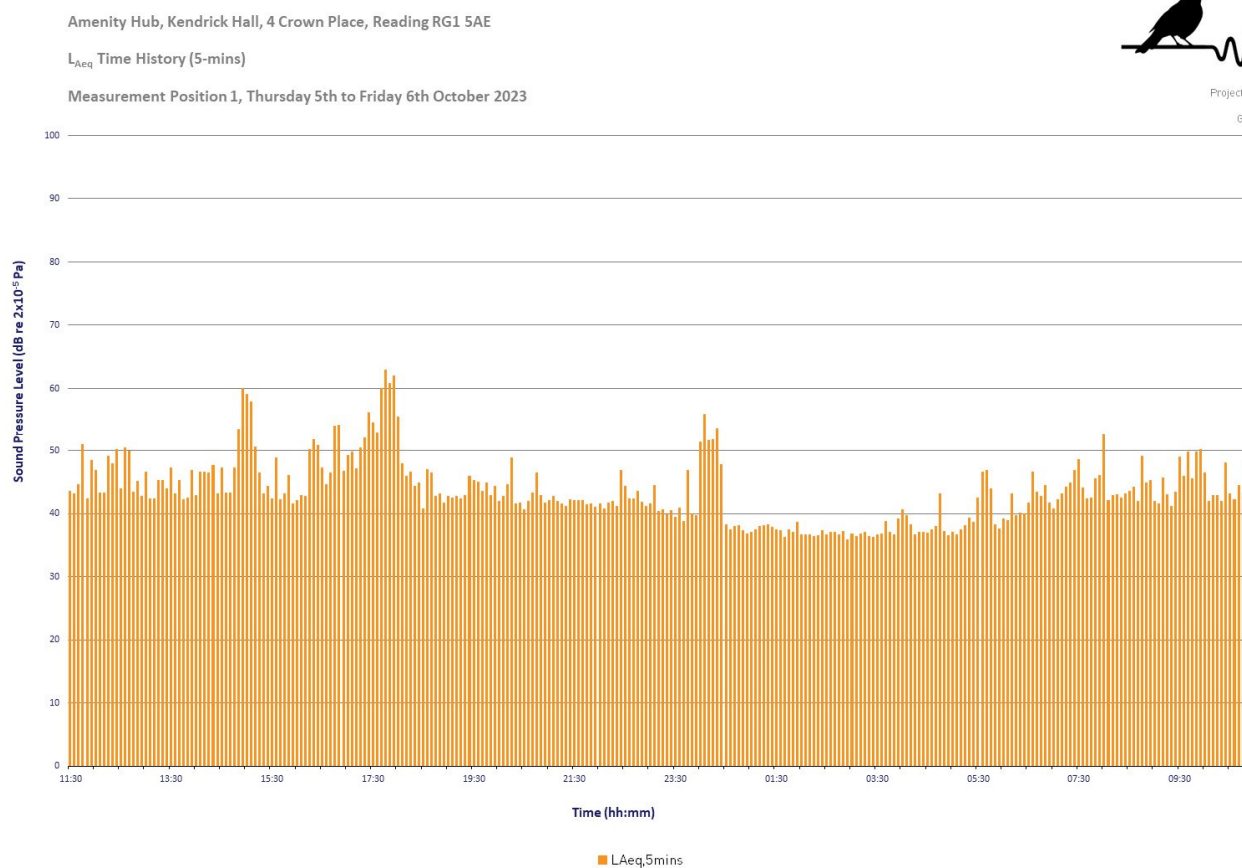
Photos of the measurement location are illustrated below:



No. 5 Kendrick Road

Monitoring Location

The following time-history graphs indicate the measured noise levels at the survey position.



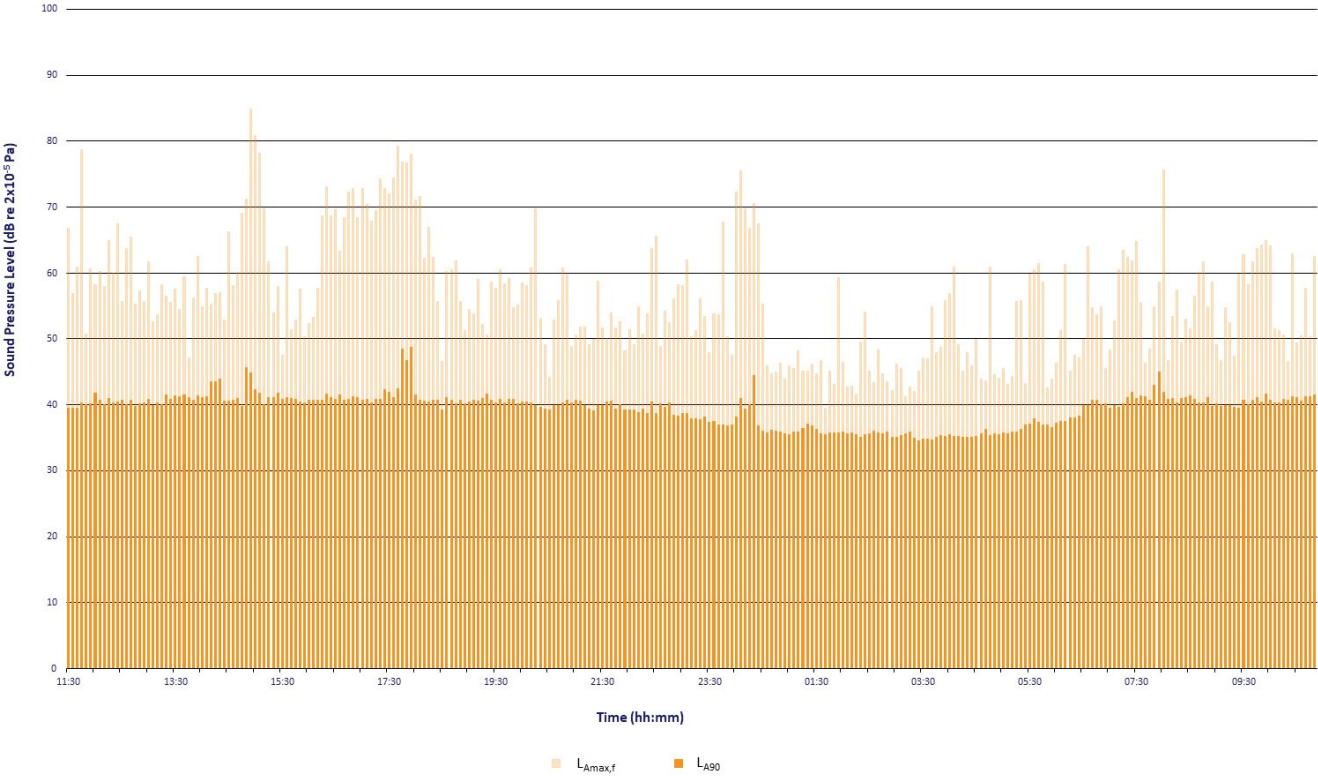
Amenity Hub, Kendrick Hall, 4 Crown Place, Reading RG1 5AE

L_{Amax,f} and L_{A90} Time History (5-mins)

Measurement Position 1, Thursday 5th to Friday 6th October 2023



Project: 2066
Graph 2



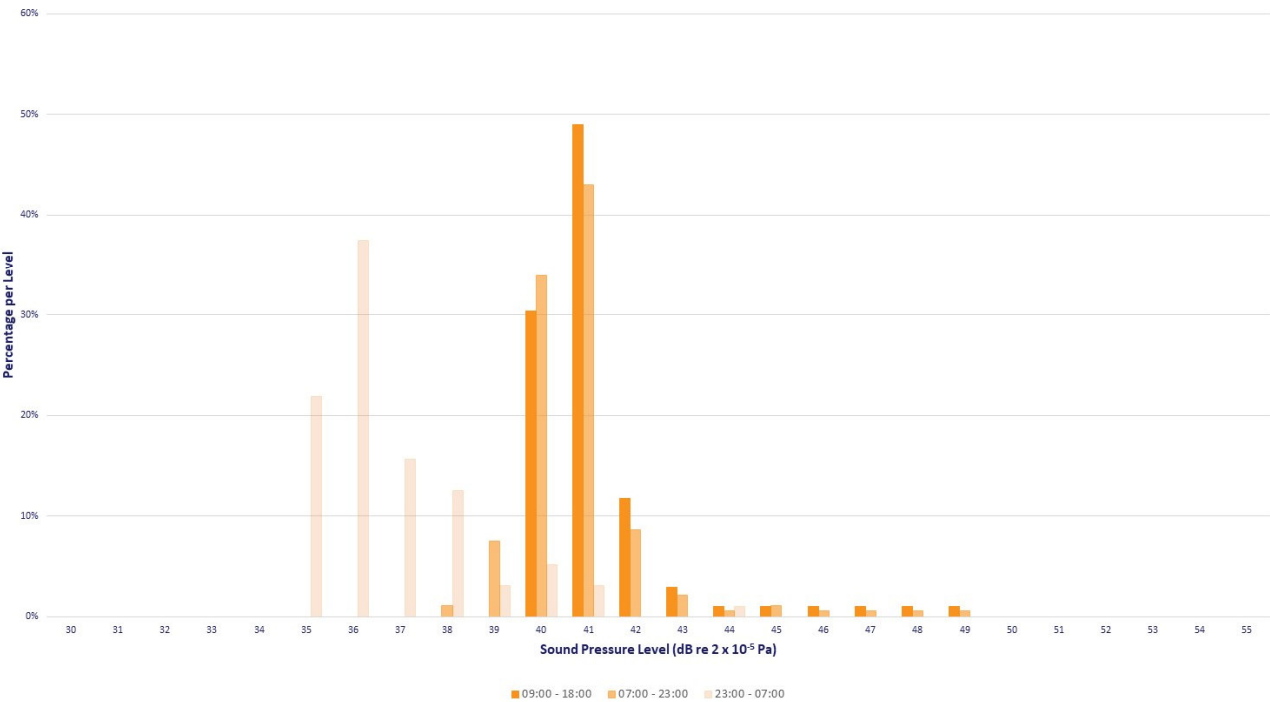
Amenity Hub, Kendrick Hall, 4 Crown Place, Reading RG1 5AE

L_{A90,5 minutes} Histogram

Measurement Position 1, Thursday 5th to Friday 6th October 2023



Project: 2065
Graph 3



A summary of the measured noise levels is as follows:

Table 1 – Summary of Measured Noise Levels

Measurement Period	Position 1	
	Typical Lowest $L_{A90,5min}$ (dB)	Period-Averaged L_{Aeq} (dB)
Office Hours (09:00 – 18:00 hours)	40	51.6
Daytime (07:00 – 23:00 hours)	40	48.7
Night-time (23:00 – 07:00 hours)	35	43.1

“Typical-Lowest” Background Levels

When considering the existing background levels at a site, BS 4142:2014 “*Methods for Rating and Assessing Industrial and Commercial Sound*” recommends assessing to the “typical” measured $L_{A90, 15mins}$ background levels, BS 4142:2014 goes on to state:

In using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods.

BS 4142:2014 suggests that statistical analysis is a suitable method to determine the “typical” background level. This can be carried out by calculating the level of the most-commonly occurring $L_{A90, 15mins}$ period during the proposed operating hours of equipment.

We generally consider that designing to the most-commonly occurring $L_{A90, 15mins}$ period is not sufficient during those slightly quieter periods. In our opinion, a more representative value would be the “typical-lowest” level, which can be determined statistically as the lowest rounded $L_{A90, 15mins}$ level which occurs for at least 10% of the assessment period.

The “typical-lowest” background noise levels ($L_{A90, 5mins}$) at the measurement position are therefore summarised in the Table 1 above, based upon the L_{A90} histograms in Graph 3 above. This data can be used to set plant noise emission criteria for use in the assessment of noise emissions from the proposed plant at the development.

Plant Noise Emission Criteria

It is understood air conditioning condensers are proposed as part of this application. Suitable plant noise emission criteria have therefore been stated in the below sections, to which the condensers can be designed.

Local Authority Requirements

It is understood the Local Authority, Reading Borough Council (RBC), request that plant noise emissions shall ideally be -10dB below the background noise levels at the nearest noise sensitive receptor. The following is understood to be RBC’s standard planning condition wording, taken from EN17 of their Local Plan:

“Where noise generating equipment is proposed, the noise source specific level (plant noise level) should be at least 10dBA below the existing background level as measured at the nearest noise sensitive receptor.”

To this end, it is proposed to design plant noise emissions from the proposed plant to a level -10dB below the background noise levels at the nearest noise sensitive receptors. Table 2 below sets out the criteria based upon the survey data in Table 1.

Table 2 – Mechanical Plant Noise Criteria

Operational Period	Atmospheric Plant Noise Emission Limit at Nearest Existing Noise Sensitive Receptor (dBA)
Office Hours (09:00 – 18:00 hours)	30
Daytime (07:00 – 23:00 hours)	30
Night-time (23:00 – 07:00 hours)	25

In line with BS 4142:2014+A1:2019, should the proposed plant be identified as having intermittent or tonal characteristics, a further penalty should be subtracted from any of the above proposed noise emission limits.

Low Background Noise Levels

However, due to the low background noise levels present on site, this results in very low criteria being formulated. We suggest that imposing a noise emission limit as low as 25-30dBA is both; unnecessary to achieve acceptable conditions at the nearest existing noise-sensitive properties, and unenforceable with regard to the ability of normal (Class 1) instrumentation to measure the noise contribution of new plant.

The current version of BS 4142:2014+A1:2019 states:

“Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.”

In addition, Section 1 of the ‘old’ version of BS4142:1997 stated:

“The method is not suitable for assessing the noise measured inside buildings or when the background and rating noise levels are both very low...For the purposes of the standard, background noise levels below about 30dB...are considered to be very low.”

BS 4142:2014 ‘Methods for rating and assessing industrial and commercial sound’ states, “Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.”

Therefore, designing the plant to meet the otherwise prevailing background noise levels would result in an “indication of having a low impact”.

Under such circumstances, we propose a criterion that mechanical services be designed so that noise emissions from the plant *meet* the background. Notwithstanding this, all reasonable efforts will be made to reduce noise levels as much as is reasonably practicable to try and at least achieve -5dB below background, i.e. 35dBA daytime.

Proposed Criterion

It is therefore proposed to design plant to a level of **40dBA** at the nearest receptors. This would *meet* the background noise level during the daytime, which is therefore “an indication of the specific sound source having a low impact.”. Based on the sound reduction given by a partially open window, as outlined in BS 8233:2014, internal noise levels are anticipated to be approximately 15dB lower than external noise levels, which would mean that resultant internal noise levels would still easily comply with guidance values as per BS 8233 (5dB below in fact).

Atmospheric Emissions Assessment

Proposed Plant

It is understood 2No. air-conditioning external condensers are proposed to the rear of the Amenity Hub, which may operate 24-7 but most likely daytime hours only, to provide cooling. The units are out of sight from the surrounding buildings, tucked behind the amenity hub to offer screening to the nearest existing receptors.

The 2No. units are proposed to comprise Mitsubishi SUZ-M25VA units, for which the manufacturer's datasheet states:

Sound Pressure Level (SPL) – Cooling Mode – 'Rated' – 45dBA @ 1m

Sound Pressure Level (SPL) – Heating Mode – 'Rated' – 46dBA @ 1m

Sound Power Level (SWL) – Cooling Mode – 59dB

These units are very quiet, domestic type models. Suitably selected mitigation measures can be procured, *as required*, in order to meet the above stated project criteria. The mitigation may be in the form of an attenuation package or kit, which typically achieves circa 5-8dB reduction with inlet and outlet attenuators. Alternatively, a full acoustic enclosure can typically achieve circa 12dB reduction. Night setback modes are usually available on most inverter driven units, and these can reduce source noise levels by around at least 3-5dBA, depending on the manufacturer and unit model.

Nearest Receptors

Three nearest receptors have been identified, as follows:

R1 – Existing Student Rooms in Block B to the North, approx. 7m from the condensers currently proposed location.

R2 – Existing Student Rooms in Block D to the South, approx. 23m from the condensers.

R3 – No. 5 Kendrick Road to the West, other side of 3m high boundary wall, approx. 12m from the condensers.

Noise levels from the proposed condenser units to No. 5 Kendrick Road would be subject to barrier screening effects from the existing boundary wall, which will help to reduce the noise experienced at the receptor R3.

Assessment Methodology

Calculations have been made to assess the proposed condensing units to the nearest Receptors, accounting for:

- Source Term (SPL) [a typical spectrum has been assumed from a similar unit]
- 20LogR Distance attenuation
- Screening losses (boundary wall)
- Directivity losses
- Reflection corrections
- Insertion losses of attenuators, louvres or kits (*if applicable/required*)

Table 3 below indicates an example calculation to Receptor R1 (Block B), which is considered worst case due to the limited distance and screening losses afforded to this location, as compared to the other Receptors R2 & R3.

Table 3 – Example Calculation of Condenser Units to R1 Receptor (worst case)

Parameter	Octave-band Noise Level (dB) at Octave-band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Typical Sound Pressure Level at 1m	58	51	45	44	40	37	32	31	46
2off	3	3	3	3	3	3	3	3	-
Distance Loss @ 7m	-17	-17	-17	-17	-17	-17	-17	-17	-
Screening Losses	0	0	0	0	0	0	0	0	-
Directivity (0° / 90°)	-5	-5	-5	-5	-5	-5	-5	-5	-
Reflection Corrections (boundary wall)	5	5	5	5	5	5	5	5	-
Resultant Noise Level at Receiver	44	37	31	30	26	23	18	17	32

Table 4 below indicates the calculation to Receptor R2 (Block D), as follows:

Table 4 – Example Calculation of Condenser Units to R2 Receptor

Parameter	Octave-band Noise Level (dB) at Octave-band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Typical Sound Pressure Level at 1m	58	51	45	44	40	37	32	31	46
2off	3	3	3	3	3	3	3	3	-
Distance Loss @ 23m	-27	-27	-27	-27	-27	-27	-27	-27	-
Screening Losses	0	0	0	0	0	0	0	0	-
Directivity (0° / 90°)	-5	-5	-5	-5	-5	-5	-5	-5	-
Reflection Corrections (boundary wall)	5	5	5	5	5	5	5	5	-
Resultant Noise Level at Receiver	34	27	21	20	16	13	8	7	22

Table 5 below indicates the calculation to Receptor R3 (5 Kendrick Road), as follows:

Table 5 – Example Calculation of Condenser Units to R3 Receptor (Top Floor – Worst Case)

Parameter	Octave-band Noise Level (dB) at Octave-band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Typical Sound Pressure Level at 1m	58	51	45	44	40	37	32	31	46
2off	3	3	3	3	3	3	3	3	-
Distance Loss @ 12m	-22	-22	-22	-22	-22	-22	-22	-22	-
Screening Losses (Boundary Wall – Grazing)	-5	-4.9	-4.8	-4.6	-4.2	-3.2	-0.7	0	-
Directivity (0° / 0°)	0	0	0	0	0	0	0	0	-
Reflection Corrections (boundary wall)	5	5	5	5	5	5	5	5	-
Resultant Noise Level at Receiver	39	32	26	25	22	20	17	17	28

The predicted resultant noise levels at the Receptors are therefore summarised as follows:

R1 – 32dBA

R2 – 22dBA

R3 – 28dBA

If the units were re-located at least 2 to 3m more towards the centre of the proposed building (i.e. move them South), this would increase the distance losses to Receptor R1 sufficiently in order to reduce the resultant noise levels at Block B down to below 30dBA.

It should also be noted that the source noise levels assumed in the calculations are based upon 100% duty, so during the night-time operation (if needed) or once the Hub space has “got down to temperature”, it is likely the units will ramp down and tick over at a reduced duty (inverter driven) and thus noise levels will be correspondingly lower too (typically 3-5dB reduction), meaning the criteria should be more comfortably met.

The predicted resultant noise levels stated above easily comply with the suggest project criterion of 40dBA, but in fact, meet the Local Authority’s daytime criteria (30dBA), as stated in Table 2 above, providing:

- The proposed units are moved slightly further South, so they’re approximately in the centre of the rear façade of the proposed Amenity Hub – predicted level would then be 25dBA at both Student blocks.
- The units have their ‘low noise’ or ‘night setback’ mode enabled, *if* they are to operate during the night-time period, or preferably turn off by timer for the night-time.

In addition to controlling the atmospheric and roomside noise transfer of the units, it is also important to consider the transfer of noise as vibration to any sensitive areas within the proposed buildings. To this end, it is advised the items of plant be mounted on suitable anti-vibration mountings, i.e. Neoprene-in-shear mounts with minimum static deflection of 6mm, off the rear wall of the Hub.

We trust the above is clear and of assistance, but should you have any queries, please do not hesitate to contact the undersigned.

Yours sincerely,
For Blackbird Acoustics Limited



Alex J Wyatt
Director