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**READING BC CIVIC CENTRE LIBRARY
PLANT NOISE ASSESSMENT**

Technical Report: R10061-2 Rev 1

Date: 23rd November 2023

For: HCC Property Services
C/o Mace Ltd
155 Moorgate
London
EC2M 6XB

24 Acoustics Document Control Sheet

Project Title: Reading BC Civic Centre Library – Plant Noise Assessment

Report Ref: R10061-2 Rev 1

Date: 23rd November 2023

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For and on behalf of 24 Acoustics Ltd				

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0	Approved for issue	Andre Pires	Chris McConnell	Stephen Gosling
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1.0 INTRODUCTION

- 1.1 24 Acoustics Ltd has been instructed by Mace Ltd, on behalf of HCC Property Services, to undertake an assessment of noise from proposed roof mounted plant at Reading Borough Council Civic Centre, as part of the relocation of the central library.
- 1.2 This report presents the results of the assessment, following site visits and a background noise survey undertaken between 14th and 22nd September 2023.
- 1.3 All sound pressure levels quoted in this report are in dB relative to 20 μ Pa. A glossary of the acoustic terminology used in this report is provided in Appendix A.

2.0 SITE DESCRIPTION

- 2.1 The site is located at Reading Borough Council's Civic Centre , which currently comprises a 3-storey office building with a reception open area on the ground floor. The site is located west of Bridge Street in Reading city centre. Residential properties are located west and south of the site and The Oracle Centre shopping centre is located to the east.
- 2.2 An aerial view of the site and the noise measurement location is shown in Figure 1.
- 2.3 It is proposed to replace the two existing roof mounted chillers with 6No. air source heat pumps that will provide cooling and heating to the building. Figure 2 Shows the proposed plant location.
- 2.4 The nearest residential properties to the proposed plant are as shown in Figure 1 and summarised below:
- Riverside House, located approximately 65 m south to the proposed roof plant;
 - 20 Simmond Street approximately 40 m west from the proposed roof plant;
 - 54 Maltings Place approximately 50 m west from the proposed roof plant.
- 2.5 It is understood that the proposed plant will operate over 24 hours . This assessment will consider the specific noise level of all plant against the daytime (07:00 to 23:00 hours) and night-time (23:00 to 07:00 hours) background noise levels.

3.0 RELEVANT CRITERIA

BS 4142:2014 Methods for Rating Industrial and Commercial Sound

- 3.1 BS 4142:2014 [Reference 1] provides a method for rating the effects of industrial and commercial sound on residential receptors.
- 3.2 The standard advocates a comparison between the representative measured L_{A90} background noise level and L_{Aeq} noise level from the source being considered. For rating purposes if the noise source is tonal, intermittent or otherwise distinctive in character, a rating correction should be applied.
- 3.3 The standard states that a difference between the rating level and the background level of around +10 dBA is an indication of a significant adverse impact, depending on the context and a difference of around +5 dBA is likely to be an indication of an adverse impact, also depending on the context. Where the rating level does not exceed the background noise level, this is an indication of the specific sound source having a low impact (depending upon the context).
- 3.4 BS 4142 requires the noise impact to be assessed depending on the context. In relation to situations where background noise levels are low, the standard 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."

Local Authority Criteria

- 3.5 Reading Borough Council's Local Plan, 2019 [Reference 2] states the following in Policy EN17: Noise Generating Equipment:

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

4.0 NOISE MEASUREMENTS

Background Noise Survey

- 4.1 A noise survey was undertaken between 14th and the 22nd September 2023 to assess the existing background noise levels, using the following equipment:
- Rion precision sound level meter Type NL-52
 - Brüel & Kjær acoustic calibrator Type 4231
- 4.2 The noise monitoring equipment was located on the roof of the building roof at a height of 1.5m above roof level.
- 4.3 Measurements were undertaken in samples of 5 minutes in terms of the overall free-field A-weighted L_{eq} , L_{90} and $L_{max,f}$ noise levels. Measurements were made in accordance with BS 7445:1991 "Description and measurement of environmental noise Part 2 - Acquisition of data pertinent to land use" [Reference 3].
- 4.4 The instrumentations' calibration was checked before and after the survey in accordance with the manufacturer's instructions. No significant drift in calibration was recorded. Calibration of 24 Acoustics' equipment is traceable to National Standards.
- 4.5 The instrumentation was fitted with environmental weather shields during the surveys. Weather conditions during the surveys were variable with periods of strong wind and rainfall. Measurements affected by adverse meteorological conditions have been removed from the assessment.
- 4.6 The results of the background noise surveys are shown graphically in Appendix B and are summarised in Table 1 in terms of the typical background noise level.

Date (March 2023)	Typical Background Noise Level	
	Daytime dB LA90, 1 Hour (07:00 - 23:00)	Night-Time dB LA90,15 min (23:00 - 07:00)
Thursday 14/9/2023	*52	39
Friday 15/9/2023	51	42
Saturday 16/9/2023	47	42
Sunday 17/9/2023	45	40
Monday 18/9/2023	53	41
Tuesday 19/9/2023	54	41
Wednesday 20/9/2023	54	41
Thursday 21/9/2023	52	40
Representative Level	46	41

Table 1: Summary of Measured Noise Levels (* = incomplete period)

- 4.7 The results show that the weekday daytime noise levels were affected by noise from existing plant on the building. It is understood that the plant was off during the weekend and night-time periods. The results from the weekend period have therefore been used to determine the representative daytime background noise level.

5.0 PLANT NOISE ASSESSMENT

Plant Noise Data

- 5.1 It is proposed to replace the two existing chiller units with six modern Mitsubishi E series air source heat pumps. The proposed plant layout and location is shown in Figure 2.
- 5.2 The manufacturer's sound power level data for the proposed Mitsubishi E 1800 YCL-N is 85 dBA sound power level per unit.
- 5.3 Initial calculations identified the need for noise mitigation during night-time hours. It is understood that the plant will be limited to run at 50% capacity during night-time hours (23:00 – 07:00), with a reduced sound power level of 75 dBA per unit as confirmed by Mitsubishi.
- 5.4 All the residential receptors will benefit from significant acoustic screening from the roof plant, provided by the roof edge.

Assessment

- 5.5 Calculations have been undertaken to determine the level of noise from the proposed plant at the nearest noise sensitive windows including corrections for distance, reflections and screening. The plant is not expected to exhibit tonal or temporal characteristics that would be distinguishable at the nearest noise sensitive receptors. The calculations have included for the reduced noise output during night-time hours.
- 5.6 The calculated cumulative noise levels from the proposed plant are described in Tables 2 to 4.

	Riverside House	
	Daytime (07:00 to 23:00 hours)	Night-Time (23:00 to 07:00 hours)
Background Noise Level	46 dB LA90,1 hour	41 dB LA90,15 min
Plant Noise Level	36 dB LAeq, 1 hour	27 dB LAeq, 15 min
Level Difference	-10 dBA	-14 dBA

Table 2: Plant Noise Assessment at Riverside House.

	20 Simmond Street	
	Daytime (07:00 to 23:00 hours)	Night-Time (23:00 to 07:00 hours)
Background Noise Level	46 dB LA90,1 hour	41 dB LA90,15 min
Plant Noise Level	36 dB LAeq, 1 hour	27 dB LAeq, 15 min
Level Difference	-10 dBA	-14 dBA

Table 3: Plant Noise Assessment at 20 Simmond Street.

	54 Maltings Place	
	Daytime (07:00 to 23:00 hours)	Night-Time (23:00 to 07:00 hours)
Background Noise Level	46 dB LA90,1 hour	41 dB LA90,15 min
Plant Noise Level	34 dB LAeq, 1 hour	25 dB LAeq, 15 min
Level Difference	-12 dBA	-16 dBA

Table 4: Assessments at 54 Maltings Place.

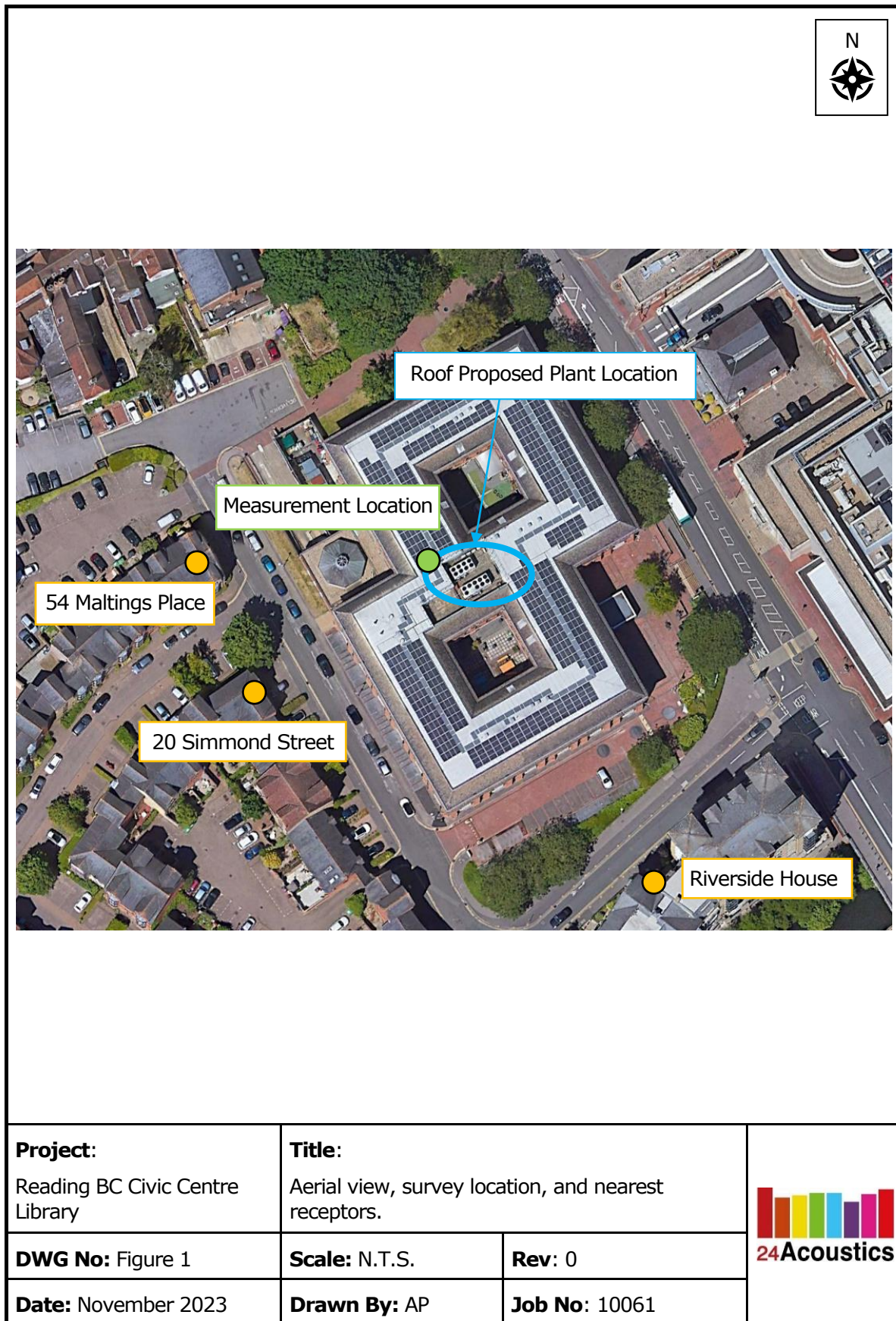
- 5.7 The above assessment demonstrates that plant noise levels will achieve Reading Borough Council's plant noise criteria of 10dB below the background noise level during the daytime and night time periods.

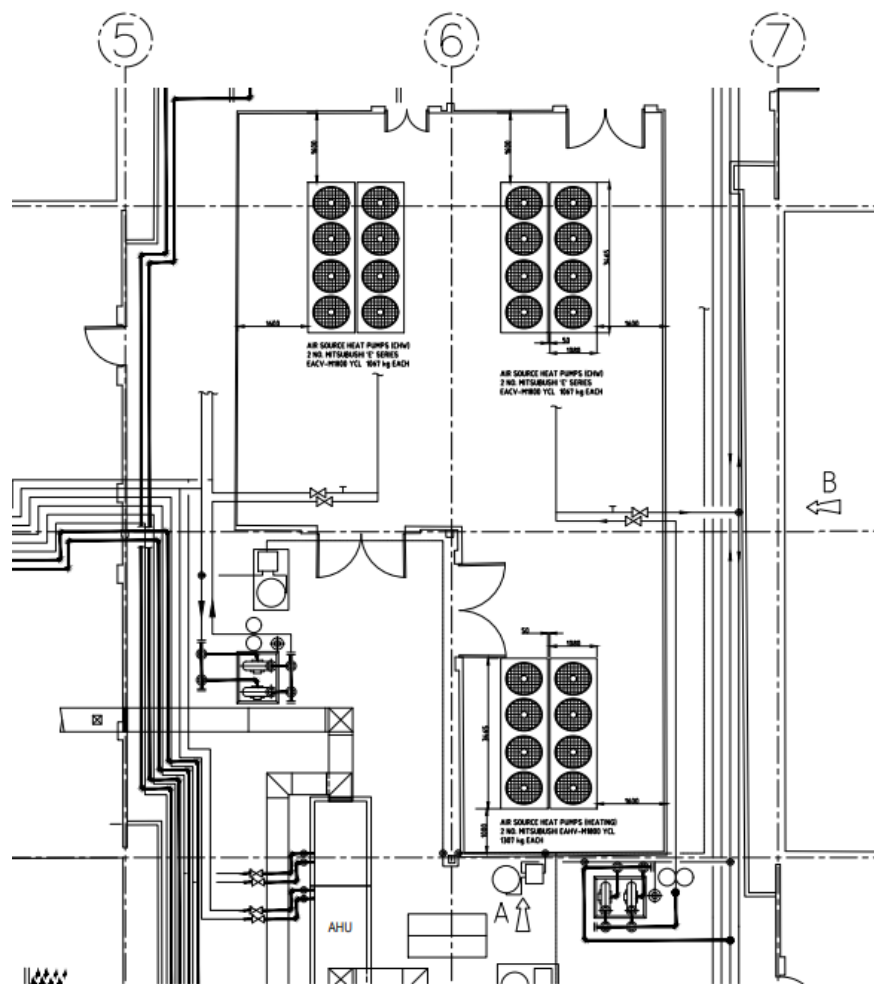
6.0 CONCLUSIONS

- 6.1 24 Acoustics Ltd has been instructed by Mace Ltd to undertake a plant noise assessment of noise from proposed roof mounted plant at at Reading Borough Council Civic Centre, as part of the relocation of the central library
- 6.2 An environmental noise survey has been undertaken to determine the existing background noise levels representative of nearby residential properties.
- 6.3 Calculations have been undertaken, based on manufacturer's noise data, to determine the plant noise levels at the nearest noise sensitive windows.
- 6.4 The assessment has included for plant noise mitigation, in the form of reduced operating capacity during night-time hours.
- 6.5 The assessment demonstrates that noise from proposed new plant at the nearest affected noise sensitive windows will meet Reading Borough Council's plant noise criteria during daytime and night-time periods.

REFERENCES

1. British Standards Institution. British Standard 4142:2014. Methods for Rating Industrial and Commercial Sound, 2014.
2. Reading Borough Council's Local Plan, November 2019.
3. British Standards Institution. British Standard 7445:1991 Description and measurement of environmental noise Part 2 - Acquisition of data pertinent to land use, 1991.





Project: Reading BC Civic Centre Library	Title: Proposed Plant Location		 24Acoustics
DWG No: Figure 2	Scale: N.T.S.	Rev: 0	
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APPENDIX A – ACOUSTIC TERMINOLOGY

Noise is defined as unwanted sound. The range of audible sound is from 0 to 140 dB. The frequency response of the ear is usually taken to be around 18 Hz (number of oscillations per second) to 18000 Hz. The ear does not respond equally to different frequencies at the same level. It is more sensitive in the mid-frequency range than the lower and higher frequencies and because of this, the low and high frequency components of a sound are reduced in importance by applying a weighting (filtering) circuit to the noise measuring instrument. The weighting which is most widely used and which correlates best with subjective response to noise is the dBA weighting. This is an internationally accepted standard for noise measurements.

For variable sources, such as traffic, a difference of 3 dB is just distinguishable. In addition, a doubling of traffic flow will increase the overall noise by 3 dB. The 'loudness' of a noise is a purely subjective parameter, but it is generally accepted that an increase/ decrease of 10 dB corresponds to a doubling/ halving in perceived loudness.

External noise levels are rarely steady, but rise and fall according to activities within an area. In attempt to produce a figure that relates this variable noise level to subjective response, a number of noise indices have been developed. These include:

i) The L_{Amax} noise level

This is the maximum noise level recorded over the measurement period.

ii) The L_{Aeq} noise level

This is "equivalent continuous A-weighted sound pressure level, in decibels" and is defined in British Standard BS 7445 as the "value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time interval, T, has the same mean square sound pressure as a sound under consideration whose level varies with time".

It is a unit commonly used to describe construction noise and noise from industrial premises and is the most suitable unit for the description of other forms of environmental noise. In more straightforward terms, it is a measure of energy within the varying noise.

iii) The L_{A10} noise level

This is the noise level that is exceeded for 10% of the measurement period and gives an indication of the noisier levels. It is a unit that has been used over many years for the measurement and assessment of road traffic noise.

iv) The L_{A90} noise level

This is the noise level that is exceeded for 90% of the measurement period and gives an indication of the noise level during the quieter periods. It is often referred to as the background noise level and is used in the assessment of disturbance from industrial noise.

APPENDIX B – AMBIENT NOISE SURVEY RESULTS

