

Technical Memorandum

Project : Waitrose Caversham
Date : 7 October 2022
Ref : EC19529-1
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TITLE : Plant Noise Impact Assessment

This Technical Memorandum presents the results of a noise impact assessment of new and replacement external refrigeration plant proposed to serve the existing Waitrose & Partners store located at 51 Church Street, Reading RG4 8AY. This new plant is to be located at roof level within the existing plant area of the store, as indicated in Figure 1 below.

The plant noise impact at the closest and most affected noise sensitive receptors to the proposed new plant location has been assessed against historic background noise data we have for the site and current British Standards and World Health Organisation guidance.

Table 1 presents the published details for the proposed new dry air cooler that is to replace a total of 4 No existing refrigeration condensers on the roof with the existing plant being decommissioned and removed.

Unit	Model	Published Noise Emissions, dB(A)
Dry Air Cooler (DAC)	Clade ASL-ZAP-EC266-ECMP-450-H	38 dB(A) @ 10m

Table 1: Proposed plant including manufacturer's published noise data.

The proposed new replacement DAC will operate on a 24-hour basis.

A copy of the proposed new plant layout and plant details has been included in Appendix A for reference.

The following aerial view of the store and surroundings has been annotated showing the proposed new plant locations as well as the nearest identified noise sensitive receivers. The site is immediately bound by the following:

- North: Church Street roadway and commercial and residential properties beyond;
- East: Mixed commercial and residential dwellings along Church Street;
- South: Store car parking; and
- West: Store car parking and other commercial units.





Figure 1: Aerial view of the site and surroundings.

The nearest and most affected existing residential receivers will be those of Archway House approximately 70m to the east of the proposed plant location. Whilst the dwelling at first floor level of Church House is closer to the plant location it is also significantly lower than the roof of the Waitrose store and therefore benefits from significant acoustic screening provided by the roof edge of the store. The top floor dwellings of Archway House are at an equivalent level as the proposed plant and therefore does not benefit from any significant acoustic screening.

All other noise sensitive receptors are at a greater distance from the proposed plant or are protected by greater level of screening from intervening structures and so will be subject to lower levels of noise.

Table 2 below presents a summary of the resultant noise levels from the proposed new plant at this identified nearest noise sensitive receiver.

Item	Noise Level	Notes
New DACs	38 dB(A) @ 10m	Sound Pressure Level at 10m
Spherical distance losses from 10m to 70	- 17 dB	Distance to nearest windows
Resulting Noise Level	21 dB(A)	Archway House

Table 2: Plant Noise Calculation

A resultant noise level of 21 dB(A) has been calculated at the nearest, most affected windows of Archway House.

The calculated noise levels are based on the full-load duty for the plant and should be viewed as the worst-case scenario.

World Health Organisation's (WHO) 'Night Noise Guidelines for Europe – 2009' includes guidance on the effects of external night-time noise on the population's health. Table 5.4 of that document outlines the health effects associated with different external average, yearly night time (23:00 – 07:00) noise levels based on levels outside of bedroom windows ($L_{night,outside}$). For external noise levels up to 30dB(A), although individual sensitivities and circumstances may vary, no substantial biological effects are observed. Thus, 30dB(A) is equivalent to the No Observed Effect level (NOEL) for night noise.

The report further states that an external noise level of 40 dB(A) or below is equivalent to the lowest observable adverse effect level (LOAEL).

Based on the calculated worst-case resultant noise levels at Archway House from the proposed plant will be considerably below 30 dB(A) during all periods, and as such can be considered as achieving the NOEL.

BS8233:2014, 'Guidance on sound insulation and noise reduction for buildings', section 7 gives guidance on acoustic criteria and noise levels appropriate for various internal spaces that have different functions. Section 7.7 relates specifically to buildings having a residential purpose and offers guidance on appropriate internal ambient noise levels for dwellings (when unoccupied) with specific consideration:

- for bedrooms, the acoustic effect on sleep; and
- for other rooms, the acoustic effect on resting, listening and communicating.

The guidance applies to external noise as it affects the internal acoustic environment from sources without a specific character.

Table 4 of section 7.7.2 recommends the following internal noise limits based on the presence of steady, external noise sources:

Table 4 Indoor ambient noise levels for dwellings

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	—
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	—
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

The guidance criteria are based upon research and existing guidelines provided by the World Health Organisation.

It is generally considered that the sound insulation provided by a partially open window will be 15dB, dependent on window type, extent of opening and source frequency content.

Table 3 presents the noise levels that could be expected within the dwellings against the relevant daytime and night time BS 8233 design criteria. We have presented the summary based on the most affected receptors. A minimal loss of 15dB could be expected for noise passing through a partially open window.

Period	Condition	Calculated $L_{Aeq,1\text{hour}}$ external	Minimum sound reduction loss	Resultant internal ambient noise level	BS8233 Design Criterion
Daytime	Windows Open	21 dB	15dB	6 dB(A) $L_{eq,15\text{ minutes}}$	35dB(A) $L_{eq,16\text{ hour}}$
Night time	Windows Open	21 dB	15dB	6 dB(A) $L_{eq,15\text{ minutes}}$	30dB(A) $L_{eq,8\text{ hour}}$

**Table 8.5: Calculated Worst Case Internal Ambient Noise levels
within worst affected dwellings of Archway House**

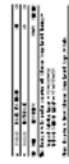
The resultant internal noise levels from the worst case operation of the DAC plant is significantly below the design guidelines within BS8233 and therefore unlikely to result in any adverse impact. The absolute levels are of such a low magnitude that they would be expected to have a negligible impact within the dwellings even with the windows open.

On the basis of this worst-case assessment, the calculations indicate that levels would be below the NOEL at the nearest existing residential dwellings. It is therefore considered that noise should not pose a material constraint to the operation of the proposed plant at Waitrose Caversham.

APPENDIX A

SITE PLANS AND PROPOSED PLANT LAYOUTS

quietly moving forward



WAITROSE
& PARTNERS

VAN TROSE
CAVERSHAM

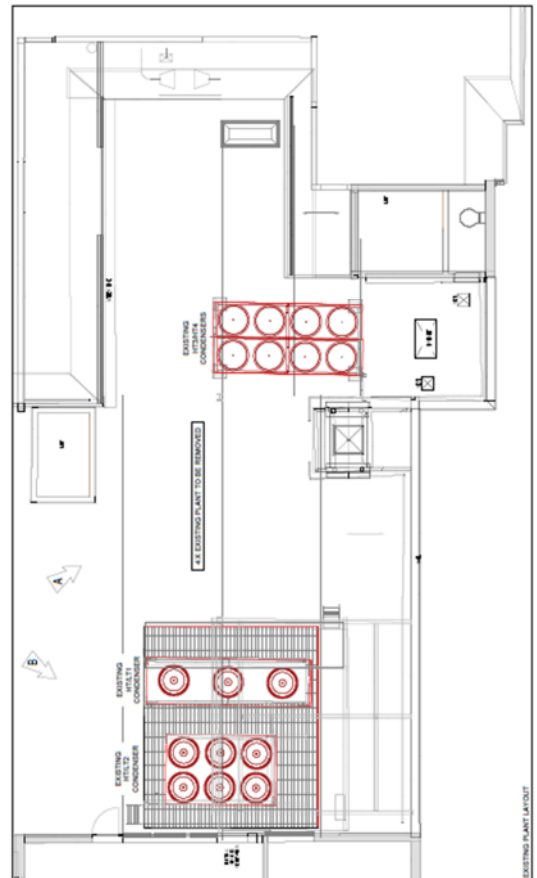
PROPOSED ROOF LEVEL
REFRIGERATION PLANT



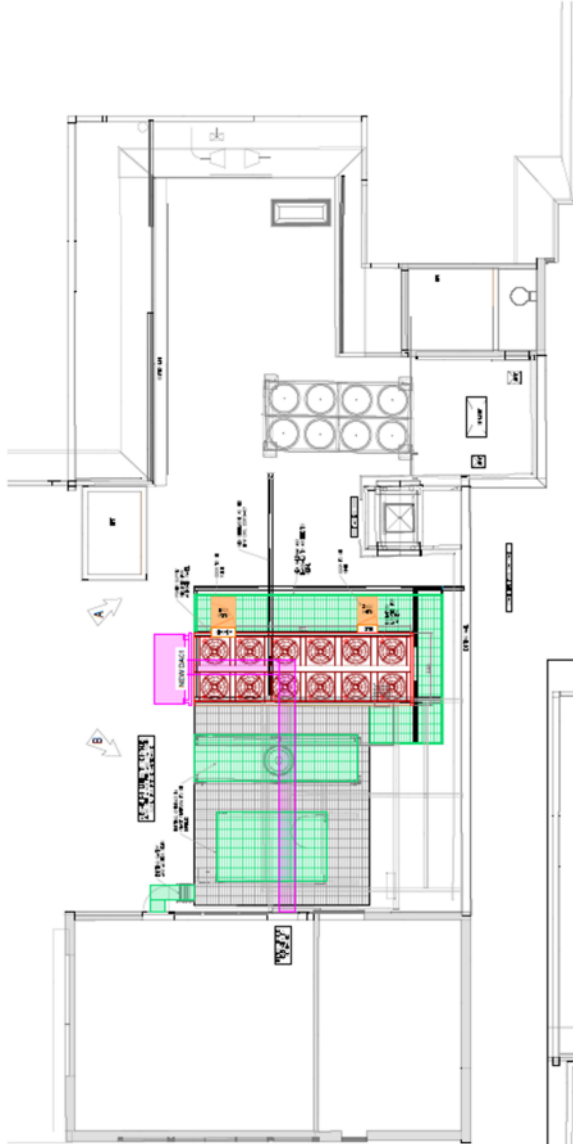
Oaksmere

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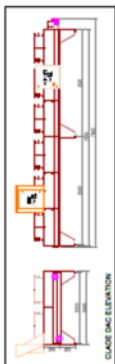
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EXISTING PLANT LAYOUT



SHORT AIR COOLER SELECTION									
UNIT TYPE	WATER FLOW (GPM)	WATER TEMP. (°F)	AIR TEMP. (°F)	WATER PRESS. (PSI)	WATER SPECIFIC HEAT (BTU/LB-°F)	WATER DENSITY (LB/FT ³)	WATER VISCOSITY (CENTISTOKE)	WATER PUMP HEAD (FT)	WATER PUMP POWER (HP)
1000	100	70	85	10	1.0	62.4	1.0	10	0.1
2000	200	70	85	10	1.0	62.4	1.0	10	0.1
3000	300	70	85	10	1.0	62.4	1.0	10	0.1
4000	400	70	85	10	1.0	62.4	1.0	10	0.1
5000	500	70	85	10	1.0	62.4	1.0	10	0.1
6000	600	70	85	10	1.0	62.4	1.0	10	0.1
7000	700	70	85	10	1.0	62.4	1.0	10	0.1
8000	800	70	85	10	1.0	62.4	1.0	10	0.1
9000	900	70	85	10	1.0	62.4	1.0	10	0.1
10000	1000	70	85	10	1.0	62.4	1.0	10	0.1

[illegible]