

ATELIER CRESCENDO

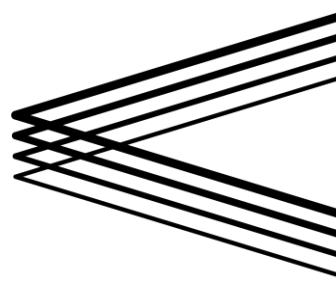
**MANCHESTER UNIVERSITY HOSPITAL NHS FOUNDATION
TRUST**

**CDC NORTH SPOKE CASE,
HARPURHEY**

**PLANT NOISE IMPACT ASSESSMENT REPORT
REVISION A**

16/04/2024





<i>Document Version</i>	<i>Date</i>	<i>Author</i>	<i>Comments</i>
A	16/04/2024	Marc Fuzellier-Hart	-

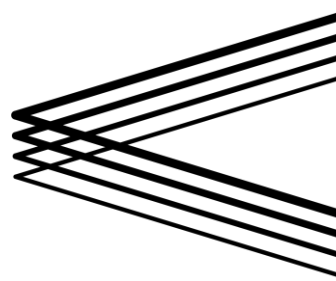
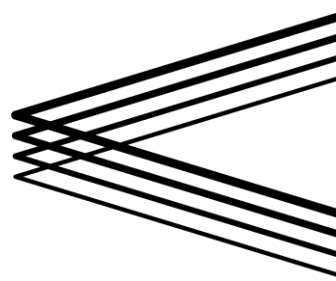


TABLE OF CONTENTS

1	Executive Summary	3
2	Site Description and Proposals	4
2.1	Location	4
2.2	Site Description	4
2.3	Proposals.....	5
3	Legislation and Guidelines.....	7
3.1	Local Authority Requirements	7
3.2	British Standard 4142 - Method for Rating and Assessing Industrial and Commercial Sound 7	
4	Background Noise Survey	9
4.1	Measurement Location.....	9
4.2	Measurement Equipment.....	10
4.3	Survey Results	11
4.4	Meteorological Conditions	12
4.5	Discussion of Noise Climate.....	13
5	Plant Noise Assessment.....	14
5.1	Overview	14
5.2	Proposals.....	14
5.3	Plant Noise Emission Limits	15
5.4	Plant Noise Calculations.....	16
5.5	Conclusion.....	17

Appendix A – Acoustic Terminology

Appendix B – Plant Noise Data



1 EXECUTIVE SUMMARY

A new Cardio Respiratory unit is proposed at ground floor level of the existing North City Family and Fitness Centre in Harpurhey, Manchester.

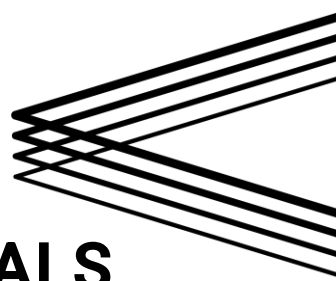
As part of the proposals, new ventilation and cooling/heating systems are proposed.

Therefore, Atelier Crescendo have been appointed to undertake a plant noise impact assessment the new systems may have on the nearest residential properties to the east and the north of the site.

A fully automated background noise survey has been carried out to establish the existing background noise levels at the nearest residential properties.

Following the review of the proposals and calculations, the assessment shows that the noise levels (presented in Table 5) generated by the ventilation and cooling/heating systems proposed at ground floor level are lower than the plant noise emission limits (presented in Table 4) and therefore achieve the requirements set by the Local Authority.

Detailed calculations are available upon request.



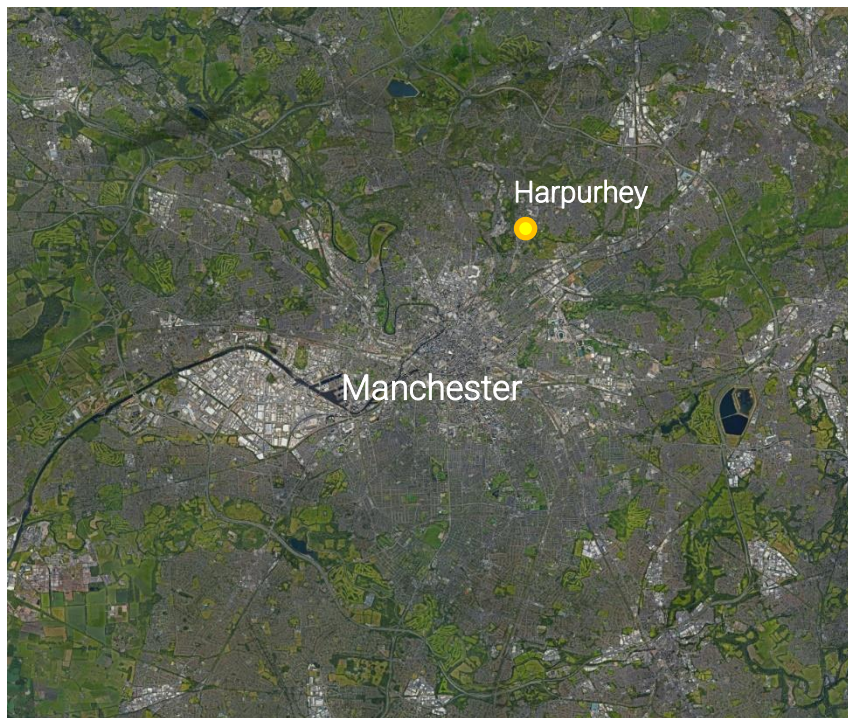
2 SITE DESCRIPTION AND PROPOSALS

2.1 LOCATION

The site is located in Harpurhey and falls within the jurisdiction of Manchester City Council.

The approximate site location is indicated on Figure 1 below.

Figure 1 - Approximate site location (in yellow)



(Imagery ©2024 Google, Airbus, Imagery ©2024 Map Data ©2024 Google.)

2.2 SITE DESCRIPTION

North City Family and Fitness Centre is located within the commercial district of Harpurhey. It is surrounded by a large car park to the west and the north, North City shopping centre and a LIDL store to the south, Upper Conran Street to the east and Moston Lane to the north.

The nearest noise sensitive receptors are residential properties located across Moston Lane to the north of the site and across Upper Conran Street to the east.

Figure 2 below presents a plan of the site.

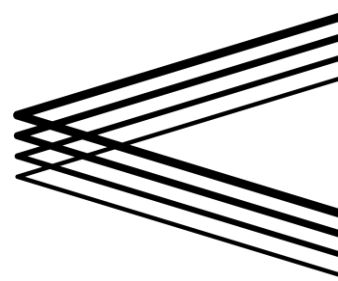


Figure 2 - Site description



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2.3 PROPOSALS

A new Community Diagnostic Centre is proposed with:

- > a new Cardio Respiratory Unit, at ground floor level, within North City Family & Fitness Centre. This unit will mostly include a number of exam/consultation rooms.
- > a new Community Diagnostic Centre to the north of the existing car park. This unit will include two MRI scanner rooms.

Figure 3 below shows the location of each unit.

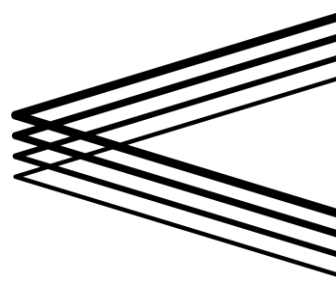
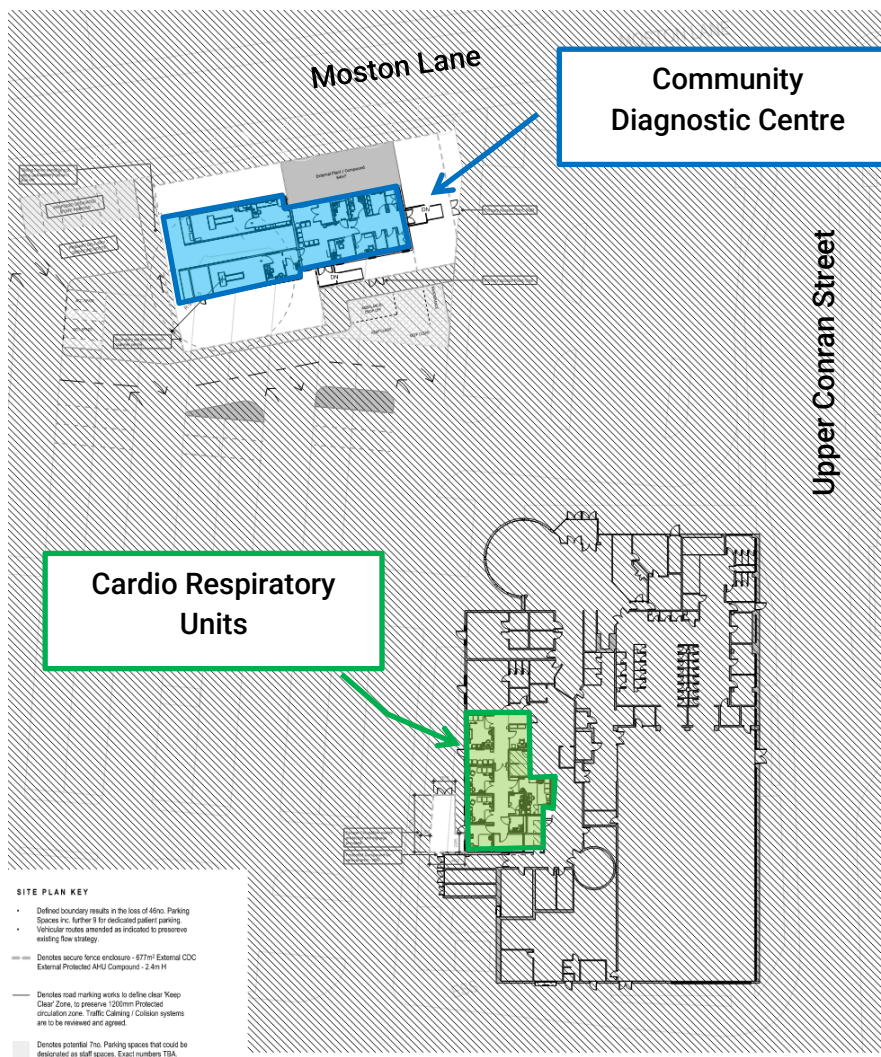
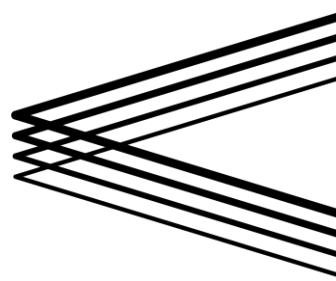


Figure 3 – Location of proposed CDC and Cardio Respiratory units



The Cardio Respiratory Unit is proposed to be mechanically ventilated with dedicated Air Handling Units and cooled/heated with dedicated heat pumps.



3 LEGISLATION AND GUIDELINES

3.1 LOCAL AUTHORITY REQUIREMENTS

The site falls within the jurisdiction of Manchester City Council.

Plant noise requirements are set in Planning & Noise – Technical Guidance (June 2022), issued by Manchester City Council, as follows:

“Noise from fixed plant, equipment or machinery can be very annoying and disruptive to people living nearby particularly where that item involved emits a noise with impulsive or tonal characteristics.

Many of the complaints Environmental Health receive about noise from plant, equipment and machinery specifically concern the character of the noise emitted. Any noise assessment needs to consider not only the overall level of noise emitted, but also its particular characteristics. The noise assessment should be based on BS 4142, and any application for fixed plant, equipment or machinery must demonstrate that:

*‘Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of **5dB (LAeq) below the typical background (LA90)** level at the nearest noise sensitive location’.*

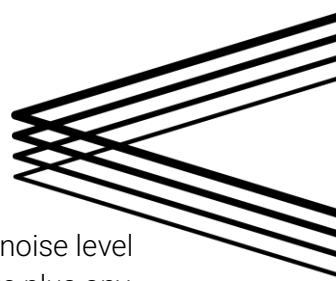
*By designing the sound pressure level of any plant items to generate a noise impact of at **least 5dB below the existing background level**, any plant noise impact should be of a negligible level which should not give rise to complaints from users or occupiers of existing noise-sensitive usages. See Appendix A with regards to the expectation of how to calculate a ‘typical’ background level.*

Past experience has shown that this criterion can be readily achieved. Where available, product specification data for new items should be submitted with the acoustic report.

Consultants should be using these to compare with data from the noise survey and propose mitigation where the levels are above those specified in the criterion. Where this information is not available a consultant may choose to measure the noise, levels generated by the equipment in question where the equipment has already been installed elsewhere (and in accordance with BS 4142).”

3.2 BRITISH STANDARD 4142 - METHOD FOR RATING AND ASSESSING INDUSTRIAL AND COMMERCIAL SOUND

BS 4142:2014 describes methods for rating and assessing the effects of outdoor sound levels, of an industrial and/or a commercial nature, “on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident”.



The impact of a specific sound is indicated by subtracting the existing background noise level from the rating level (i.e. noise level from the proposed items of plant/machinery/etc plus any acoustic feature corrections).

The standard states that:

- > “a difference of around +10dB or more is likely to be an indication of a significant adverse impact”;
- > “a difference of around +5dB is of marginal significance is likely to be an indication of an 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”.

The noise from the current redevelopment is expressed in terms of a rating level and given as a $L_{Aeq, T}$ noise level. The existing background noise level is expressed in terms of a $L_{A90, T}$ noise level.

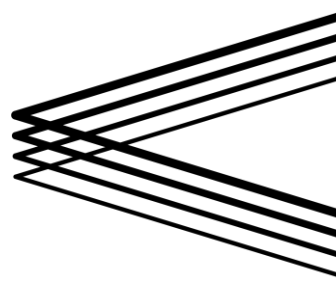
T is the assessment time interval, 1 hour for operations during day time (07:00 – 23:00) and 15-minutes for operations during night-time hours (23:00 to 07:00 hours).

BS 4142:2014 states that if a noise source contains an ‘acoustic feature’, such as tonality, intermittency or impulsiveness, a penalty should be applied.

A penalty of between 0 dB and +6 dB can be applied for tonality, and the standard states, *“Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible”.*

A penalty of up to +9dB can be applied for impulsivity, and the standard states. *“Subjectively, this can be converted to a penalty of +3 dB for impulsivity which is just perceptible at the noise receptor, +6dB where it is clearly perceptible, and +9 dB where it is highly perceptible”.*

A penalty of +3dB can be applied for intermittency, and the standard states: *“When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. This can necessitate measuring the specific sound over a number of shorter sampling periods that are in combination less than the reference time interval in total, and then calculating the specific sound level for the reference time interval allowing for time when the specific sound is not present. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.”*



4 BACKGROUND NOISE SURVEY

A background noise survey was undertaken from Wednesday 12 July until Thursday 13 July 2023, during daytime (07:00 – 23:00) and night-time (23:00 – 07:00) periods, to determine the representative background noise levels around the site and inform the assessment of the noise generated by the new plant and other fixed noise generating machinery.

The survey consisted of a manned and unmanned measurements.

This Chapter summarises the survey methodology and the results.

4.1 MEASUREMENT LOCATION

The noise level measurements were undertaken at two locations as described in the Table 1 below and shown on Figure 4 below.

Table 1 - Description of the measurement locations

Measurement Location	Description
1	The sound level meter was located to the north of the existing car park, along Moston Lane. The microphone was positioned at approximately 1.5 m above the ground level. This location was selected to obtain the worst case (i.e. during high traffic periods, between 08:00 and 10:00 hours) incident noise levels on the façades of the proposed CDC unit. At this location, the measurements were manned.
2	The sound level meter was located to the west of North City Family and Fitness Centre. The microphone was positioned at approximately 1.5 m above the ground level. This location was selected to obtain the incident noise levels on the façades of the proposed Cardio Respiratory unit. At this location, the measurements were unmanned.

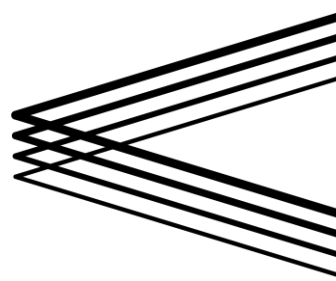


Figure 4 - Noise measurement locations

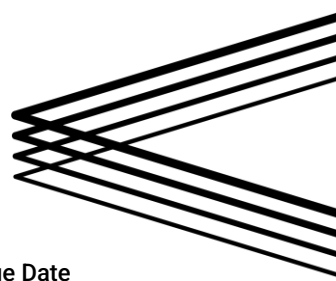


4.2 MEASUREMENT EQUIPMENT

The Table 2 below presents the details of the instrumentation used to undertake the measurements.

Table 2 - Details of measurement instrumentation

Equipment	Manufacturer & Model	Serial Number	Calibration Due Date
Sound level meter	Svantek Type 971a	133607	20/02/2024
Pre-amplifier	Svantek SV 18A	103491	



<i>Equipment</i>	<i>Manufacturer & Model</i>	<i>Serial Number</i>	<i>Calibration Due Date</i>
<i>Microphone</i>	Svantek Type 7152	85914	
<i>Calibrator</i>	Svantek SV33B	139040	23/02/2024

At both measurement locations, the sound level meter was located in an environmental case with the microphone connected to the sound level meter via an extension cable. The microphone was fitted with a Svantek windshield.

The equipment was calibrated prior to and on completion of the survey. No significant deviations occurred (no more than 0.1 dB).

4.3 SURVEY RESULTS

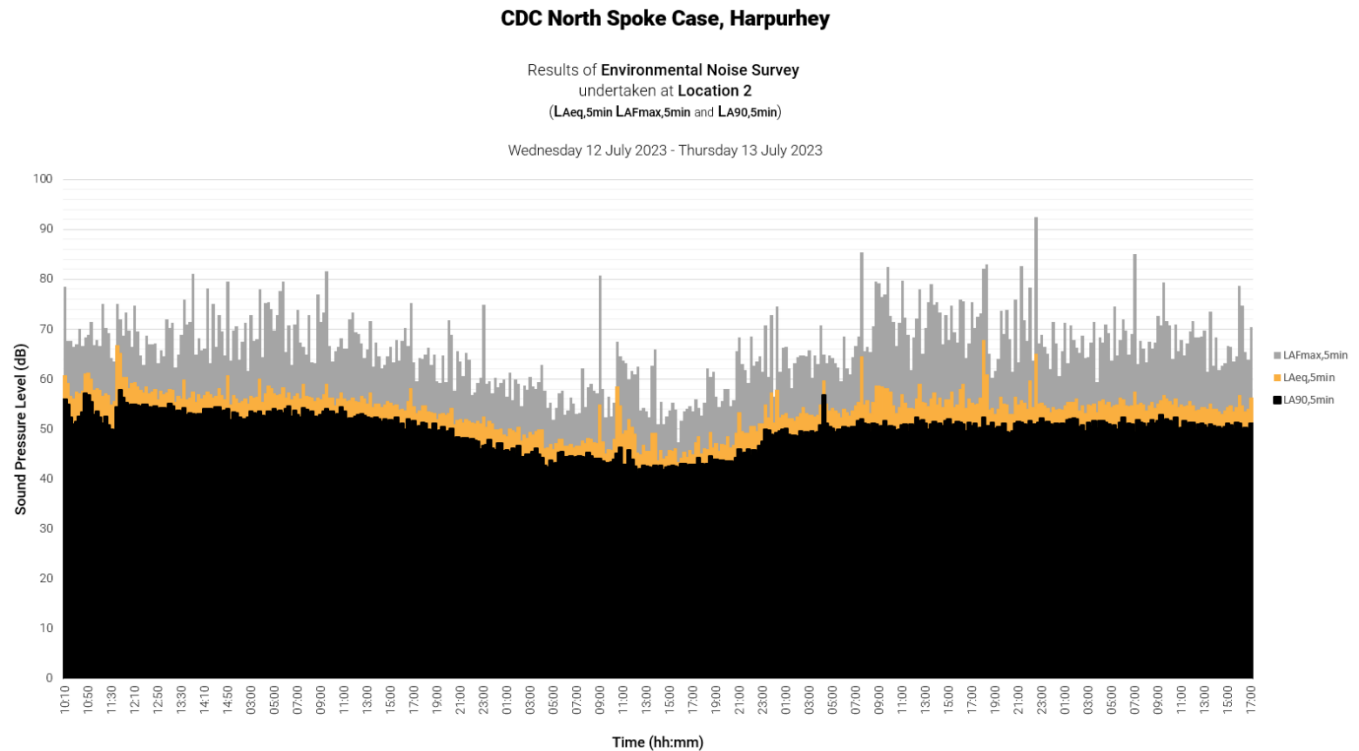
For the purpose of the assessment, Table 3 below details the lowest background noise levels measured during daytime (09:00–19:00), evening time (19:00–23:00) and night-time (23:00–00:00) periods.

Table 3 - Results of background noise survey

<i>Measurement Location</i>	<i>Time period</i>	Minimum Background Noise Levels <i>L</i> _{A90,T} (T=1 hour for daytime and 15 min for night-time periods)
1	Daytime (08:00 – 10:00)	52 dB
	Daytime (07:00 – 23:00)	50 dB
2	Evening time (19:00 – 23:00)	46 dB
	Night-time (23:00 – 07:00)	43 dB

Figure 5 below presents a time history graph with the 5-minute A-weighted (dBA) L_{90} , L_{eq} and $L_{max,f}$ measured throughout the duration of the survey undertaken at Location 2.

Figure 5 - Time history graph



4.4 METEOROLOGICAL CONDITIONS

For the first 30 minutes of the manned measurements at location 1, light rain was experienced and the road was wet. Therefore, noise levels measured during this period were discounted from the assessment. After this period, no rain was experienced, the wind speeds were perceived to be below 5 m/s and the ground was identified to be dry under foot.

For the measurements at location 2, due to the nature of the survey, i.e. unmanned, it is not possible to accurately comment on the weather conditions throughout the entire duration of the survey.

At the beginning and the end of the unmanned measurements at location 1, the weather conditions during the noise survey were noted to be dry and the sky was clear. The wind speeds perceived to be below 5 m/s. The ground was identified to be dry under foot.

The local temperature was recorded as approximately 20°C during the day and approximately 10°C during the night.

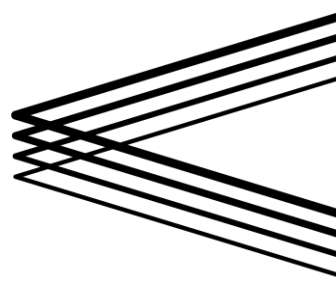
These conditions were considered conducive for undertaking accurate and reliable environmental noise measurements around the site.



Note: Rainfalls were recorded during short periods across the unmanned measurements. Therefore, noise levels measured during these periods were discounted from the assessment.

4.5 DISCUSSION OF NOISE CLIMATE

During attendance, the site was noted to be moderately loud and the dominant noise source was noted to be traffic on the surrounding road network, especially on Morton Lane (to the north) and Upper Conran Street (to the east), and the car park (to the west).



5 PLANT NOISE ASSESSMENT

5.1 OVERVIEW

As discussed in Section 2.3, new ventilation and cooling/heating systems are proposed to service the new Cardio Respiratory Unit and will be located at ground floor level.

Therefore, this section presents a detailed noise impact assessment of the new systems on the nearest residential properties.

5.2 PROPOSALS

A number of plant are proposed to be installed at ground floor level, near the new Cardio Respiratory Unit. They include:

- > **1 new Air Handling Units** located at approximately 58 metres from the nearest residential properties to the east approximately 118 metres from the nearest residential properties to the north;
- > **4 new Air Source Heat Pumps** located at 58 metres from the nearest residential properties to the east approximately 118 metres from the nearest residential properties to the north;

The location of each element is shown on Figure 6 below.

The maximum sound power or pressure levels of the proposed equipment are presented in Appendix B.

The proposed operation of Cardio Respiratory unit is between 09:00 and 18:00 hours. Therefore, the plant are likely to be operated during this time period as well.

It is understood that all other plant or equipment installed externally will be quiet.

Condensers

AHU

Exact pipe routes TBC on site

22mm LTHW F&R BRANCH OFF TO SERVE FROST COIL

28mm LTHW F&R BRANCH OFF TO SERVE RE-HEAT COIL

MITSUBISHI PKA-MTKA2 WALL MOUNTED AC UNIT

Room labels: R.B.00.101 Entrance Lobby, R.B.00.102 Entrance / Circulation, R.B.00.103 Waiting Area / Exercise Circulation, R.B.00.301 Exam room 1 - Radiography and Ophthalmology, R.B.00.302 Exam room 2 - Cardiology and Optimalmetry, R.B.00.303 Exam room 3 - Respiratory and Optimalmetry, R.B.00.304 Distribution, R.B.00.305 Acc. WC, R.B.00.306 Brew, R.B.00.307 Exam room 5 - Cardiology Echo, R.B.00.308 Saloon / Cleaners, R.B.00.309 Consumables, R.B.00.310 Office, R.B.00.311 Reception.

Equipment labels: RP-01, RP-02, RP-03, RP-04, RP-05, RP-06, RP-07, RP-08, RP-09, RP-10.

As discussed in Section 3.1, noise generated by new equipment associated with the development should be controlled so that it is no greater than 5 dB below the prevailing background noise levels at the nearest noise sensitive properties.

CDC North Spoke Case, Harpurhey
Plant Noise Impact Assessment Report – Revision A

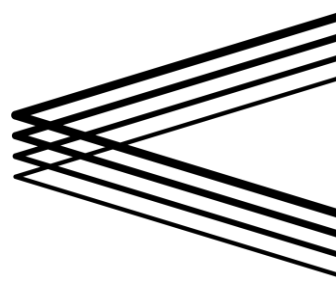


Table 4 – Plant Noise Emission Limits

<i>Time period</i>	Plant Noise Emission Limits (to be achieved at 1m from any noise sensitive window) $L_{Ar,Tr}^*$
Daytime (09:00 – 19:00)	45 dB
Evening time (19:00 – 23:00)	41 dB
Night-time (23:00 – 07:00)	38 dB

* T_r =1hour for daytime and evening time periods; T =15min for night-time period

5.4 PLANT NOISE CALCULATIONS

Based on the proposals presented in Section 5.2, calculations have been undertaken to predict the plant noise emission levels at the nearest residential properties to the north and east of the site.

For the calculations, it has been assumed that the plant can be operated continuously over minimum 1 hour.

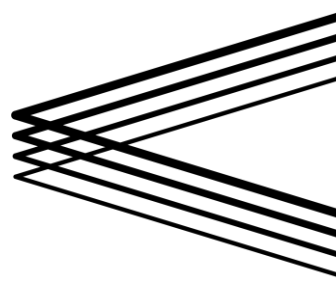
The calculations consider distance, directivity and screening losses.

In line with BS 4142:2014 methodology, the noise from all the plant has been assessed to be free from tonality or irregularity.

Table 5 below presents the results of the calculations. Details of the calculations are available upon request.

Table 5 – Plant Noise Emission Levels at the nearest residential properties to the north and east of the site

<i>Receptor</i>	Worst-case Plant Noise Emission Levels (at 1m from any noise sensitive window) $L_{Ar,1hr/15min}$
Residential properties to the north	27 dB
Residential properties to the east	28 dB



5.5 CONCLUSION

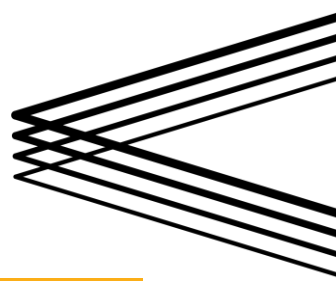
The calculated plant noise emission level, presented in Table 5, is lower than the plant noise emission limits presented in Table 4.

In conclusion, the noise levels from the new ventilation and cooling/heating systems, proposed at ground floor level for the new Cardio Respiratory Unit are likely to achieve the Local Authority's requirements and, therefore, unlikely to cause any adverse impact on the nearest residential properties.

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APPENDIX A

ACOUSTIC TERMINOLOGY

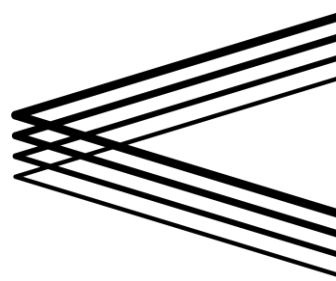


<i>Terminology</i>	<i>Description</i>
<i>Sound Pressure</i>	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
<i>Decibel (dB)</i>	Used as a measurement of sound pressure level. It is the logarithmic ratio of the noise being assessed to a standard reference level.
<i>A-weighting, dB(A)</i>	The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise, the 'A' weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average human. It is also possible to calculate the 'A' weighted noise level by applying certain corrections to an un-weighted spectrum. The measured or calculated 'A' weighted noise level is known as the dB(A) level. Because of being a logarithmic scale noise levels in dB(A) do not have a linear relationship to each other. For similar noises, a change in noise level of 10dB(A) represents a doubling or halving of subjective loudness. A change of 3dB(A) is just perceptible.
<i>$L_{eq,T}$</i>	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
<i>L_{max}</i>	L_{max} is the maximum sound pressure level recorded over the period stated. L_{max} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the L_{eq} noise level.
<i>L_{90}</i>	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time, hence L_{90} is the level exceeded for 90% of the time and as such can be regarded as the background noise level'.
<i>Façade</i>	At a distance of 1m in front of a large sound reflecting object such as a building façade.
<i>Octave Band</i>	Octave Band A range of frequencies whose upper limit is twice the frequency of the lower limit.

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APPENDIX B

PLANT NOISE DATA



AHU reference	Element of AHU		Sound Power Levels (dB) in octave band centre frequency								Broadband dBA
			63	125	250	500	1000	2000	4000	8000	
AHU01 TW-IHP	Supply	Inlet (outdoor)	81	82	89	81	75	72	67	61	69
		Outlet (supply)	80	80	89	80	81	77	72	65	87
	Extract	Inlet (extract)	76	77	84	76	70	67	62	56	69
		Outlet (exhaust)	75	75	84	75	76	72	67	60	82
	Surrounding (assumed at 3m)		90	76	82	72	76	68	66	59	-

Pant reference	Mode	Sound Pressure Levels (dB), at 1 m, in octave band centre frequency								Broadband dBA
		63	125	250	500	1000	2000	4000	8000	
PUZ- WM112YAA	Heating mode	54	57	46	44	42	35	32	27	47
	Cooling mode	54	56	48	48	43	40	34	27	49
PUZ- ZM140YKA	Heating mode	63	55	53	50	57	52	37	30	52
	Cooling mode	53	55	50	48	45	41	35	37	50