



KIER PROPERTY

ELIZABETH STREET, CHEETHAM HILL

NOISE IMPACT ASSESSMENT FOR PLANNING PURPOSES

20 April 2022

AEC REPORT: P4528/R1b/AGB

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DOCUMENT STATUS

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Revision	Date	Document Details	Author	Checked By
--	14.01.22	First Issue	AGB	WSK
a	17.04.22	Updated to consider comments from the Local Authority	AGB	WSK
b	20.04.22	Updated to clarify use of roller shutter doors	AGB	--

1.0 INTRODUCTION

- 1.1 Acoustic and Engineering Consultants Limited (AEC) has been instructed by Kier Property to undertake a noise impact assessment in relation to a new mixed use commercial development, on Elizabeth Street, Cheetham Hill. The assessment is to be submitted at part of the planning application for the development.
- 1.2 This report presents details of the on-site noise measurements undertaken by AEC, identifies the potential noise sources associated with the development and presents an assessment of the noise potentially impacting on the nearest residential properties, with reference to appropriate guidance.
- 1.3 The planning application is for use of the units 24 hours per day 7 days per week with no restrictions on servicing hours. The report investigates the potential impact of such use.
- 1.4 Acoustic terminology used throughout this report is described in brief in Appendix A.

2.0 SITE AND DEVELOPMENT DESCRIPTION

- 2.1 The development site is located off Elizabeth Street, Cheetham Hill, as identified by the red border on Figure 3.1, below.
- 2.2 As identified on Figure 3.1, the site is surrounded on most sides by existing commercial buildings including light industrial and warehouse units, which act as a buffer in terms of acoustics.
- 2.3 The nearest residential receiver to the site is a block of flats forming part of St Davids Court, located directly to the northwest corner of the site, as identified by the orange border on Figure 3.1, below. Other residential receivers include existing properties on Queens Road (the A6010) further north than Elizabeth Street. There are no residential properties close to the site towards the south or east.
- 2.4 The site is accessed from the north directly off Elizabeth Street. Existing warehouses buffer the site from Elizabeth Street. Directly opposite the site are four retail units with associated car parking.
- 2.5 The proposed development will incorporate 9 light industrial/warehouse units of varying sizes with associated car parking as identified on the attached Figure A. The buildings to the north will form a significant barrier in terms of potential noise impacting on the nearest residential properties in St David's Court.
- 2.6 The main noise associated with the development will be delivery noise and noise from potential mechanical services plant. There is no heavy industry associated with the development and, as such, internal noise break-out is not considered to be an issue, although this element is discussed further below.

- 3.2 All measurements were undertaken in accordance with guidance presented in BS 4142:2014 'Methods for rating and assessing industrial and commercial sound'. Full details of the measurement procedure are attached as Appendix B with the measured data presented in table B1 of Appendix B.
- 3.3 In summary, the background noise levels affecting St Davids Court were approximately:
- 43dBL_{A90, 15min} during the night-time (early morning from 04:30h);
 - 53dBL_{A90, 1 hour} after 08:00h on a weekday;
 - 49dBL_{A90, 1 hour} during the weekday evening;
 - 50dBL_{A90, 1 hour} during a Sunday morning.

4.0 ASSESSMENT METHODOLOGY

National Planning Policy Framework

- 4.1 The latest Planning Policies are included in the National Planning Policy Framework (NPPF) published by the Department for Communities and Local Government in March 2012 and last updated in June 2021. This document provides a framework for local planning authorities and decision makers when drawing up plans for housing and other development.
- 4.2 The planning policies which relate specifically to noise are presented in paragraphs 170, 180 and 182 which are reproduced below:

'170. Planning policies and decisions should contribute to and enhance the natural and local environment 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.....'*

180. 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;*
- b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.*

182. 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.

- 4.3 Further to the above, the Governments 'Planning Practice Guidance' published on 29 November 2016 and updated on 24 May 2021 states:

‘Noise needs to be considered when development may create additional noise, or would be sensitive to the prevailing acoustic environment (including any anticipated changes to that environment from activities that are permitted but not yet commenced). When preparing plans, or taking decisions about new development, there may also be opportunities to make improvements to the acoustic environment. Good acoustic design needs to be considered early in the planning process to ensure that the most appropriate and cost-effective solutions are identified from the outset.’

- 4.4 In addition, with regard to the potential for noise to override other planning concerns, the Planning Practice Guidance states:

It can, but neither the Noise Policy Statement for England nor the National Planning Policy Framework (which reflects the Noise Policy Statement) expects noise to be considered in isolation, separately from the economic, social and other environmental dimensions of proposed development.

- 4.5 When considering the acoustic environment in relation to plan-making and decision making, the Planning Practice Guidance states that Local Authorities should take into account:

- whether or not a significant adverse effect is occurring or is likely to occur;
- whether or not an adverse effect is occurring or likely to occur; and
- whether or not a good standard of amenity can be achieved.

- 4.6 The terms ‘significant adverse’ and ‘adverse’ above are referenced to the Noise Policy Statement for England (NPSE), published by Department for Environment, Food and Rural Affairs (DEFRA) dated March 2010. One of the main aims of this policy is also to avoid significant adverse effects on health and quality of life.

- 4.7 With respect to the two terms above, the explanatory note for the NPSE introduces two concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation (WHO). 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.*

Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

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

- 4.8 National Planning Practice Guidance (NPPG), an online resource, brings together the aims of the NPPG and NPSE and tries to indicate how can it be established if noise is likely to be a concern. To assist with this, the guidance presents a noise exposure hierarchy table which is reproduced as Table 4.1 below

Table 4.1: National Planning Policy Guidance - Noise

Response	Examples of Outcome	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 or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived 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 and/or attitude, 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 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 and/or attitude, 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
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g., regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g., auditory and non-auditory	Unacceptable Adverse Effect	Prevent

Manchester City Council

- 4.3 Manchester City Council's (MCC) "*Planning and Noise - Technical Guidance*" document, dated December 2015 provides technical guidance in relation noise related planning issues.
- 4.4 With regard to noise from commercial / industrial developments, MCC states that guidance in BS4142:2014 '*Methods for rating and assessing industrial and commercial sound*' (BS4142) should be used. Details of the guidance are discussed below.

MCC indicates that:

'The development should be designed so as to achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location'.

BS4142: 2014

- 4.5 BS4142 provides methods for rating and assessing industrial and commercial sound by comparing the specific sound level (that directly attributable to the industrial/commercial sound) to the prevailing background sound level ($\text{dBL}_{\text{A90, T}}$) over relevant periods that the commercial/industrial activities occur.
- 4.6 It is necessary to determine the specific sound level from the industrial/commercial activities over a period of one hour during the daytime and/or 15 minutes during the night-time. The specific sound level relates to the specific commercial/industrial sound source only and has to be corrected to take account of other sound sources generally in the area, residual sound. Daytime is normally considered to be over the period 0700 to 2300 hours, and night-time 2300 to 0700 hours.
- 4.7 BS4142, in section 9, identifies that certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where present at the assessment location, such features are taken into account by adding a correction to the specific sound level to obtain the rating level. A correction should be applied if one or more of the following features occur, or are expected to be present for new or modified sound sources:
- Tonality-* for sound ranging from not tonal to prominently tonal a correction of 0 to 6dB should be considered.
- Impulsivity-* A correction of up to 9dB can be applied for sound that is highly impulsive, considering both the rapidity and overall change in sound level.
- Other-* Where a sound features characteristics that are neither tonal nor impulsive but are readily distinctive against the residual environment a penalty of 3dB can be applied.
- Intermittency-* If intermittency is distinctive against the residual environment a penalty of 3dB can be applied.
- 4.8 The significance of the potential impact is indicated by the difference between the background sound level and the rating level. Typically, the greater this difference, the greater the magnitude of the impact.
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
 - A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
 - 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 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.
- 4.9 With regard to undertaking the assessment, BS4142 indicates that the context of the sound must be taken into consideration.
- 4.10 Section 11 of BS4142, indicates that 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. For the purposes of this assessment, it is considered that background noise levels below about 30dB and rating levels below about 35dB are low.

5.0 ASSESSMENT

General

- 5.1 The operational hours of the site are currently undefined. However, for assessment purposes, it is considered that staff could start arriving in some units at around 5 to 6am when there could also be deliveries. In addition, it is assumed that most units would operate during normal business hours although some may operate into the evening. It is assumed that there would be no operations after 9pm and that deliveries would not occur in the evening.
- 5.2 The noise associated with the future site will be due to:
- Car parking;
 - Deliveries;
 - Mechanical plant serving the units;
 - Noise break-out from within the units.

Each of these noise sources are discussed in further detail below.

Noise Levels due to Car Parking Activities

- 5.3 In relation to car parking activities, AEC has previously undertaken measurements demonstrating that a car parking at 10m would typically result in noise exposure levels in the order of 72dBL_{AE}.
- 5.4 Based on the assumption that 15 car movements could occur in a worst-case hourly night-time period, Table 5.1, below, predicts the resultant noise levels at the windows of the properties in St Davids Court, some 70m away from the parking spaces.

Table 5.1 – Anticipated Noise Levels Worst-case Nigh-time Parking Activities

Noise Level @ 10m	15 Vehicles	Correction for 1 hour	Attenuation, dB		Noise Level at Receiver, dBL _{Aeq, 1h}
			Distance	Screening	
72dBL _{AE}	+12dB	-36dB	70m (-17dB)	0dB	31

- 5.5 With reference to the early morning noise levels of around 53dBL_{Aeq, 10min} measured at St Davids Court during the night-time, there would be no increase in ambient noise levels at the properties, even if car parking numbers were significantly higher. Furthermore, it should be noted that the majority of car parking spaces are more than 70m away and will be screened from St Davids Court by existing and proposed buildings.
- 5.6 In terms of maximum noise levels due to car doors being closed, these would typically be no greater than around 72dBL_{Amax, F} at 10m, resulting in maximum noise levels of no greater than 55dBL_{Amax, F} external to St Davids Court. Allowing a 12dB reduction in external to internal noise levels across a window that is open for ventilation purposes, internal maximum noise levels in the apartments would be below 45dBL_{Amax, F} as a result of car doors closing. Furthermore, it should be noted that the majority of car-parking spaces are screened from St Davids Court, meaning the maximum noise levels would be significantly lower.
- 5.7 During the daytime, even it is assumed that there are 45 car movements per hour, the total noise would be below 36dBL_{Aeq, 1 hour} due to car parking and given that ambient noise levels would be no lower than 55dBL_{Aeq, 1 hour}, there would be no increase in ambient noise levels.

- 5.8 Based on the above, it is considered that noise levels due to car parking would have no observed effect and as such would be acceptable.

Delivery Noise

- 5.9 In terms of delivery noise, this has been assessed based on the following noise levels, which AEC has measured in relation to other non-related commercial developments.

Van Delivery

- 5.10 Based on extensive noise level measurements undertaken by, the anticipated 'worst-case' noise levels due to van deliveries are presented in Table 5.2, below.

Table 5.2 – Summary of Measured Noise Levels for Van Loading/Unloading Activities at 10m

Activity	Noise Level at 10m, dB		
	L _{AE}	L _{Aeq}	L _{Amax}
Van manoeuvring	76	-	66-71
Van Idling	-	54	-
Loading / Unloading	-	53	69
Van pass-by	74	-	-

- 5.11 It is assumed that the following activities will occur during the Van loading / unloading process.

- Van enters the site via the eastern entrance.
- Turns drives to any one of the units, travelling at no greater than 15mph;
- Van is unloaded / loaded;
- Engine is switched off during the loading process;
- Van drives off the site via the same route that it entered.

- 5.12 In terms of a worst-case number of deliveries, based on 20 units on site, these are considered to be:

- Night-time, 23:00 to 07:00h 'worst-case' 15-minute period – 4 van deliveries at 4 different units;
- Daytime, 07:00 to 23:00h 'worst-case 1-hour period – 1 van delivery at each of the 8 units.

HGV Delivery

- 5.13 Based on noise level data measured by AEC at a number of different sites in relation to previously undertaken assessments, the noise levels generated during typical HGV delivery activities are presented in Table 5.3, below.

Table 5.3 – Summary of Measured Noise Levels for HGV Loading/Unloading Activities at 10m

Activity	Noise Level at 10m, dB		
	L _{AE}	L _{Aeq}	L _{Amax}
HGV arriving / pass-by	84	-	-
HGV manoeuvring	87	-	72-79
HGV idling	-	63	-
Loading/unloading	-	60	76-81

5.14 The assessment is based on the following HGV delivery process and activities:

- HGV arrives at site and enters via the eastern entrance.
- HGV turns into the service yard and manoeuvres into position to reverse onto the HGV loading bay, travelling at no greater than 10mph (and any bay could be used during the night-time and the daytime);
- HGV is unloaded / loaded;
- HGV is switched off during the loading process;
- HGV drives off the site via the same route.

5.15 It is only the larger units that can accept HGV deliveries and the anticipated number of movements are presented below.

- Night-time, 23:00 to 07:00h 'worst-case' 15-minute period – 2 HGV deliveries at 2 different units;
- Daytime, 07:00 to 23:00h 'worst-case 1-hour period – 5 HGV deliveries at 5 different units.

5.16 Due to the size and nature of the units it has been assumed that there would be no requirement to unhitch and re-hitch trailers. This activity is normally only associated with large distribution units.

Noise Map of Deliveries (L_{Aeq} levels)

5.17 With reference to the above and selecting potential 'worst-case' units, noise levels affecting the nearest residential properties have been modelled using our CadnaA® noise mapping software which predicts environmental noise levels in accordance with guidance in ISO 9613-2:1996 '*Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation*'.

5.18 The predicted noise levels are presented on Figures B and C for the daytime and D and E for the night-time periods. The levels predicted relate to a 1-hour period during the daytime and a 15-minute period during the night-time. **It is important to note that the noise levels presented are considered to represent a 'worst-case' and not typical case.**

5.19 The calculated noise levels are at the worst-case height of the receivers.

5.20 A BS4142 assessment, based on the calculated delivery noise levels for each of the property areas is presented in Table 5.4 below.

5.21 The noise map demonstrates that although properties in St Davids Court are closer to the development, it is actually properties on Queens Road that are subjected to the highest noise levels from the site (some 2 to 3dB higher). However, as the background noise levels affecting these properties are higher than those affecting St Davids Court, a BS4142 assessment for Queens Road compared to St Davids Court would result in the same outcome. As such, consideration has only been given to St Davids Court, for ease of reference.

5.22 As the existing residential properties around the site are already affected by relatively high traffic noise levels from the surrounding roads and there are already deliveries occurring in the area as a result of a significant number of existing retail and commercial premises, it is considered that the site should be considered in this context i.e. the residential properties are already subjected to noise from the types of sources that will be associated with the development.

Table 5.4 – BS4142 Assessment of Delivery Noise Levels

Description	St Davids Court
Daytime (1-hour period)	
Specific Noise Level (dBL _{Aeq})	35
Character adjustment	+5
Rating Noise Level, dB	40
Background (dBL _{A90})	49
Rating Minus Background	-9
Night-time (15-minute period)	
Specific Noise Level	34
Character adjustment	+5
Rated Noise Level	39
Background	43
Background Minus Rated	-4

- 5.23 With reference to the delivery noise assessment presented in Table 5.4, during the daytime in all instances, the rating level is at least 9dB below the background level which is a clear indication that there would be no observed effect or a low observed effect level.
- 5.24 Furthermore, the noise levels are in line with MCC's requirements. Lastly in terms of context, as identified above there are already a large number of retail / commercial properties in the area of the residential properties. As such, potential daytime noise levels are considered to be acceptable.
- 5.25 In terms of the night-time in all instances the rated delivery noise levels should be no higher than the background level minus 4dB. This is considered to represent a low observed effect level. Furthermore, the noise levels are approximately in line with MCC's requirements. Lastly in terms of context, as identified above there are already a large number of retail / commercial properties in the area of the residential properties. As such, potential night-time noise levels are considered to be acceptable.
- 5.26 The above is considered to clearly demonstrate that the units could be serviced 24-hours per day, 7 days per week with no observed effect, or, as a worst-case situation, a low observed effect level. As such, 24-hour servicing should be deemed acceptable within the constraints laid out above.

Maximum Noise Levels Due to Deliveries

- 5.27 With reference to the maximum noise levels presented in tables 5.2 and 5.3 above, the predicted night-time maximum noise levels inside bedrooms of St David's Court (the worst-case affected residential properties) are presented in Table 5.5, below.
- 5.28 The -13dB noise reduction across an open window that is used in Table 5.5 is based on guidance in the Association of Noise Consultants (ANC) '*Acoustics Ventilation and Overheating - Residential Design Guide*' Ver 1.1 January 2020 (AVO). It relates to a window that is open to approximately 2% of the floor area to control summertime overheating.

Table 5.5 – Anticipated Maximum Noise Levels Due to Deliveries (2300h to 0700h)

Source	L _{Amax} @10m	Distance To Residential	Distance Attenuation	Screening Attenuation	Window Attenuation	Internal Level L _{Amax}
HGV Manoeuvring	79	90	-19dB	-10dB	-13dB	37dB
HGV Unloading	81	78	-18dB	-15dB		35dB
Van Manoeuvring	71	70	-17	--		41dB
Van Unloading	69	80	-18	--		38dB

- 5.29 As stated in the World Health Organisation's (WHO) 'Guidelines for Community Noise' (1999), maximum noise levels should not regularly exceed 45dB_{L_{Amax}} in bedrooms during the night-time period (2300h to 0700h) in order to avoid sleep disturbance.
- 5.30 The resultant internal maximum noise levels due to delivery noise, as presented in Table 5.5, are clearly below the WHO night-time maximum noise limit, further demonstrating that night-time deliveries are acceptable in terms of noise.

Noise Break-out

Assumed Internal Noise Level

- 5.31 It is assumed that reverberant noise levels inside light industrial uses would be no greater than 75dB_{L_{Aeq,T}}. This is considered a reasonable assumption and in reality, noise levels in warehouses would typically be lower.

External Envelope

- 5.32 Based on the assumption that the roof, side, and rear facades of the buildings would be constructed from a twin metal skin with mineral wool in the cavity, with reference to Speedeck data, this construction should provide a sound insulation performance of approximately 37dBR_w.
- 5.33 Based on the above a noise break-out calculation has been undertaken to the worst-case affected properties on in St Davids Court, which demonstrate that noise levels would be no greater than 26dB(A) (assuming 75dB(A) internally). The calculation sheet is included a Appendix C.

Closed Roller Shutter Doors

- 5.34 In terms of roller shutter doors, a basic door provides a sound insulation performance of around 17dBR'_w and an insulated door would normally provide a higher acoustic performance. Based on an internal noise level of no greater than 75dB_{L_{Aeq}} as an internal reverberant level, the noise levels at St David's Court would be no greater than around 26dB_{L_{Aeq}} due to breakout from roller shutters or units 4 to 8 combined. Due to screening and increased distance attenuation, noise break-out from the other units would not add to this figure.
- 5.35 As such, assuming roller shutter doors were closed, the combined break-out noise level (around 29dB_{L_{Aeq}}) would be some 17dB below the night-time background noise levels. Even allowing for noise character, a BS4142 assessment indicates that this would represent no impact or, as a worst-case situation, a low impact.
- 5.36 This clearly demonstrates that with roller shutter doors closed and a reasonable internal noise limit set, noise break-out from the units would be controlled to an appropriate level even during the night-time periods.

Open Roller Shutter Doors

- 5.37 Assuming roller shutter doors were open to all units and that each unit was operating at an internal noise level of $75\text{dB}_{\text{LAeq,T}}$ calculations indicate that the noise levels affecting the nearest residential properties would be some $39\text{dB}_{\text{LAeq,T}}$. The calculation is presented on the noise map in Figure F.
- 5.38 Assuming a +5dB character correction the resultant noise rating level of 44dB(A) minus the daytime background noise level of $49\text{dB}_{\text{LA90,T}}$ is some -5dB. This indicates a minor impact and should be deemed acceptable especially as this represents a potential 'worst-case' situation.
- 5.39 In terms of the night-time, the noise rating level minus the background noise level of $43\text{dB}_{\text{LA90,T}}$ results in a +1dB difference. Based on this it is considered that the shutters should not remain open for extended periods during the night-time. However, it is considered acceptable to open the roller shutter doors during night-time deliveries as the HGV or van in question would screen the noise break-out and, furthermore, the likelihood of all units having a delivery at the same time is practically zero, meaning that the noise levels affecting the residential properties would be significantly lower than stated above.

Plant Noise Levels

- 5.40 In terms of mechanical plant, there are only air source heat pumps on the side of a number of units. The locations of these are Identified on Figure G. Appendix D includes the data sheet for the proposed units, which generate a level of 53dB(A) at a distance of 1m, based on normal use.
- 5.41 Figure H presents the noise map calculation of the above plant items, demonstrating that these sources would generate a noise level of 22dB(A) at the nearest residential window. Even allowing for a 5dB noise character correction (which is considered a pessimistic approach), the resultant noise level would still be more than 10dB(A) lower than the night-time background noise level of $43\text{dB}_{\text{LA90, 15min}}$ meaning plant noise would have no observed effect.

6.0 CONCLUSIONS

- 6.1 AEC has undertaken a noise assessment in relation to the proposed new Commercial development at Elizabeth Street, Cheetham Hill.
- 6.2 Calculations indicate that car parking noise levels at the nearest affected receiver (St Davids Court) would not increase the general ambient noise levels assuming 15 cars in a 'worst case' night-time 15 minutes and 45 cars in a 'worst-case' daytime hour period. Based on this car-parking would have no observed effect on the residential properties and should be deemed acceptable.
- 6.3 Based on HGV and van deliveries, the predicted daytime (07:00-23:00h) night-time (23:00 to 07:00h) noise levels are presented on Figures B to E respectively. Using these noise levels, a BS4142 assessment has been undertaken as presented in Table 5.4 above. The assessment demonstrates that noise level limits set by MCC would be achieved at all noise sensitive receivers.
- 6.4 Assuming the building envelope achieves a minimum sound insulation performance of around 35dBR_w which can be achieved with a twin metal skin system incorporating mineral wool insulation, to comply with MCC's requirements, allowable internal noise levels will be in the order of 75dBL_{Aeq} which is considered to be appropriate operational for light industrial activities.
- 6.5 With roller shutter doors open to each unit, assuming an operating noise level of 75dBL_{Aeq,T} the predicted noise level at St David's Court is 39dBL_{Aeq,T}. Allowing a +5dB noise character adjustment, the rating level would be some 5dB below the daytime background noise levels indicating that leaving roller shutter doors open should be acceptable during the daytime periods.
- 6.6 With regard to the night-time, the noise rating level minus the background level would be some +1dB, meaning that ideally not remain open for extended periods during the night-time. However, as described above, it would be acceptable to open the roller shutters to receive deliveries when the vehicle would screen internal activities and, furthermore, as only a small number of units are likely to receive deliveries at the same time, the noise levels affecting the properties would be significantly lower.
- 6.7 Based on the proposed air source heat pumps, the noise levels due to these items would be some 22dB(A) external to St David's Court (the 'worst-case affected residential windows'). This level comfortable complies with MCC's plant noise limit requirements the noise level.
- 6.8 In summary, in terms of noise and the details discussed above, the assessment demonstrates:
- 24hr operation of the units is acceptable;
 - 24hr deliveries area acceptable;
 - 24hr use of heat pumps is acceptable;
 - Roller shutter doors can remain open in each unit during the daytime (based on a reasonable internal noise level assumption);
 - During the night-time, roller shutters could be opened to receive deliveries but should ideally not remain open for extended periods.
- 6.9 Based on the above, noise should not be considered a determining factor in relation to the planning permission being sought. Furthermore, the assessment demonstrates that 24/7 operation should be a viable option.



Andrew Burke

Figure B – Noise Map Showing Daytime Predicted Noise Levels $\text{dBL}_{\text{Aeq}, 1\text{hr}}$

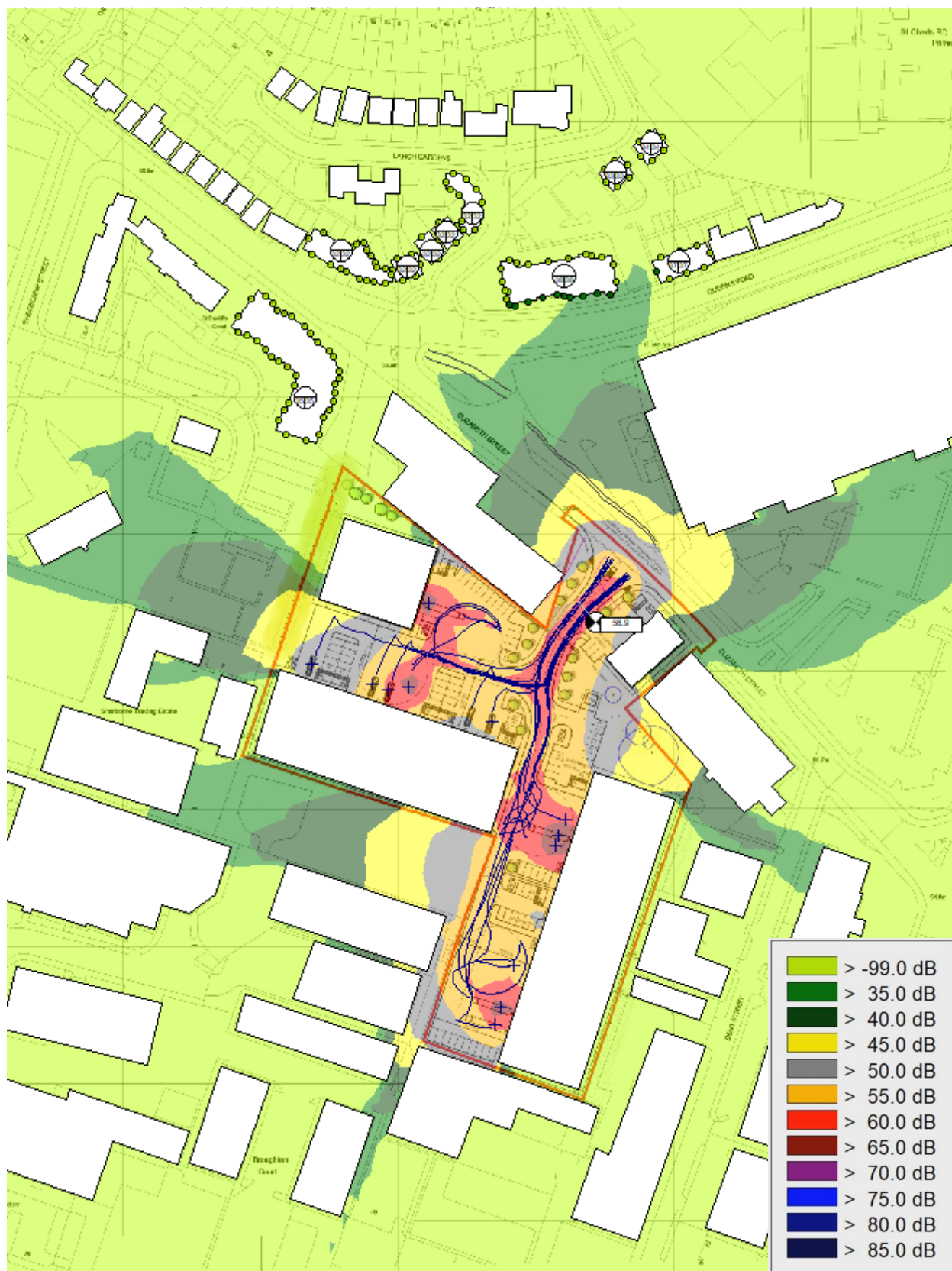


Figure D – Noise Map Showing Night-time Predicted Noise Levels $\text{dBL}_{\text{Aeq}, 15\text{min}}$

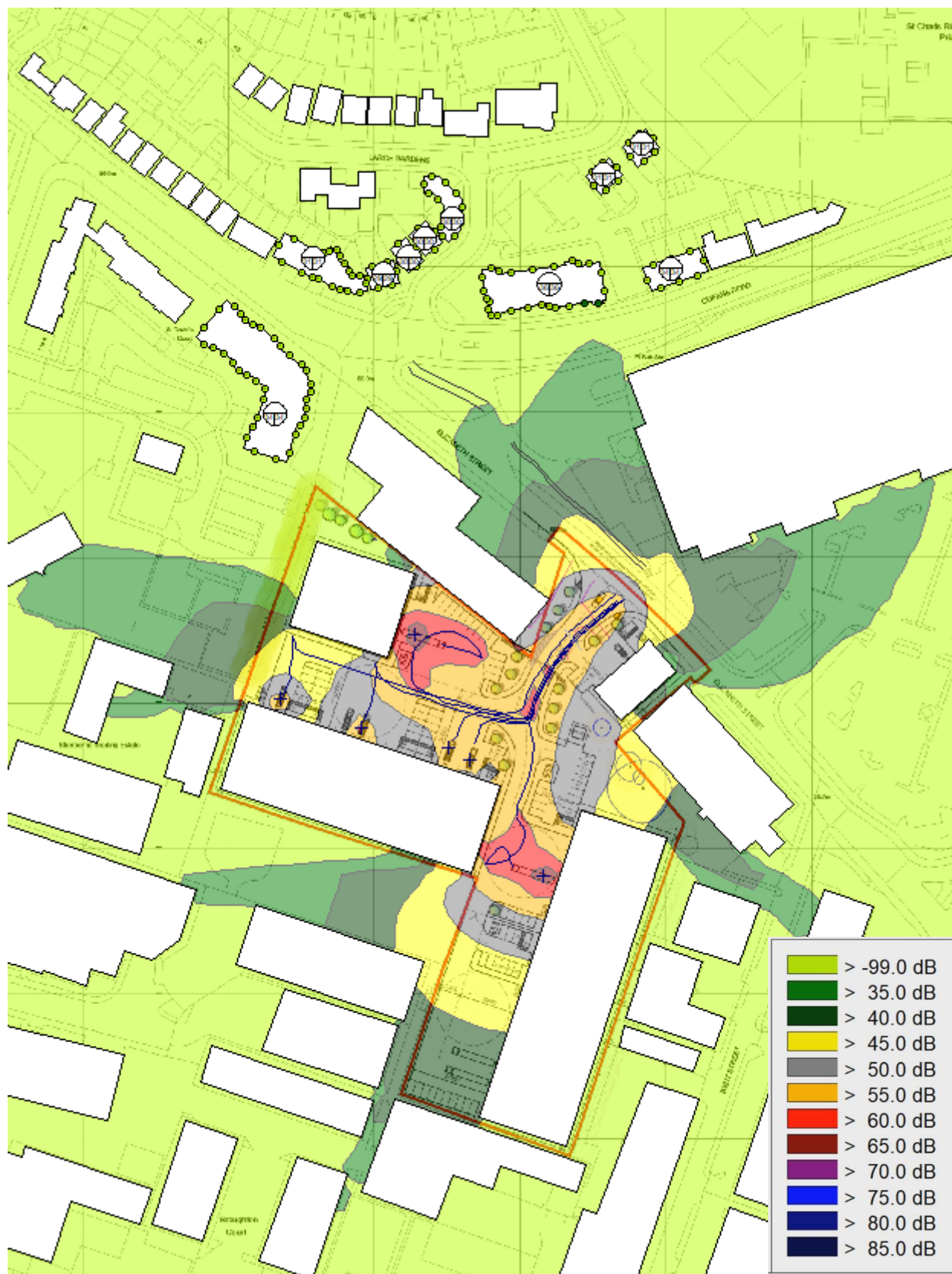


Figure E – Noise Map Showing Night-time Predicted Noise Levels $\text{dBL}_{\text{Aeq}, 15\text{min}}$ at the Residential Properties

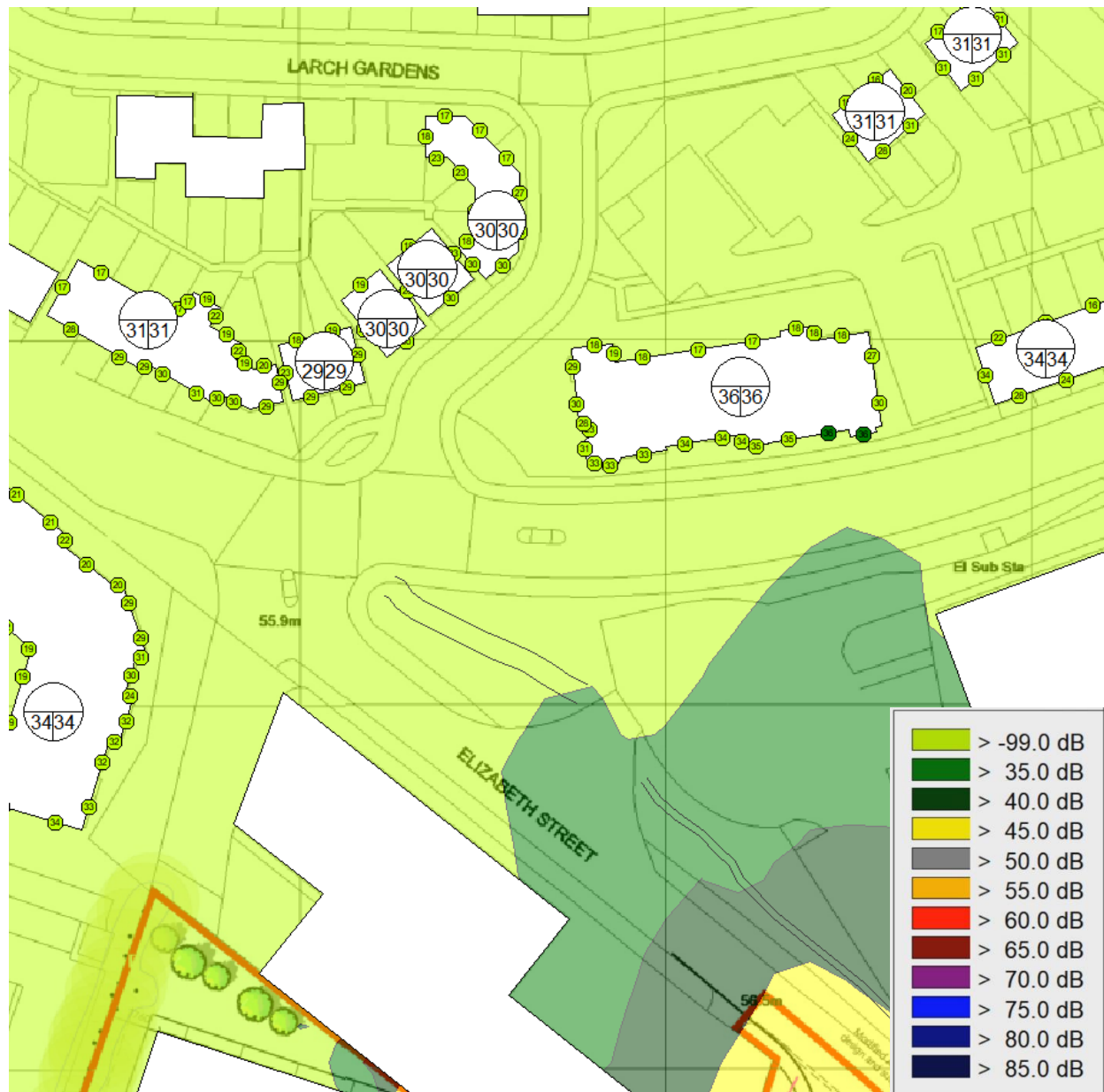
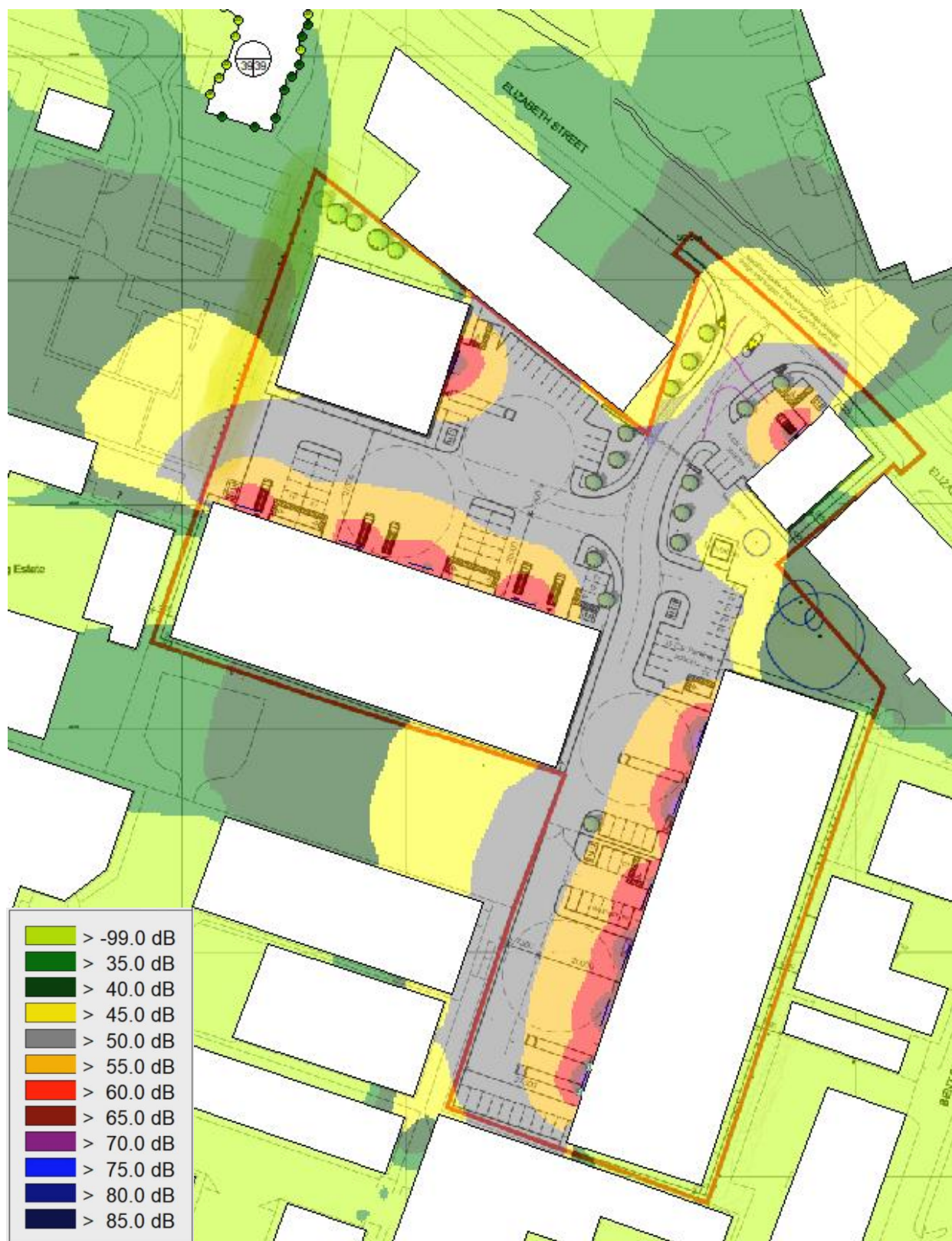


Figure F – Noise Break-out, $dBL_{Aeq,T}$, via Open Roller Shutters

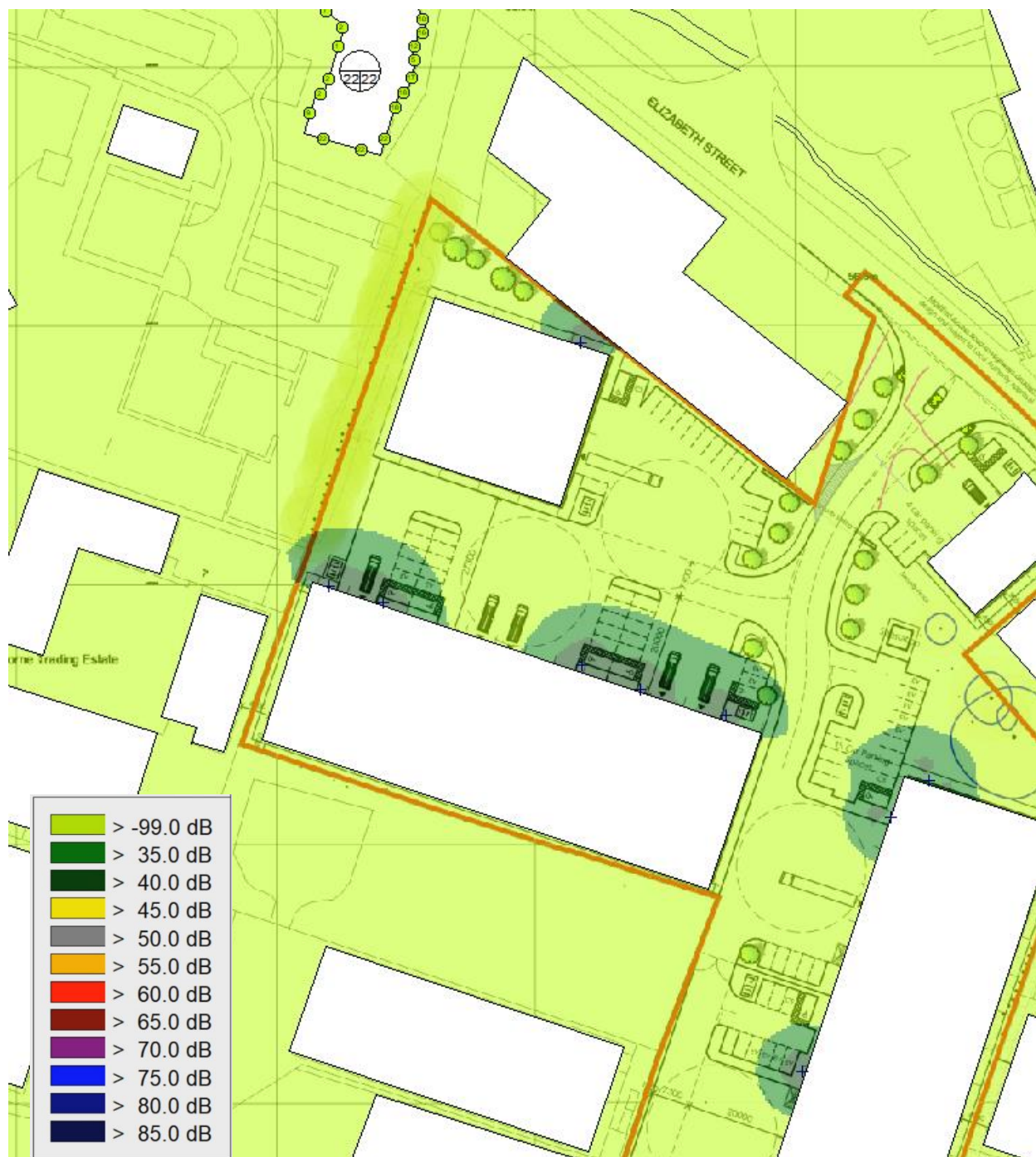


Site plan of a residential development showing units 02 through 09. The plan includes the following labels and dimensions for heat pump outdoor units:

- Unit 09:** HEAT PUMP OUTDOOR UNIT APPROX 1000 X 400 X 1000H
- Unit 08:** HEAT PUMP OUTDOOR UNIT APPROX 1000 X 400 X 1400H
- Unit 07:** HEAT PUMP OUTDOOR UNIT APPROX 1000 X 400 X 1400H
- Unit 06:** HEAT PUMP OUTDOOR UNIT APPROX 1000 X 400 X 1400H
- Unit 05:** HEAT PUMP OUTDOOR UNIT APPROX 1000 X 400 X 1400H
- Unit 04:** HEAT PUMP OUTDOOR UNIT APPROX 1000 X 400 X 1400H
- Unit 03:** HEAT PUMP OUTDOOR UNIT APPROX 1000 X 400 X 1400H
- Unit 02:** HEAT PUMP OUTDOOR UNIT APPROX 1000 X 400 X 1400H
- Unit 02 (Alternative):** HEAT PUMP OUTDOOR UNIT APPROX 1000 X 400 X 1400H ALTERNATIVE LOCATION

Other labels on the plan include Warehouse, Works, Elizabeth House, and various street names (e.g., 23a, 43, 45, BEAUFORT STREET).

Figure H – Predicted Heat Pump Noise Levels, $\text{dBL}_{\text{Aeq,T}}$



Appendix A - Acoustic Terminology in Brief

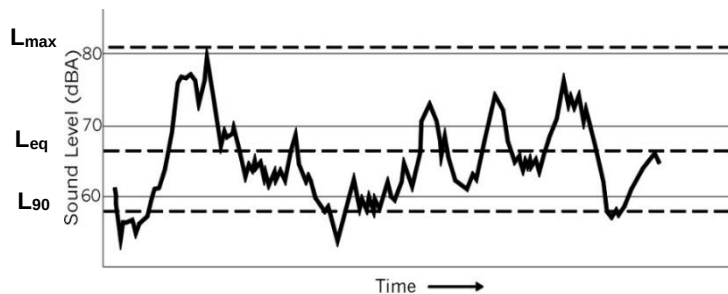
General

Sound is produced by mechanical vibration of a surface, which sets up rapid pressure fluctuations in the surrounding air. The rate at which the pressure fluctuations occur determines the pitch or *frequency* of the sound. The frequency is expressed in Hertz (*Hz*), that is, cycles per second. The human ear is sensitive to sounds from about 20 Hertz to 20,000 Hertz. Although sound can be of one discrete frequency - a 'pure tone' - most noise is made up of many different frequencies.

The human ear is more sensitive to some frequencies than others, and modern instruments can measure sound in the same subjective way. This is the basis of the A-weighted sound pressure level *dBA*, normally used to assess the effect of noise on people. The *dBA* weighting emphasizes or reduces the importance of certain frequencies within the audible range

Sound / Noise Units

The figure below shows an example of sound level varying with time. Because of this variation over time the same period of noise can be described by several different levels. The most common of these are described below.



Commonly Used Descriptors for Sound / Noise

$L_{Amax, T}$	The maximum (A-weighted) sound level measured during a given time. 'Fast' or 'Slow' meter response should be cited.
$L_{Aeq, T}$	The equivalent continuous (A-weighted) sound level. It may be thought of as the "average" sound level over a given time, <i>T</i> . It is used for assessing noise from various sources: industrial and commercial premises, construction sites, railways and other intermittent noises. It can be considered as the "ambient" noise level.
$L_{A90, T}$	The (A-weighted) sound level exceeded for 90% of a measurement period. It is the value often used to describe the "background" noise.
$L_{A10, T}$	The (A-weighted) sound level exceeded for 10% of a measurement period. It is the value often used to describe traffic noise.
$L_{A1, T}$	The (A-weighted) sound level exceeded for 1% of a measurement period. It is the value generally used to indicate a 'typical' maximum noise level.
L_{AE}	The sound exposure level is a notional noise level and describes the average L_{Aeq} noise level of an event over a given time period as if it occurred during a one second period. This allows the L_{Aeq} to be determined over a time period with a number of distinct events
Free-field Level	This refers to the sound level measured outside, away from reflecting surfaces.

Façade Level	This refers to the sound level measured outside, at 1m from a hard reflecting surface, typically 3dB greater than the free-field level.
Other Common Acoustics Descriptors	
R_w	Single number rating used to describe the <u>laboratory</u> airborne sound insulation properties of a material or building element over a range of frequencies, typically 100-3150Hz.
R'_w	Apparent sound reduction index - Single number rating used to describe the sound reduction index of an on-site construction over a range of frequencies, typically 100-3150Hz.
D_w	Single number rating used to describe the on-site airborne sound insulation properties of a material or building element over a range of frequencies, typically 100-3150Hz.
D_{nT,w}	Weighted standardized level difference. A single number rating used to describe the on-site airborne sound insulation performance properties of a material or building element over a range of frequencies, typically 100-3150Hz. Standardized to a reference reverberation time of 0.5s (unless otherwise stated).
C_{tr}	A road traffic spectrum adaptation term which is used to describe the low frequency sound insulation performance of building elements.

APPENDIX B – Measurement Procedure

Date & Time of Survey:	January 2022 – Thursday 6 (20:00-22:00), Friday 7 (04:30-08:30), Sunday 9 (09:00-10:30).					
Personnel:	Andy Burke (AEC).					
Equipment Used:	B&K 2250 Real Time Analyser (AEC Kit 4).					
Calibration:	The sound level analyser, which conforms to BS EN 61672-1: 2013 ' <i>Electroacoustics – Sound level meters - Part 1 Specifications</i> ' for Class 1 Type Z meters, was in calibration and check calibrated before and after the measurement periods using a Brüel & Kjær type 4231 (94dB) calibrator. There was no significant drift of calibration.					
Weather Conditions:	Attended:					
	Date	Period	Wet/Dry	Temp°C	Wind Speed & Direction	Cloud Cover
	Thu 6 Jan	Evening	Dry	0°C	Little or no wind	60%
	Fri 7 Jan	Night / Day	Dry	1°C		90%
	Sun 9 Jan	Weekend	Damp roads	3°C		100%
Measurement Locations:	Attended: Measurements were undertaken at 3 locations around the development site. Identified as A to C on Figure 3.1 and described below. A – Adjacent to St Davids Court. B – On Larch Gardens, approximately 7m from edge of Queens Road. C – On Larch Gardens, screened from traffic on Queens Road.					
Measurement Details:	Attended: Measurements were undertaken over various periods in terms of L_{eq} , L_{10} , L_{90} , and L_{max} .					
Façade / Free-Field:	All measurements were undertaken in Free-field					
Measured Data:	Presented on Table B1, below					

Table B1 – Measured Noise Levels

Pos	Period				Comments
		L _{A90.0}	L _{Aeq}	L _A F _{max,F}	
Thursday 6 January					
A	20:21-20:22	50.2	58.5	70.2	Traffic on Elizabeth St, Queens Rd and Cheetham Hill Rd. Maximum due to traffic on Elizabeth Street
	20:57-21:08	49.4	58.5	71.1	
	21:31-21:41	48.0	56.9	67.3	
B	20:34-20:44	50.4	65.0	78.7	As above, maximum due to traffic on Larch Rd / Queens Rd
	21:10-21:20	51.5	64.3	77.4	
C	20:46-20:56	46.1	51.7	67.7	As above, maximum due to traffic on Larch Rd
	21:21-20:29	45.3	55.7	69.8	
Friday 7 January					
A	04:35-04:42	42.5	54.4	67.8	Traffic on Elizabeth St, Queens Rd and Cheetham Hill Rd. Maximum due to traffic on Elizabeth Street
	05:54-06:17	43.6	55.4	69.6	
	06:30-06:32	45.5	57.4	68.1	
	07:00-07:25	48.8	58.4	69.5	
	08:00-08:15	52.7	59.5	68.3	
B	04:58-05:12	45.7	60.3	76.3	As above, maximum due to traffic on Larch Rd / Queens Rd
	06:08-06:18	47.1	61.9	77.9	
	06:42-06:52	49.4	65.0	76.2	
C	05:15-05:26	41.5	47.4	64.1	As above, maximum due to traffic on Larch Rd
	06:19-06:29	42.5	48.0	63.7	
	06:53-06:59	44.3	51.4	72.5	
Sunday 9 January					
A	09:00-09:13	51.8	58.5	69.1	Traffic on Elizabeth St, Queens Rd and Cheetham Hill Rd. Maximum due to traffic on Elizabeth Street
	10:00-10:12	51.5	58.6	71.1	
B	09:15-09:27	50.7	65.0	77.6	As above, maximum due to traffic on Larch Rd / Queens Rd
	10:14-10:25	51.7	65.4	76.3	
C	09:29-09:49	47.8	52.7	67.7	As above, maximum due to traffic on Larch Rd

APPENDIX C – Noise Break-out Calculation

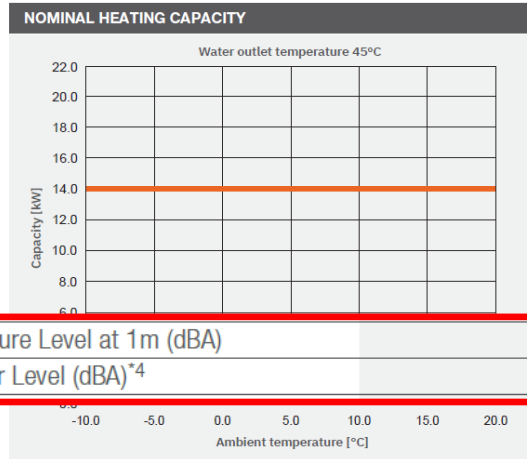
	Contract No:	P4528							Date:	14-Jan
	Client:	Kier								
	Project:	Elizabeth St, Cheetham Hill							Consultant:	AGB
NOISE BREAK OUT TO OUTSIDE										
Noise Source	Internal activity									
	Corrections to obtain L_p at element ? (eg distance/directivity)									
Building & Element	Twin skin Roof & Walls									
	Area (S)	1500 m ²	Width(a)=	15 m	Height(b)=	100 m				
	Position Directivity (Q)	2	(=4 for a wall, 2 for a roof)							
	Additional Directivity									
Receiver	St Davids Court									
	Distance (R) from element	45 m								
	Propagation Corrections									
	Barrier	0								
	Façade	0								
Calculation										
	Frequency, Hz	63	125	250	500	1k	2k	4k	8k	dBA
	Internal Level, dB	68	68	68	68	68	68	68	68	75
	Internal Corrections, dB									
	Corrected Internal Level, Lin, dB	68	68	68	68	68	68	68	68	75
	SRI of Element, dB	10	13	25	43	52	52	50	50	
	Additional Directivity, dB									
	Propagation Corrections									
	Barrier, dB									
	Façade, dB									
	Level (1) at Receiver	43	40	28	10	1	1	3	3	26
	Level (2) at Receiver	41	38	26	8	-1	-1	1	1	24
Criterion	dB	52	45	41	39	40	34	21	13	43
	Shortfall (1)	-9	-5	-13	-29	-39	-33	-18	-10	
	Shortfall (2)	-11	-7	-15	-31	-41	-35	-20	-12	
Calculation Method	(1)	$L_p = L_{in} - R - 6 + 10\log(S) - 20\log(R) - 11 + 10\log(Q)$								
	(2)	$L_p = L_{in} - R - 6 + 10\log(ab/(\pi^2 R^2)) + 10\log(Q/2)$								

APPENDIX D – Proposed Heat Pumps

Heating Product Information

PUZ-HWM140VHA(-BS)
Ecodan R32
Monobloc Air Source Heat Pump

OUTDOOR UNIT		PUZ-HWM140VHA(-BS)
HEAT PUMP SPACE HEATER - 55°C	ErP Rating	A++
	η_{s}	131%
	SCOP (MCS)	3.35
HEAT PUMP SPACE HEATER - 35°C	ErP Rating	A+++
	η_{s}	176%
	SCOP (MCS)	4.48
HEAT PUMP COMBINATION HEATER - Large Profile ¹	ErP Rating	A+
	η_{wh}	130%
HEATING ² (A-7/W35)	Capacity (kW)	14
	Power Input (kW)	5.71
	COP	2.45
OPERATING AMBIENT TEMPERATURE (°C DB)		-28 ~ +35
SOUND DATA ³	Pressure Level at 1m (dBA)	53
	Power Level (dBA) ⁴	67
WATER DATA	Pipework Size (mm)	28
	Flow Rate (l/min)	40.1
	Water Pressure Drop (kPa)	20
DIMENSIONS (mm)	Width	322
WEIGHT (kg)		
ELECTRICAL DATA	Nominal Running Current (amps) I_n	13.8 (33)
	Fuse Rating - MCB Sizes (A) ⁵	40
REFRIGERANT CHARGE (kg) / CO ₂ EQUIVALENT (t)	R32 (GWP 675)	3.3



SOUND DATA³

Pressure Level at 1m (dBA)

53

Power Level (dBA)⁴

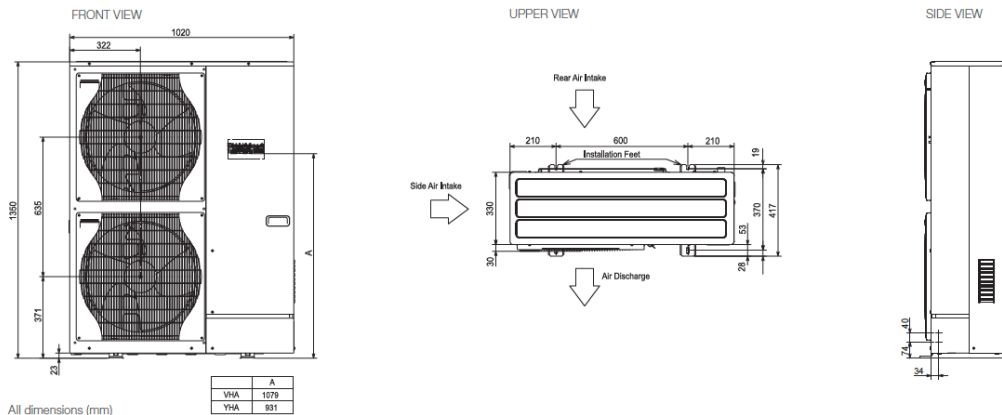
67

Notes:

- ¹ Combination with EP120X Cylinder
² Under normal heating conditions at outdoor temp: -7°CDB / -8°CWB, outlet water temp 35°C, inlet water temp 30°C.
³ Under normal heating conditions at outdoor temp: 7°CDB / 6°CWB, outlet water temp 55°C, inlet water temp 47°C as tested to BS EN14511.
 Low Noise mode accessory (reference P1AC-SA89TA-EP) available for VHA chassis.
⁴ Sound power level tested to BS EN12102.
⁵ Under nominal heating conditions at outdoor temp: 7°C, outlet water temp: 35°C.
⁶ MCB Sizes BS EN60898-2 & BS EN60947-2.
⁷ Grille.

η_{s} is the seasonal space heating energy efficiency (SSHEE) η_{wh} is the water heating energy efficiency

PUZ-HWM140VHA(-BS) DIMENSIONS



All dimensions (mm)



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Note: The fuse rating is for guidance only. Please refer to the relevant databook for detailed specification. It is the responsibility of a qualified electrician/electrical engineer to select the correct cable size and fuse rating based on current regulation and site specific conditions. Mitsubishi Electric's air conditioning equipment and heat pump systems contain a fluorinated greenhouse gas, R410A (GWP:2088), R32 (GWP:875), R407C (GWP:1774), R134a (GWP:1430), R513A (GWP:831), R454B (GWP:468), R1234ze (GWP:7) or R1234yf (GWP:4). *These GWP values are based on Regulation (EU) No 517/2014 from IPCC 4th edition. In case of Regulation (EU) No.626/2011 from IPCC 3rd edition, these are as follows. R410A (GWP:1975), R32 (GWP:550), R407C (GWP:1650) or R134a (GWP:1300).

Effective as of September 2020



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