Cole Jarman

Domino's, 73 Farringdon Road

Noise Assessment

Report 19/0289/R1

Domino's, 73 Farringdon Road

Noise Assessment

Report 19/0289/R1

The MSG Group

Academy House
403 London Road
Camberley
Surrey
GU15 3HL

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Cole Jarman Limited Reg. in England and Wales No. 7102436
An RSK Company
Registered Office Spring Lodge, 172 Chester Road, Helsby WA6 0AR
www.colejarman.com info@colejarman.com

Head Office +44 (0)1932 829007
John Cree House, 24b High Street, Addlestone, Surrey, United Kingdom KT15 1TN
Manchester 0161 470 8888 | Fourways House, 57 Hilton Street, Manchester M1 2EJ
Bristol 0117 287 2633 | The Old School, Stillhouse Lane, Bristol BS3 4EB

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Noise Assessment

1 Introduction

1.1 It is proposed to convert the existing jewellery shop and showroom (Class A1) at 73 Farringdon Road, London to provide a Domino's pizza takeaway (Class A5).

1.2 The proposals involve the installation of new mechanical services plant and operating a pizza delivery service. As such, an assessment of noise generated by plant and pizza delivery vehicles at nearby existing noise sensitive receptors is required.

1.3 This report details a noise survey undertaken at the site by Cole Jarman to quantify existing background and ambient noise levels as the basis for the required assessment. It is shown that noise levels generated by the proposals can be controlled to within appropriate limits.

2 Site Description

2.1 The site of the proposed conversion comprises the basement and ground floor of the six storey building (including basement) on the corner where St Cross Street meets Farringdon Road, part of the A201, a busy main road, albeit with a 20mph limit. This is shown on figure 19/0289/F1.

2.2 Condensing plant is to be wall mounted behind louvred doors on the St Cross Street elevation and a kitchen extract exhaust grille positioned above this. Fresh air intake grilles are proposed at high level; one in the Farringdon Road elevation and one in the St Cross Street elevation.

2.3 Pizza deliveries are intended to be made by scooter. A row of motorcycle parking bays on St Cross Street, indicated on the attached figure, is proposed for use by the scooter drivers.

2.4 The first, second and third floors above the site are offices and the fourth floor is an apartment. The neighbouring property at 71 Farringdon Road has a similar arrangement with residential flats from second to fifth floor levels.

2.5 Directly opposite the site are office buildings, 50 Farringdon Road and, on St Cross Street, Paragon House. Behind the site, Da Vinci House is also an office building. Beside Paragon House and opposite Da Vinci House is a large multi-storey car park.

3 Noise Survey

3.1 **Methodology**

3.1.1 An unattended noise survey was undertaken at the site over a typical weekday and a full weekend, commencing at 1200 hours on Thursday 30th May and ending at 0800 hours on Monday 3rd June 2019.

3.1.2 Measurements were taken at two locations where background and ambient noise levels are expected to be representative of those at the nearest noise sensitive receptors to each side of the site. These are shown on the attached figure 19/0289/F1 and described as follows:

- MP1 – at edge of scaffolding, just above 2nd floor finish level overlooking Farringdon Road
- MP2 – at edge of scaffolding, just above 2nd floor finish level overlooking St Cross Street

3.1.3 Measurements of the L_{Aeq}, L_{Amax} and L_{A90} indices were recorded over consecutive 15-minute periods (see the attached Glossary of Acoustic Terms for an explanation of the noise units used).

3.1.4 Audio file recordings were also made at both locations over the entire survey in order to provide insight into existing noise sources affecting the area and to help identify measurement periods where results would have been affected by works to the façade of 73 Farringdon Road.

3.1.5 Noise measurements were made using the equipment listed in Table T1.

Item	Manufacturer	Type
Sound Level Analyser (x2)	Rion	NL-52
Acoustic Calibrator (x2)	Rion	NC-74
Weatherproof windshield (x2)	Rion	WS-15

T1 Equipment used during unattended noise survey.

3.1.6 The sound level analysers were calibrated before the survey commenced and after it had concluded. No significant drift was noted to have occurred.

3.1.7 The weather conditions while installing and retrieving the equipment were noted to be warm and dry with a light breeze. These conditions are considered suitable for the measurements that were taken and publically available online weather data indicates little change over the duration of the survey.

3.2 Results

3.2.1 The results of the noise measurements at MP1 and MP2 are presented in the attached time history figures 19/0289/TH01 and 19/0289/TH02, respectively.

3.2.2 While on site, tools used in the façade works were intermittently audible over other ambient noise sources. Louder construction works were also underway on Paragon House, opposite the site. Otherwise, traffic on Farringdon Road was the dominant noise source.

3.2.3 The measurement result time history graphs and waveform audio recorded at each position provide the following information about the local noise climate during the survey:

- Use of power tools on the Paragon House construction has elevated the noise levels measured at both positions between about 0800 and 1500 hours on Thursday, Friday and Saturday.
- Other construction activity is audible but not dominant at other times.
- Traffic runs continuously on Farringdon Road for much of the daytime and into the night until about 0100 hours, after which vehicles begin to pass more intermittently.
- Pedestrians walking and conversing in the streets also contributed notably to the noise climate throughout the survey. This also became less significant around 0100 each night.
- Vehicles pass the site regularly on St Cross Street, including to access the multi-storey car park. However, this is more intermittent than traffic on Farringdon Road.
- Daytime traffic noise levels are lower on weekend days than on week days, whereas night time levels are comparable.

3.2.4 The representative background noise levels measured at MP1 and MP2 are shown in Table T2. These have been derived statistically, in accordance with BS 4142:2014, from the survey data recorded over the weekend, when lower noise levels were measured than on week days.

Location	**Measured Background Noise Levels, $L_{A90,15min}$ dB**		
	Day (0700-1900)	**Evening (1900-2300)**	**Night (2300-0700)**
MP1 – Farringdon Road	56	55	47
MP2 – St Cross Street	52	51	45

T2 Representative measured background noise levels.

4 Plant Noise

4.1 Noise Emissions Criteria

4.1.1 Appendix 3 of the current version of the Camden Local Plan states the following requirements for the assessment of industrial and commercial noise within the borough:

A relevant standard or guidance document should be referenced when determining values for LOAEL and SOAEL for non-anonymous noise. Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS 4142) will be used. For such cases a 'Rating Level' of 10

dB below background (15dB if tonal components are present) should be considered as the design criterion).

4.1.2 Additional guidance in Appendix 3 states that a design criterion of 15 dB below background may not be required where the assessed noise contains tonal components, if it can be shown that there will be no significant change to the character of the existing noise climate.

4.1.3 In some cases, Camden may also require consideration of the predicted noise level in absolute terms, rather than only as a rating level considered in relation to existing background levels.

There are certain smaller pieces of equipment on commercial premises, such as extract ventilation, air conditioning units and condensers, where achievement of the rating levels (ordinarily determined by a BS:4142 assessment) may not afford the necessary protection. In these cases, the Council will generally also require a NR curve specification of NR35 or below, dependent on the room (based upon measured or predicted Leq,5mins noise levels in octave bands) 1 metre from the façade of affected premises, where noise sensitive premise is located in a quiet background area.

4.1.4 Assessment of sound from proposed fixed installations of mechanical plant equipment is included within the scope of BS 4142:2014. Therefore, use of this standard is appropriate in this case. Furthermore, the survey results indicate that nearby noise sensitive premises are not located in a quiet background area. While this is open to some interpretation, the superseded 1997 version of BS 4142 stated that background noise levels of 30 dB(A) should be considered low, whereas in this case even night time background levels are at least 15 dB higher than this.

4.1.5 Based on the above commentary, noise limits shall apply to the rating level associated with the proposed mechanical services plant. The limits shall be 10 dB below the existing background level at each sensitive receptor, as set out in Table T3 below. These limits shall be reduced by 5 dB in any case where the predicted noise level spectrum at the receptor appears tonal.

Location	**Plant Noise Emission Limits, dB(A)**		
	Day (0700-1900)	**Evening (1900-2300)**	**Night (2300-0700)**
Noise sensitivities - Farringdon Road	46	45	37
Noise sensitivities - St Cross Street	42	41	35

T3 Plant noise emission limits.

4.1.6 Housing, schools and hospitals as well as offices, workshops and open spaces are listed as examples of noise sensitive development types in the Camden Local Plan. Appendix 3 of the Local Plan states that the Council will consider the likely times of occupation for different types of development. Therefore, it is necessary to assess noise levels from proposed plant outside

windows to offices and residential properties but only the daytime criteria apply where offices are concerned, the evening and night time criteria apply only to residential receptors.

4.2 Assessment

4.2.1 Condensing plant is to be wall mounted behind louvred doors on the St Cross Street elevation and a kitchen extract exhaust grille positioned above this. Fresh air intake grilles are proposed at high level; one in the Farringdon Road elevation and one in the St Cross Street elevation.

4.2.2 All plant will be required during the takeaway's proposed opening hours, 1000-0500 hours, and a single cold room condenser will run outside these hours. The total noise emissions from all plant will therefore need to meet the night time limits at nearby residential receptors.

4.2.3 Details of the proposed plant and associated noise levels used in the assessment can be found in the attached schedule 19/0289/SCH1.

4.2.4 Noise levels have been calculated at five assessment positions, as shown on the attached figure 19/0289/F2 and described below.

- AP1 – window to first floor office above site, Farringdon Road elevation
- AP2 – window to first floor office above site, St Cross Street elevation
- AP3 – ground floor window to Paragon House offices, opposite site on St Cross Street
- AP4 – front window to second floor flat, 71 Farringdon Road
- AP5 – window to fourth floor flat above site, St Cross Street elevation

4.2.5 Our calculations have taken into account duct end reflections, grille directivities, radiation, distance and reflections from the receptor façade as appropriate. Since the condensers are set back behind the façade overlooking St Cross Street, losses have been included for screening where assessing noise transmitted from these units to receptors further up the same façade.

4.2.6 The calculations are set out in the attached Appendix A.

4.3 Mitigation

4.3.1 Atmospheric side silencers are required for the intakes of each supply AHU and the exhaust of the extract fan. The silencers must meet the insertion losses shown in the following table.

Silencer	Minimum Insertion Loss (dB) @ Octave Band Centred Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
ATT1 – Ground floor AHU inlet	4	8	14	21	27	27	21	16
ATT2 – Basement AHU inlet	7	12	20	33	39	40	35	28
ATT3 – Extract fan exhaust	9	18	36	43	45	35	25	19

T4 Minimum octave band transmission losses to be achieved by silencers.

4.3.2 We would expect the silencers listed below to provide the required insertion losses. However, these are given as an indication only. The insertion losses should be taken as the design criteria, and not the silencer length. Any proposed silencer should be confirmed to achieve the stated insertion losses as a minimum.

- ATT1 – 900mm long rectangular splitter silencer with 35% free area
- ATT2 – 1200mm long rectangular splitter silencer with 30% free area
- ATT3 – 1800mm long rectangular splitter silencer with 33% free area

4.3.3 It should be ensured, also, that each silencer does not introduce substantial pressure drops (limit to no more than 40Pa) such that the fan duty would increase to serve the space, or such that regenerated noise is created across the silencer. Duct terminations (e.g. grilles) should be sized to limit any pressure loss to no more than 40Pa.

4.3.4 The extract fan silencer should be Melinex faced.

4.3.5 The silencers should be located within the demise of the building, close to the fans so that noise breakout from the duct is also reduced.

4.3.6 In order to minimise structure borne noise transmission, the extract and supply fans should be installed on suitable AV hangers, and be joined to the rigid ductwork using flexible connections.

4.3.7 Attenuation of noise from the two condensers will also be required. This should be achieved using acoustic louvres in the doors in front of the units. The minimum insertion losses for these louvres are shown in the following table.

Louvres	Minimum Transmission Loss (dB) @ Octave Band Centred Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
LOU1 – louvred condenser doors	4	5	7	9	13	13	12	10

T5 Minimum octave band transmission losses to be achieved by acoustic louvres

4.3.8 The stated louvre insertion losses should be achievable using 150mm deep acoustic louvres. The doors will also need effective seals around their full perimeter, including the thresholds and the rebate between the two.

4.3.9 Any other materials, e.g. cladding panels, that form part of the section of façade in front of the condensers shall have a minimum mass per unit area of 10kg/m^2 to minimise noise breakout from any paths other than the acoustic louvres.

4.4 Results

4.4.1 Based on the mitigation measures described above, we predict noise levels at the assessment positions as presented in the table below, alongside the plant noise limits specified above.

Location	Predicted Noise Level, dB(A) *Noise Emission Limit, dB(A)*	
	Day (0700-1900)	Evening/night (1900-0700)
AP1 – Office (Farringdon Road)	46 *(46)*	-
AP2 – Office (St Cross Street above site)	42 *(42)*	-
AP3 – Office (St Cross Street opposite site)	42 *(42)*	-
AP4 – Residential (Farringdon Road)	29 *(46)*	29 *(37)*
AP5 – Residential (St Cross Street)	31 *(42)*	31 *(35)*

T6 Predicted plant noise emission levels at the most exposed residential windows

4.4.2 It can be seen from the table above that the limits are expected to be met at all sensitive receptors during all relevant time periods. Calculation results have been presented here for the scenario where all plant will run, to account for the proposed opening hours, which include the quietest night time period. In reality, however, noise levels will be lower between 0500 and 1000 hours when the takeaway is not trading and only the cold room condenser will run.

4.4.3 Octave band results are provided in Appendix A. No tonal features are expected to be apparent in the noise spectrum at each receptor, hence no penalty corrections have been applied.

5 Delivery Noise

5.1 **Methodology**

National Planning Policy Framework

5.1.1 In the National Planning Policy Framework (NPPF) specifically on the subject of noise, paragraph 123 states:

Planning policies and decisions should aim to:

Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;

Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development including through the use of conditions;

Recognise that development will often create some noise and existing business wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established, and

Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for the recreational and amenity value for this reason.

5.1.2 While the NPPF does not provide any technical guidance on noise, the intention is that the planning system should seek to deter development that will give rise to significant adverse noise effects, but not stand in the way of reasonable development, with predicted noise impacts being mitigated as necessary and practicable.

5.1.3 It is appropriate to assess the impact of noise level change due to delivery and customer activity rather than absolute noise levels.

DMRB, Guidelines for Environmental Noise Impact Assessment (2014)

5.1.4 The proposed assessment methodology is based upon guidance contained within DMRB, *Guidelines for Environmental Noise Impact Assessment* (2014).

5.1.5 Vehicle movements are likely to vary significantly over the course of a day and night time, for example during rush hours. It is therefore not appropriate to only consider noise levels in terms of $L_{Aeq,16hour}$ and $L_{Aeq,8hour}$ for full day and night time periods respectively, as these indices may not properly reflect the variable nature of traffic on roads. Instead, changes in noise level are

assessed in terms of $L_{Aeq,1\ hour}$ for each hour deemed significant. The significance of the change in a given period can then be determined.

Noise Change	Magnitude of Impact	
dB(A)	**Short Term**	**Long Term**
0	No change	No change
0.1 to 0.9	Negligible	Negligible
1.0 to 2.9	Minor	Negligible
3.0 to 4.9	Moderate	Minor
5.0 to 9.9	Major	Moderate
10+	Major	Major

T7 Noise impact descriptors

5.1.6 Table T8 shows criteria by which noise impact from the proposed operations will be assessed in relation to the nearby noise sensitive receptors, in line with DMRB guidance.

5.1.7 The new noise sources will also be introduced to the existing noise climate over a relatively short period of time and traffic flows are not expected to vary between the long and short term after opening. Assessing the short term impact can therefore be considered to be the worst case methodology for accurate assessment.

5.1.8 When considering the magnitude of impact from development, impacts equal to 'Negligible' or 'Minor' would be expected to be consistent with the requirements of the NPPF, avoiding significant adverse effects to residents, and not providing unreasonable barriers to development. This value can therefore be quantified as an increase of less than 3 dB to the existing noise levels.

5.2 Assessment

5.2.1 It is proposed that vehicles making deliveries will arrive at and depart from the motorcycle parking bays to the west of the site on St Cross Street. Deliveries are to be made by mopeds only.

5.2.2 Delivery drivers operate individually and therefore do not make noise talking to one another as they arrive and depart. The noise is limited to arrival and departure of individual mopeds.

5.2.3 Typical vehicle arrival and departure noise levels recorded at 1m from the store front of an existing pizza delivery premises, 5m back from the street side parking bays that were utilised, are tabulated below.

Activity	Measured Sound Level, L_{Ae} dB
Moped arrival at 5m (façade incident noise level)	70
Moped engine starting at 5m (façade incident noise level)	75
Moped departure at 5m (façade incident noise level)	70

T8 Summary noise levels for vehicle arrival and departures

5.2.4 Expected numbers of delivery arrivals and departures for the busiest evening and night time periods are tabulated below. These have been derived from numbers of deliveries from an existing store (Whiteladies Road, Bristol) that opens until 0500 hours, by comparing the estimated sales levels of the proposed and existing outlets.

Time period	Predicted Delivery Numbers
1900-2000	22
2000-2100	17
2100-2200	10
2200-2300	6
2300-0000	6
0000-0100	6
0100-0200	6
0200-0300	5
0300-0400	4
0400-0500	4

T9 Predicted movement associated with delivery operations

5.2.5 Two assessment positions have been selected to represent the nearest and most exposed residential receptors to noise from vehicle movements associated with delivery activity, AP4 and AP5, as described in section 4.2 above. Noise levels at both locations have been calculated using the noise data shown in table T9 and corrections for distance and angle of view relative to each section of the routes traversed by delivery mopeds.

5.2.6 The assessment is based on the assumption that all delivery vehicles will pass both receptors while approaching and departing from the motorcycle parking bays. This is pessimistic as Farringdon Road and St Cross Street both permit two-way traffic and, depending on the delivery location, not all trips will involve passing one or both receptors.

5.2.7 The changes to noise levels resulting from deliveries at the residences have been calculated for each hour between 1900-0500, based on the assumptions stated above and using the lowest ambient noise level measured over each hourly period during the four nights of the survey. Evenings and night time represent the worst case scenario with respect to potential impacts due to the lower ambient noise levels and higher demand. This assessment is inherently pessimistic and therefore considered suitably robust.

5.2.8 The results of the calculations are summarised in the tables below and evaluated against the assessment criteria defined in section 5.1 above.

AP4 (2nd floor flat, Farringdon Road)					
Time period	**Ambient, dB $L_{Aeq,1h}$**	**Delivery noise level dB $L_{Aeq,\ 1h}$**	**Total noise level, dB $L_{Aeq\ ,1h}$**	**Increase in noise levels, dB**	**Impact**
1900-2000	66.4	50.3	66.5	0.1	Negligible
2000-2100	67.3	49.1	67.4	0.1	Negligible
2100-2200	64.9	46.8	65.0	0.1	Negligible
2200-2300	65.5	44.6	65.5	0	No change
2300-0000	66.9	44.6	66.9	0	No change
0000-0100	65.0	44.6	65.0	0	No change
0100-0200	63.5	44.6	63.6	0.1	Negligible
0200-0300	63.6	43.8	63.6	0	No change
0300-0400	64.5	42.9	64.5	0	No change
0400-0500	63.2	42.9	63.2	0	No change

T10 Predicted noise impact associated with delivery operations (AP4)

AP5 (4th floor flat, St Cross Street)					
Time period	**Ambient, dB $L_{Aeq,1h}$**	**Delivery noise level dB $L_{Aeq,\ 1h}$**	**Total noise level, dB $L_{Aeq\ ,1h}$**	**Increase in noise levels, dB**	**Impact**
1900-2000	62.2	48.7	62.2	0.2	Negligible
2000-2100	63.0	47.5	63.0	0.1	Negligible
2100-2200	60.6	45.2	60.6	0.1	Negligible
2200-2300	61.2	43.0	61.2	0.1	Negligible
2300-0000	61.7	43.0	61.7	0.1	Negligible
0000-0100	60.5	43.0	60.5	0.1	Negligible
0100-0200	58.7	43.0	58.7	0.1	Negligible
0200-0300	59.0	42.2	59.0	0.1	Negligible
0300-0400	59.6	41.3	59.6	0.1	Negligible
0400-0500	58.4	41.3	58.4	0.1	Negligible

T11 Predicted noise impact associated with delivery operations (AP5)

5.2.9 Section 5.1 explains that impact values equating to negligible or minor should be viewed as compliant with the amenity requirements of the NPPF, whilst not causing unreasonable barriers to development. The results in tables T10 and T11 therefore show that the impacts due to delivery movements are expected to comply with the NPPF amenity requirements.

5.2.10 The reason for the avoidance of significant impacts is the large amount of existing traffic on the local road network. Not only will there be little change to the noise levels but the character of the delivery noise is consistent with the existing sources that already contribute to the noise climate.

5.2.11 For residences further away, any impact would be less than that assessed at the most exposed positions considered above.

5.2.12 It is also relevant to note that the proposed takeaway would be a Domino's Pizza outlet. These differ from other takeaways in that all the food is cooked to order. Therefore, the vast majority of orders are placed on the internet or by phone, with either delivery drivers taking food out or customer pickups. Only a small number of customers order at the counter and then takeaway.

5.2.13 Therefore, in conclusion the assessment shows there is no requirement for mitigation of the delivery related noise.

6 Conclusions

6.1 It is proposed to convert the existing jewellery shop and showroom (Class A1) at 73 Farringdon Road, London to provide a Domino's pizza takeaway (Class A5).

6.2 Cole Jarman have carried out a survey to quantify existing background and ambient noise levels at sensitive receptors near the proposed plant and delivery operation locations in front and to the side of the premises.

6.3 Plant noise limits for the new fan have been specified in accordance with the Camden Local Plan and an assessment of the proposed equipment has been undertaken. Silencers have been specified for ventilation plant and louvred doors in front of the condensers in order to keep noise levels below the criteria at nearby sensitive receptors.

6.4 An assessment of noise generated by pizza delivery activities has determined that the impact on the nearest dwellings will be no greater than 'Negligible', compliant with the aims of the NPPF to protect residential amenity. Therefore, the impact due to noise from deliveries is considered to be acceptable.

End of Section

Glossary of Acoustic Terms

L_{Aeq}:

The notional steady sound level (in dB) which over a stated period of time, would have the same A-weighted acoustic energy as the A-weighted fluctuating noise measurement over that period. Values are sometimes written using the alternative expression dB(A) L_{eq}.

L_{Amax}:

The maximum A-weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise when occasional loud noises occur, which may have little effect on the L_{Aeq} noise level. Unless described otherwise, L_{Amax} is measured using the "fast" sound level meter response.

L_{A10} & L_{A90}:

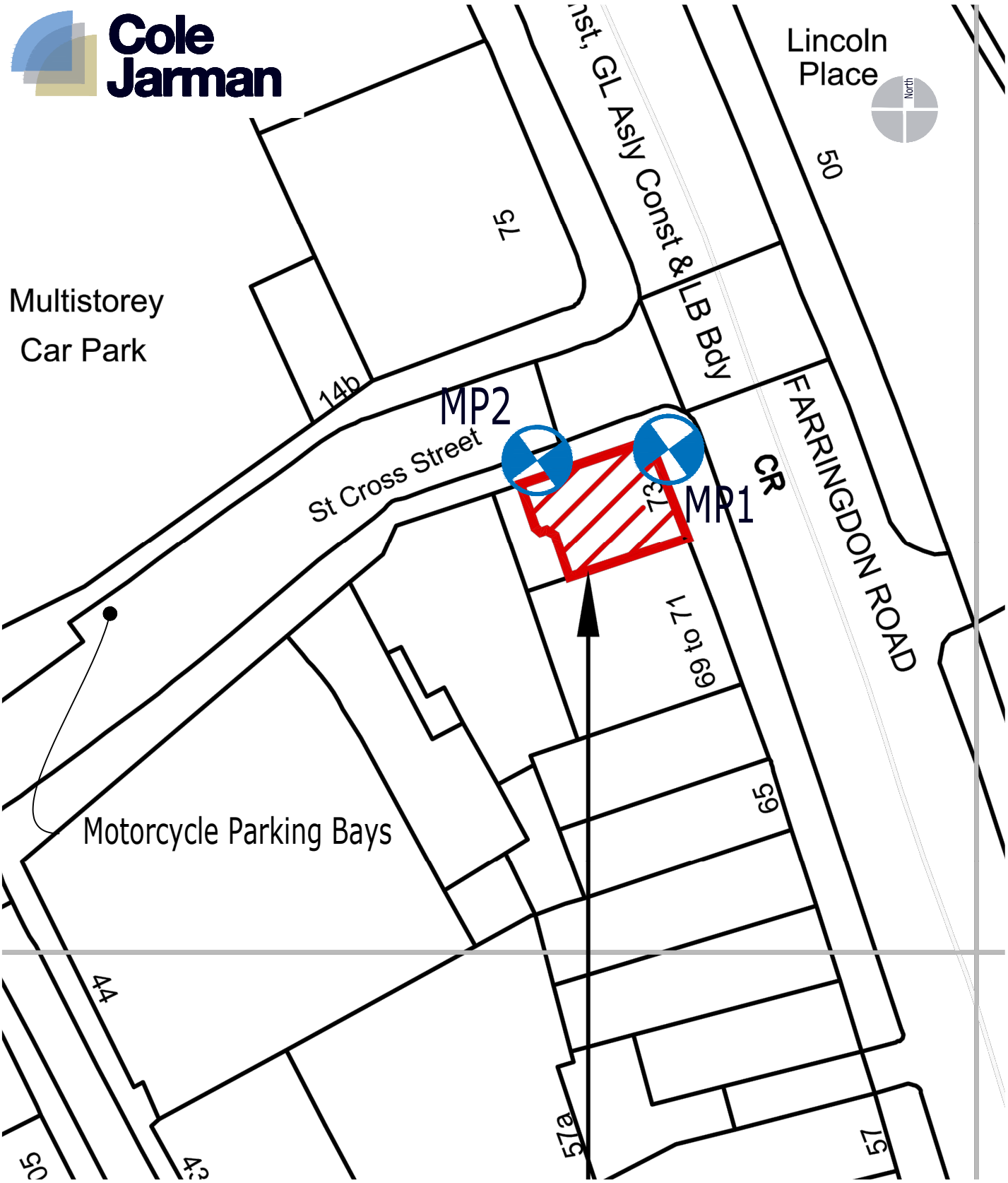
If non-steady noise is to be described, it is necessary to know both its level and degree of fluctuation. The L_{An} indices are used for this purpose. The term refers to the A-weighted level (in dB) exceeded for n% of the time specified. L_{A10} is the level exceeded for 10% of the time and as such gives an indication of the upper limit of fluctuating noise. Similarly, L_{A90} gives an indication of the lower levels of fluctuating noise. It is often used to define the background noise.

L_{A10} is commonly used to describe traffic noise. Values of dB L_{An} are sometimes written using the alternative expression dB(A) L_{n}.

L_{AX}, L_{AE} or SEL

The single event noise exposure level which, when maintained for 1 second, contains the same quantity of sound energy as the actual time varying level of one noise event. L_{AX} values for contributing noise sources can be considered as individual building blocks in the construction of a calculated value of L_{Aeq} for the total noise. The L_{AX} term can sometimes be referred to as Exposure Level (L_{AE}) or Single Event Level (SEL).

End of Section



Title: Site plan showing noise measurement positions

Figure 19/0289/F1

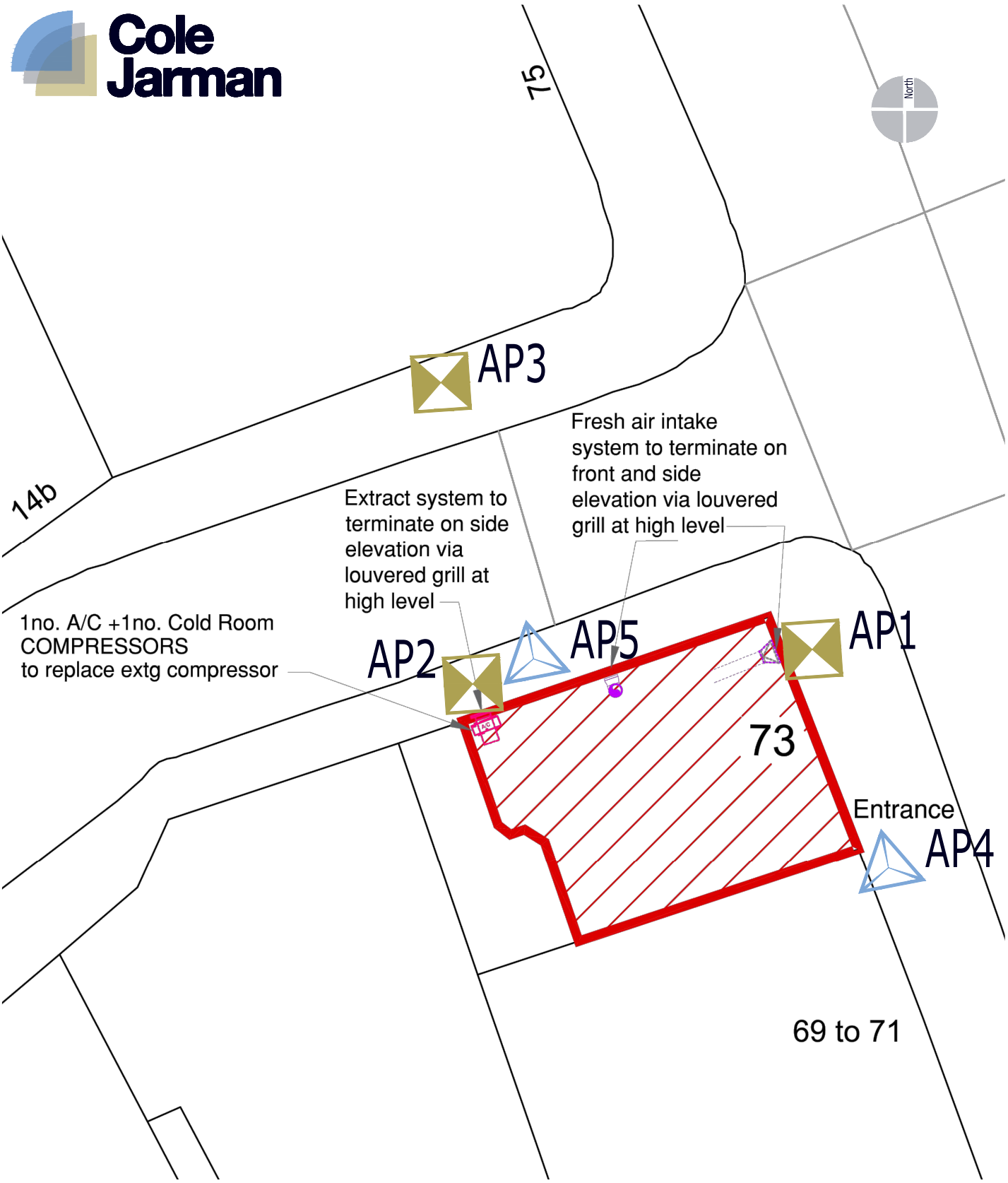
Project: Domino's, 73 Farringdon Road

Date: 6 June 2019 Revision: -

Scale: Not to scale

Cole Jarman Limited
t +44 (0)1932 829007 f +44 (0)1932 829003

John Cree House, 24B High Street, Addlestone, Surrey KT15 1TN
e info@colejarman.com w www.colejarman.com



Title: Site plan showing plant and assessment positions

Figure 19/0289/F2

Project: Domino's, 73 Farringdon Road

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Scale: Not to scale

Cole Jarman Limited
t +44 (0)1932 829007 f +44 (0)1932 829003
John Cree House, 24B High Street, Addlestone, Surrey KT15 1TN
e info@colejarman.com w www.colejarman.com

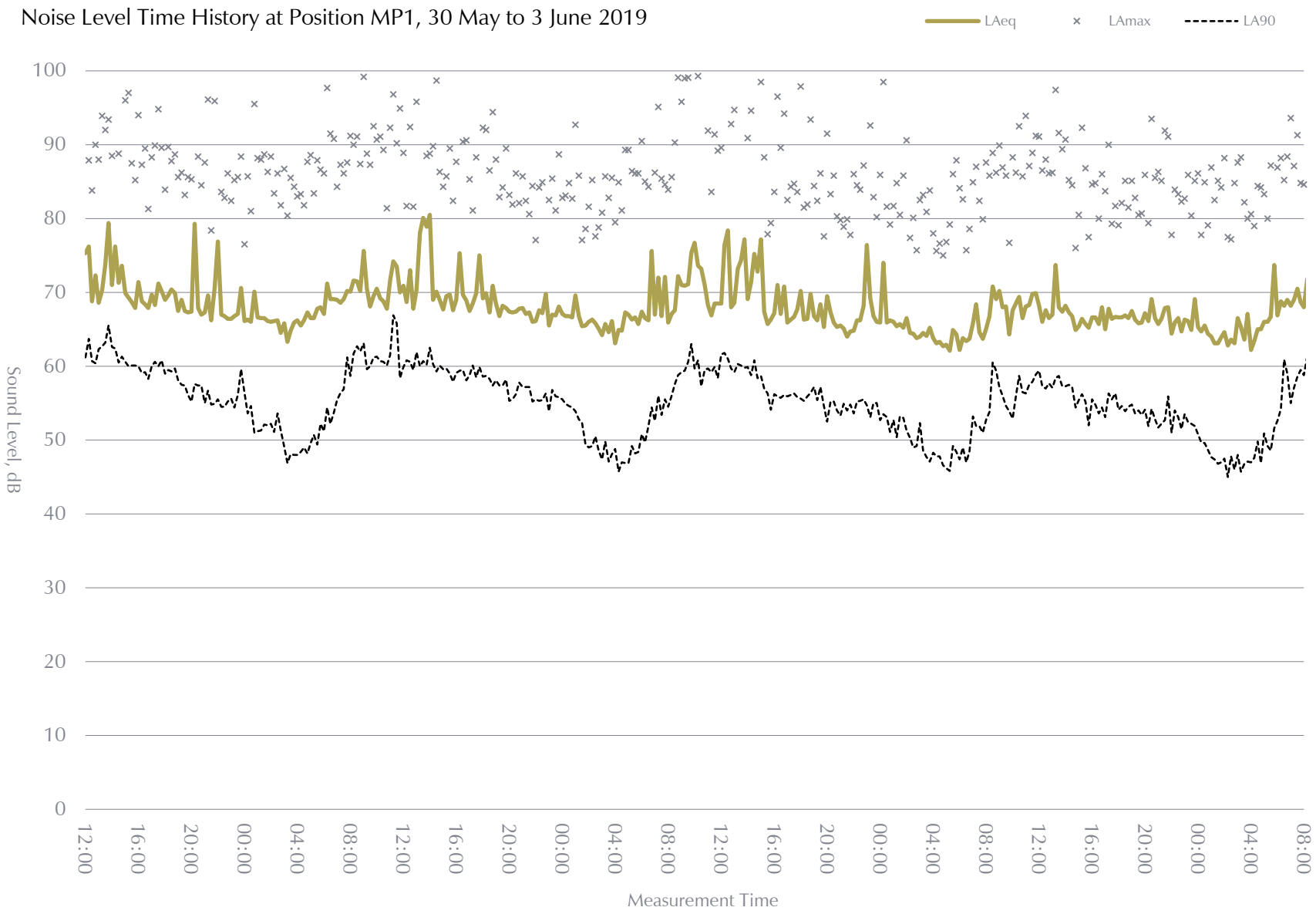


Figure 19/0289/TH01

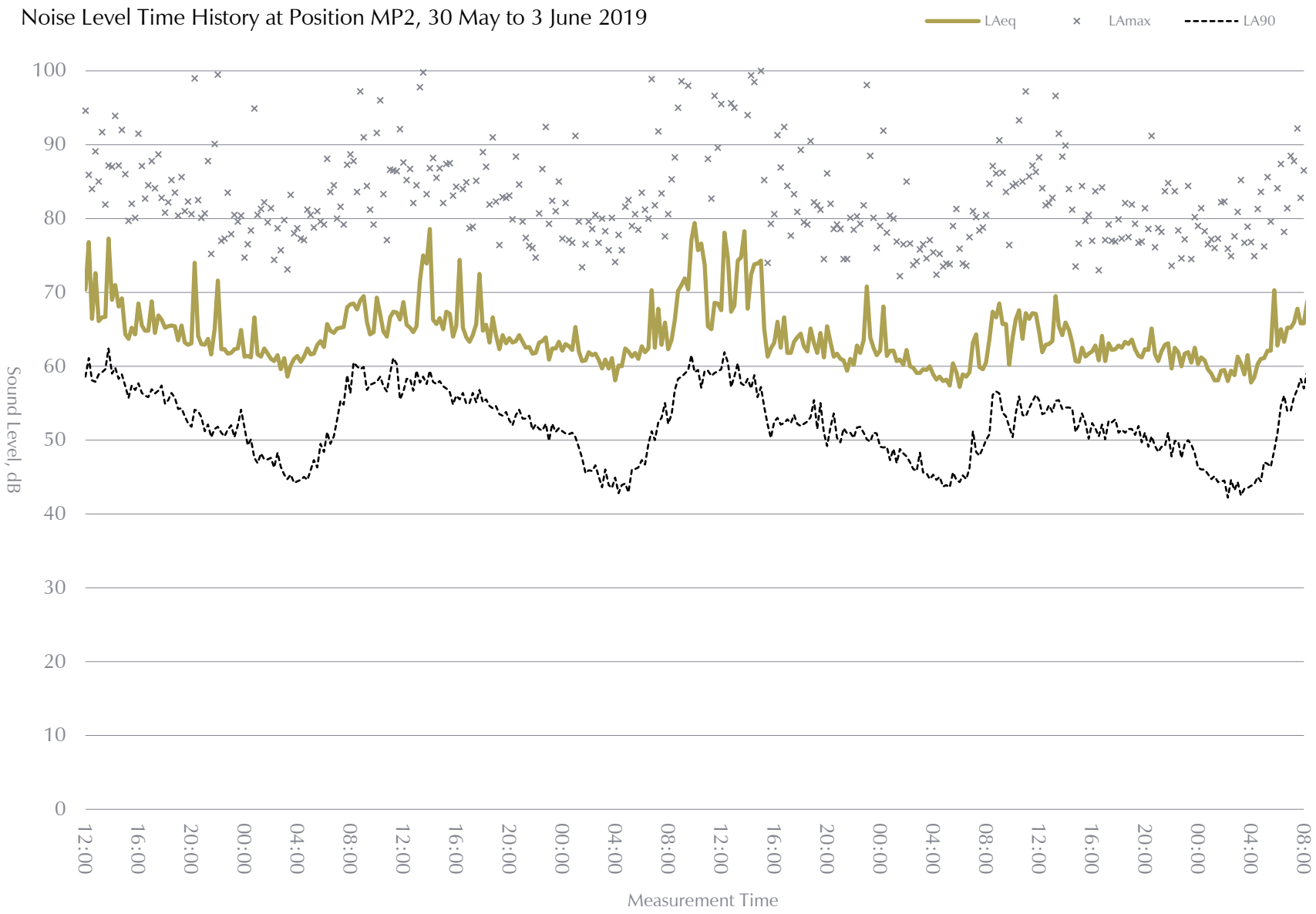


Figure 19/0289/TH02

AHU1 to AP1

		Octave Band Centre Frequency (Hz)							
		63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Noise Source									
Noise Source - AHU1									
Sound Power Levels		**77.0**	**77.0**	**78.0**	**76.0**	**78.0**	**75.0**	**73.0**	**66.0**
Silencer									
Silencer - ATT1									
		-4.0	*-8.0*	*-14.0*	*-21.0*	*-27.0*	*-27.0*	*-21.0*	*-16.0*
End Reflection									
Width/Diameter	750.0								
Length	500.0								
Rec or Circ - Rectangular									
Free or Flush - Flush									
		0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
External Grille Directivity									
Width (m)	0.8								
Height (m)	0.5								
Vertical (°)	70.0								
Horizontal (°)	0.0								
		0.5	*1.0*	*1.5*	*1.5*	*2.0*	*1.5*	*1.5*	*1.5*
Point Source Radiation Loss									
Radiation - Hemispherical									
		-8.0	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*
Point Source Distance Loss									
End Distance (m)	2.5								
		-8.0	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
External Receiver								
External Receiver - AP1								
Sound Pressure, Lp	**57.6**	**54.1**	**49.6**	**40.6**	**37.1**	**33.6**	**37.6**	**35.6**

AHU1 to AP4

		Octave Band Centre Frequency (Hz)							
		63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Noise Source									
Noise Source - AHU1									
Sound Power Levels		**77.0**	**77.0**	**78.0**	**76.0**	**78.0**	**75.0**	**73.0**	**66.0**
Silencer									
Silencer - ATT1									
		-4.0	*-8.0*	*-14.0*	*-21.0*	*-27.0*	*-27.0*	*-21.0*	*-16.0*
End Reflection									
Width/Diameter	750.0								
Length	500.0								
Rec or Circ - Rectangular									
Free or Flush - Flush									
		0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
External Grille Directivity									
Width (m)	0.8								
Height (m)	0.5								
Vertical (°)	80.0								
Horizontal (°)	80.0								
		-0.5	*-1.0*	*-2.0*	*-2.0*	*-7.0*	*-15.0*	*-15.0*	*-15.0*
Point Source Radiation Loss									
Radiation - Hemispherical									
		-8.0	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*
Point Source Distance Loss									
End Distance (m)	10.0								
		-20.0	*-20.0*	*-20.0*	*-20.0*	*-20.0*	*-20.0*	*-20.0*	*-20.0*

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
External Receiver								
External Receiver - AP4								
Sound Pressure, Lp	**44.5**	**40.0**	**34.0**	**25.0**	**16.0**	**5.0**	**9.0**	**7.0**

AHU2 to AP2

		Octave Band Centre Frequency (Hz)							
		63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Noise Source									
Noise Source - AHU2									
Sound Power Levels		**77.0**	**77.0**	**78.0**	**76.0**	**78.0**	**75.0**	**73.0**	**66.0**
Silencer									
Silencer - ATT2									
		-7.0	*-12.0*	*-20.0*	*-33.0*	*-39.0*	*-40.0*	*-35.0*	*-28.0*
End Reflection									
Width/Diameter	400.0								
Length	400.0								
Rec or Circ - Rectangular									
Free or Flush - Flush									
		0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
External Grille Directivity									
Width (m)	0.5								
Height (m)	0.5								
Vertical (°)	70.0								
Horizontal (°)	60.0								
		0.0	*0.0*	*0.0*	*-1.0*	*-1.0*	*-3.0*	*-3.0*	*-3.0*
Point Source Radiation Loss									
Radiation - Hemispherical									
		-8.0	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*
Point Source Distance Loss									
End Distance (m)	5.5								
		-14.8	*-14.8*	*-14.8*	*-14.8*	*-14.8*	*-14.8*	*-14.8*	*-14.8*

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
External Receiver								
External Receiver - AP2								
Sound Pressure, Lp	**47.2**	**42.2**	**35.2**	**19.2**	**15.2**	**9.2**	**12.2**	**12.2**

AHU2 to AP3

		Octave Band Centre Frequency (Hz)							
		63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Noise Source									
Noise Source - AHU2									
Sound Power Levels		**77.0**	**77.0**	**78.0**	**76.0**	**78.0**	**75.0**	**73.0**	**66.0**
Silencer									
Silencer - ATT2									
		-7.0	*-12.0*	*-20.0*	*-33.0*	*-39.0*	*-40.0*	*-35.0*	*-28.0*
End Reflection									
Width/Diameter	400.0								
Length	400.0								
Rec or Circ - Rectangular									
Free or Flush - Flush									
		0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
External Grille Directivity									
Width (m)	0.5								
Height (m)	0.5								
Vertical (°)	0.0								
Horizontal (°)	0.0								
		1.0	*2.0*	*3.0*	*4.0*	*5.0*	*6.0*	*6.0*	*6.0*
Point Source Radiation Loss									
Radiation - Quarterspherical									
		-5.0	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*
Point Source Distance Loss									
End Distance (m)	10.5								
		-20.4	*-20.4*	*-20.4*	*-20.4*	*-20.4*	*-20.4*	*-20.4*	*-20.4*

		Octave Band Centre Frequency (Hz)							
		63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Facade Reflection									
Reflection (dB)	3.0								
		3.0	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*
External Receiver									
External Receiver - AP3									
Sound Pressure, Lp		**48.6**	**44.6**	**38.6**	**24.6**	**21.6**	**18.6**	**21.6**	**21.6**

AHU2 to AP5

		Octave Band Centre Frequency (Hz)							
		63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Noise Source									
Noise Source - AHU2									
Sound Power Levels		**77.0**	**77.0**	**78.0**	**76.0**	**78.0**	**75.0**	**73.0**	**66.0**
Silencer									
Silencer - ATT2									
		-7.0	*-12.0*	*-20.0*	*-33.0*	*-39.0*	*-40.0*	*-35.0*	*-28.0*
End Reflection									
Width/Diameter	400.0								
Length	400.0								
Rec or Circ - Rectangular									
Free or Flush - Flush									
		0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
External Grille Directivity									
Width (m)	0.5								
Height (m)	0.5								
Vertical (°)	85.0								
Horizontal (°)	0.0								
		0.2	*0.5*	*0.5*	*1.0*	*-1.0*	*-4.5*	*-4.5*	*-4.5*
Point Source Radiation Loss									
Radiation - Quarterspherical									
		-5.0	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*
Point Source Distance Loss									
End Distance (m)	14.5								
		-23.2	*-23.2*	*-23.2*	*-23.2*	*-23.2*	*-23.2*	*-23.2*	*-23.2*

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
External Receiver								
External Receiver - AP5								
Sound Pressure, Lp	**42.1**	**37.3**	**30.3**	**15.8**	**9.8**	**2.3**	**5.3**	**5.3**

EF1 to AP2

		Octave Band Centre Frequency (Hz)							
		63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Noise Source									
Noise Source - EF1									
Sound Power Levels		**86.0**	**85.0**	**83.0**	**77.0**	**73.0**	**71.0**	**65.0**	**59.0**
Silencer									
Silencer - ATT3									
		-9.0	*-18.0*	*-36.0*	*-43.0*	*-45.0*	*-35.0*	*-25.0*	*-19.0*
End Reflection									
Width/Diameter	500.0								
Length	500.0								
Rec or Circ - Rectangular									
Free or Flush - Flush									
		0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
External Grille Directivity									
Width (m)	0.5								
Height (m)	0.5								
Vertical (°)	70.0								
Horizontal (°)	0.0								
		0.5	*1.0*	*1.5*	*1.5*	*2.0*	*1.5*	*1.5*	*1.5*
Point Source Radiation Loss									
Radiation - Hemispherical									
		-8.0	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*
Point Source Distance Loss									
End Distance (m)	2.5								
		-8.0	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
External Receiver								
External Receiver - AP2								
Sound Pressure, Lp	**61.6**	**52.1**	**32.6**	**19.6**	**14.1**	**21.6**	**25.6**	**25.6**

EF1 to AP3

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - EF1									
Sound Power Levels		**86.0**	**85.0**	**83.0**	**77.0**	**73.0**	**71.0**	**65.0**	**59.0**
Silencer									
Silencer - ATT3									
		-9.0	*-18.0*	*-36.0*	*-43.0*	*-45.0*	*-35.0*	*-25.0*	*-19.0*
End Reflection									
Width/Diameter	500.0								
Length	500.0								
Rec or Circ - Rectangular									
Free or Flush - Flush									
		0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
External Grille Directivity									
Width (m)	0.5								
Height (m)	0.5								
Vertical (°)	0.0								
Horizontal (°)	0.0								
		1.0	*2.0*	*3.0*	*4.0*	*5.0*	*6.0*	*6.0*	*6.0*
Point Source Radiation Loss									
Radiation - Quarterspherical									
		-5.0	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*
Point Source Distance Loss									
End Distance (m)	10.5								
		-20.4	*-20.4*	*-20.4*	*-20.4*	*-20.4*	*-20.4*	*-20.4*	*-20.4*

		Octave Band Centre Frequency (Hz)							
		63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Facade Reflection									
Reflection (dB)	3.0								
		3.0	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*
External Receiver									
External Receiver - AP3									
Sound Pressure, Lp		**55.6**	**46.6**	**27.6**	**15.6**	**10.6**	**19.6**	**23.6**	**23.6**

EF1 to AP5

		Octave Band Centre Frequency (Hz)							
		63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Noise Source									
Noise Source - EF1									
Sound Power Levels		**86.0**	**85.0**	**83.0**	**77.0**	**73.0**	**71.0**	**65.0**	**59.0**
Silencer									
Silencer - ATT3									
		-9.0	*-18.0*	*-36.0*	*-43.0*	*-45.0*	*-35.0*	*-25.0*	*-19.0*
End Reflection									
Width/Diameter	500.0								
Length	500.0								
Rec or Circ - Rectangular									
Free or Flush - Flush									
		0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
External Grille Directivity									
Width (m)	0.5								
Height (m)	0.5								
Vertical (°)	85.0								
Horizontal (°)	0.0								
		0.2	*0.5*	*0.5*	*1.0*	*-1.0*	*-4.5*	*-4.5*	*-4.5*
Point Source Radiation Loss									
Radiation - Quarterspherical									
		-5.0	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*
Point Source Distance Loss									
End Distance (m)	14.5								
		-23.2	*-23.2*	*-23.2*	*-23.2*	*-23.2*	*-23.2*	*-23.2*	*-23.2*

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
External Receiver								
External Receiver - AP5								
Sound Pressure, Lp	**49.1**	**39.3**	**19.3**	**6.8**	**-1.2**	**3.3**	**7.3**	**7.3**

CU1 to AP2

		Octave Band Centre Frequency (Hz)							
		63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Noise Source									
Noise Source - CU1									
Sound Power Levels		**81.0**	**77.0**	**71.0**	**69.0**	**70.0**	**64.0**	**58.5**	**56.0**
Point Source Radiation Loss									
Radiation - Quarterspherical									
		-5.0	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*
Silencer									
Silencer - LOU1									
		-4.0	*-5.0*	*-7.0*	*-9.0*	*-13.0*	*-13.0*	*-12.0*	*-10.0*
Point Source Distance Loss									
End Distance (m)	5.5								
		-14.8	*-14.8*	*-14.8*	*-14.8*	*-14.8*	*-14.8*	*-14.8*	*-14.8*
Maekawa Screening Loss									
Path Difference (m)	0.0								
		-4.8	*-4.8*	*-4.8*	*-4.8*	*-4.8*	*-4.8*	*-4.8*	*-4.8*
External Receiver									
External Receiver - AP2									
Sound Pressure, Lp		**52.5**	**47.5**	**39.5**	**35.5**	**32.5**	**26.5**	**22.0**	**21.5**

CU1 to AP3

		Octave Band Centre Frequency (Hz)							
		63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Noise Source									
Noise Source - CU1									
Sound Power Levels		**81.0**	**77.0**	**71.0**	**69.0**	**70.0**	**64.0**	**58.5**	**56.0**
Point Source Radiation Loss									
Radiation - Quarterspherical									
		-5.0	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*
Silencer									
Silencer - LOU1									
		-4.0	*-5.0*	*-7.0*	*-9.0*	*-13.0*	*-13.0*	*-12.0*	*-10.0*
Point Source Distance Loss									
End Distance (m)	11.0								
		-20.8	*-20.8*	*-20.8*	*-20.8*	*-20.8*	*-20.8*	*-20.8*	*-20.8*
Facade Reflection									
Reflection (dB)	3.0								
		3.0	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*
External Receiver									
External Receiver - AP3									
Sound Pressure, Lp		**54.2**	**49.2**	**41.2**	**37.2**	**34.2**	**28.2**	**23.7**	**23.2**

CU1 to AP5

		Octave Band Centre Frequency (Hz)							
		63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Noise Source									
Noise Source - CU1									
Sound Power Levels		**81.0**	**77.0**	**71.0**	**69.0**	**70.0**	**64.0**	**58.5**	**56.0**
Point Source Radiation Loss									
Radiation - Quarterspherical									
		-5.0	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*
Silencer									
Silencer - LOU1									
		-4.0	*-5.0*	*-7.0*	*-9.0*	*-13.0*	*-13.0*	*-12.0*	*-10.0*
Point Source Distance Loss									
End Distance (m)	17.0								
		-24.6	*-24.6*	*-24.6*	*-24.6*	*-24.6*	*-24.6*	*-24.6*	*-24.6*
Maekawa Screening Loss									
Path Difference (m)	0.0								
		-5.0	*-5.2*	*-5.5*	*-6.2*	*-7.3*	*-8.8*	*-10.9*	*-13.4*
External Receiver									
External Receiver - AP5									
Sound Pressure, Lp		**42.4**	**37.2**	**28.9**	**24.2**	**20.2**	**12.6**	**6.0**	**3.1**

CU2 to AP2

		Octave Band Centre Frequency (Hz)							
		63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Noise Source									
Noise Source - CU2									
Sound Power Levels		**49.0**	**56.0**	**60.0**	**62.0**	**59.0**	**56.0**	**52.0**	**44.0**
Point Source Radiation Loss									
Radiation - Quarterspherical									
		-5.0	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*
Silencer									
Silencer - LOU1									
		-4.0	*-5.0*	*-7.0*	*-9.0*	*-13.0*	*-13.0*	*-12.0*	*-10.0*
Point Source Distance Loss									
End Distance (m)	4.5								
		-13.1	*-13.1*	*-13.1*	*-13.1*	*-13.1*	*-13.1*	*-13.1*	*-13.1*
Maekawa Screening Loss									
Path Difference (m)	0.1								
		-5.5	*-6.0*	*-7.0*	*-8.5*	*-10.5*	*-12.9*	*-15.5*	*-18.3*
External Receiver									
External Receiver - AP2									
Sound Pressure, Lp		**21.5**	**26.9**	**27.9**	**26.5**	**17.5**	**12.1**	**6.4**	**-2.4**

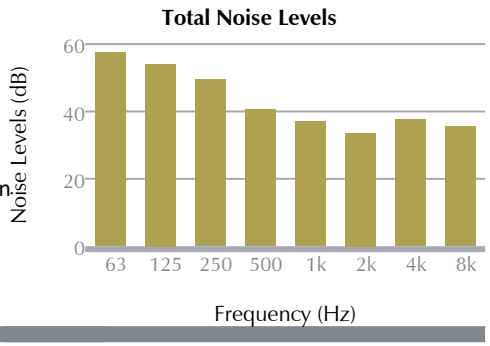
CU2 to AP3

		Octave Band Centre Frequency (Hz)							
		63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Noise Source									
Noise Source - CU2									
Sound Power Levels		**49.0**	**56.0**	**60.0**	**62.0**	**59.0**	**56.0**	**52.0**	**44.0**
Point Source Radiation Loss									
Radiation - Quarterspherical									
		-5.0	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*
Silencer									
Silencer - LOU1									
		-4.0	*-5.0*	*-7.0*	*-9.0*	*-13.0*	*-13.0*	*-12.0*	*-10.0*
Point Source Distance Loss									
End Distance (m)	11.0								
		-20.8	*-20.8*	*-20.8*	*-20.8*	*-20.8*	*-20.8*	*-20.8*	*-20.8*
Facade Reflection									
Reflection (dB)	3.0								
		3.0	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*
External Receiver									
External Receiver - AP3									
Sound Pressure, Lp		**22.2**	**28.2**	**30.2**	**30.2**	**23.2**	**20.2**	**17.2**	**11.2**

CU2 to AP5

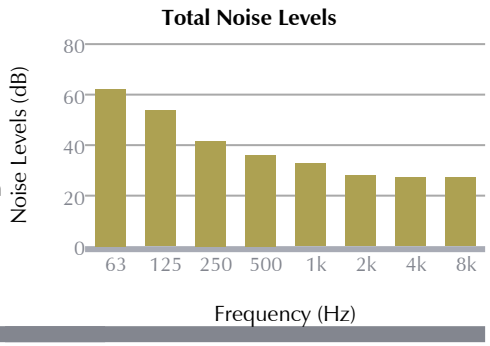
		Octave Band Centre Frequency (Hz)							
		63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Noise Source									
Noise Source - CU2									
Sound Power Levels		**49.0**	**56.0**	**60.0**	**62.0**	**59.0**	**56.0**	**52.0**	**44.0**
Point Source Radiation Loss									
Radiation - Quarterspherical									
		-5.0	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*	*-5.0*
Silencer									
Silencer - LOU1									
		-4.0	*-5.0*	*-7.0*	*-9.0*	*-13.0*	*-13.0*	*-12.0*	*-10.0*
Point Source Distance Loss									
End Distance (m)	16.0								
		-24.1	*-24.1*	*-24.1*	*-24.1*	*-24.1*	*-24.1*	*-24.1*	*-24.1*
Maekawa Screening Loss									
Path Difference (m)	0.1								
		-6.0	*-6.9*	*-8.3*	*-10.2*	*-12.6*	*-15.2*	*-18.0*	*-20.0*
External Receiver									
External Receiver - AP5									
Sound Pressure, Lp		**10.0**	**15.0**	**15.6**	**13.7**	**4.4**	**-1.3**	**-7.1**	**-15.1**

Project Name	Domino's, 73 Farringdon Road
Project Reference	19/0289
Receiver Reference	AP1
Description	1st floor office above site, front elevation.
Noise Limit	46
dBA	46



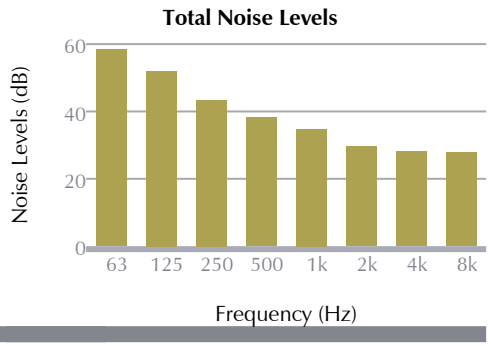
Reference	Noise Levels (dB)							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
AHU1	58	54	50	41	37	34	38	36

Project Name	Domino's, 73 Farringdon Road
Project Reference	19/0289
Receiver Reference	AP2
Description	1st floor office above site, side elevation
Noise Limit	42
dBA	42



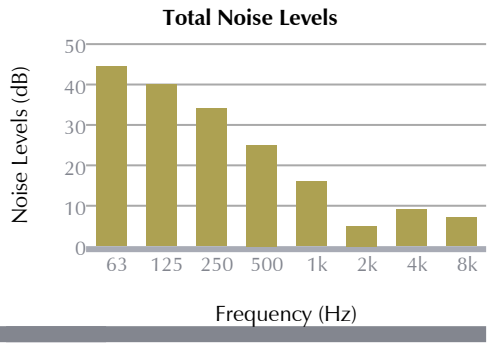
Reference	Noise Levels (dB)							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
EF1	62	52	33	20	14	22	26	26
CU1	52	47	39	35	32	26	22	21
CU2	22	27	28	26	17	12	6	-2
AHU2	47	42	35	19	15	9	12	12

Project Name	Domino's, 73 Farringdon Road
Project Reference	19/0289
Receiver Reference	AP3
Description	Gnd floor office, Paragon House
Noise Limit	42
dBA	42



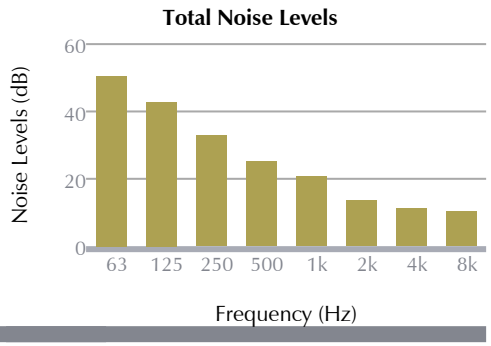
Reference	Noise Levels (dB)							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
EF1	56	47	28	16	11	20	24	24
CU1	54	49	41	37	34	28	24	23
CU2	22	28	30	30	23	20	17	11
AHU2	49	45	39	25	22	19	22	22

Project Name	Domino's, 73 Farringdon Road
Project Reference	19/0289
Receiver Reference	AP4
Description	2nd floor flat, 71 Farringdon Road
Noise Limit	37
dBA	29



Reference	Noise Levels (dB)							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
AHU1	45	40	34	25	16	5	9	7

Project Name	Domino's, 73 Farringdon Road
Project Reference	19/0289
Receiver Reference	AP5
Description	4th floor flat, 73 Farringdon Road
Noise Limit	35
dBA	31



Reference	Noise Levels (dB)							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
EF1	49	39	19	7	-1	3	7	7
AHU2	42	37	30	16	10	2	5	5
CU1	42	37	29	24	20	13	6	3
CU2	10	15	16	14	4	-1	-7	-15

Cole Jarman Limited Reg. in England and Wales No. 7102436
An RSK Company

Registered Office Spring Lodge, 172 Chester Road, Helsby WA6 0AR
www.colejarman.com info@colejarman.com

Head Office +44 (0)1932 829007
John Cree House, 24b High Street, Addlestone, Surrey, United Kingdom KT15 1TN

Manchester 0161 470 8888 | Fourways House, 57 Hilton Street, Manchester M1 2EJ
Bristol 0117 287 2633 | The Old School, Stillhouse Lane, Bristol BS3 4EB