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RESULTS OF A 24-HOUR NOISE LEVEL SURVEY CARRIED OUT ON THE EDGE OF THE ROOF OF THE MELIA WHITE HOUSE HOTEL, LONDON, NW1 AND A REPORT ON THE NOISE CONTROL MEASURES REQUIRED TO MINIMISE THE NOISE IMPACT OF THE PROPOSED NEW EXTERNAL PLANT

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Client	:	Meliá White House Hotel
Project	:	Meliá White House Hotel, Albany Street, Regents Park, NW1 3UP
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RESULTS OF A 24-HOUR NOISE LEVEL SURVEY CARRIED OUT ON THE EDGE OF THE ROOF OF THE MELIA WHITE HOUSE HOTEL, LONDON, NW1 AND A REPORT ON THE NOISE CONTROL MEASURES REQUIRED TO MINIMISE THE NOISE IMPACT OF THE PROPOSED NEW EXTERNAL PLANT

1.0. INTRODUCTION

This report details the results of a 24-hour noise survey carried out on the roof of the Meliá White House Hotel, Albany Street, London NW1 3UP.

The objectives of this survey were as follows:

- To assess the proposal to install new external plant.
- To identify the nearest properties that might be affected by noise.
- To establish the existing background noise level outside the nearest affected properties.
- To recommend noise limits and any necessary measures to ensure that the operation of the new plant does not disturb the occupants of the nearest affected properties.

This report has been divided into the following sections for ease of analysis:

2.0. SITE DESCRIPTION

The Meliá White House Hotel, Albany Street, London NW1 3UP is a substantial nine storey building standing on its own traffic island. It has a distinctive star shape on plan, and is looked on by a mixture of residential and commercial properties on the north, east and west sides. To the south of the hotel is a former church, now used for events. The attached Photo A shows an aerial view of the area.

3.0. TEST INSTRUMENTATION

All measurement equipment used during the survey complied with the requirements of BS4142:2014 “Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas”. Details of the equipment are as follows:

Integrating Sound Level Meter:	Rion type NL-52 class 1 Sound Level Meter fitted with a Rion type UC-59 ½ inch condenser microphone. Serial no.: 01121378
Statistical Analysis Modules:	Built in module capable of computing the percentile levels L1, L10, L50, L90 and L99 and also the Leq level.
Acoustic Calibrator:	Bruel & Kjaer type 4231 electronic calibrator. Serial No.: 1934160

Calibration was performed before and after the survey and found to be, in both cases, +/- 0.1 dB from the reference source.

3.1. Existing Noise Climate

Vehicular traffic travelling on the roads surrounding the hotel could be heard during the manned periods at the start and the end of the survey, so the noise levels measured will include contributions from road vehicles.

Commercial jet aircraft were observed at medium and high altitude during the manned periods at the start and the end of the survey, so it is possible that the noise levels measured could include contributions from medium altitude jet aircraft.

Existing roof mounted plant belonging to the hotel could be heard during the manned periods at the start and the end of the survey.

It was judged that road traffic and existing roof mounted plant would be the dominant sources of noise affecting the measured noise levels and the nearest affected residential properties.

4.0. TEST PROCEDURE

The survey was conducted during a continuous 24-hour period from 09.44 on Wednesday 24th May to 09.44 on Thursday 25th May 2017.

Data was continuously acquired throughout the measurement period with the individual averaging time for statistical noise data set to 15 minutes. The following 'A' weighted statistical measurements were recorded concurrently: -

LA_1 - The Sound Pressure Level exceeded for 1% of the measurement period.

LA_{10} - The Sound Pressure Level exceeded for 10% of the measurement period.

LA_{50} - The Sound Pressure Level exceeded for 50% of the measurement period.

LA_{90} - The Sound Pressure Level exceeded for 90% of the measurement period. LA90 is considered to represent the "background noise level" during the measurement period and is used for the assessment of noise to determine the likelihood of complaints (See BS 4142:2014).

LA_{99} - The Sound Pressure Level exceeded for 99% of the measurement period.

LA_{eq} - The continuous steady state Sound Pressure Level that has the same acoustic energy as the real fluctuating level.

4.1. Measurement Positions

Noise levels were measured on the north east corner of the top of building roof, at a position considered equivalent to the closest receptor property in order to enable noise predictions from the proposed plant to be compared and assessed against. The microphone was approximately 50 metres away from existing, operational roof mounted plant whilst the nearest residential window was approximately a further 10 metres away on the opposite side of the road.

The microphone was pointing vertically and was approximately 1.5 metres above roof level and was approximately 2.5 metres from the nearest reflective surface. The rest of the measurement equipment was located in a weatherproof enclosure with a low impedance cable running from the microphone to the instrumentation. The orientation and position of the microphone is shown in Photo A and Photo B in Appendix 'B' of this report.

4.2. Weather Conditions

The weather conditions prevailing during the measurement period were generally in line with those recommended in BS 4142:2014: -

Weather daytime: -	Sunny	Weather night time: -	Clear
Wind daytime: -	Calm	Wind night time: -	Calm

The microphone was protected throughout the tests by an acoustically transparent wind shield.

5.0. RESULTS AND EVALUATION OF NOISE CRITERIA

The raw test data, gathered during the noise survey, is given in Appendix 'A 'of this report.

The 'A' Weighted Leq levels measured over each 15 minute interval throughout the 24-hour period (denoted by LA_{eq}, (15 mins)) are displayed as a line graph on the attached Sketch No QF/9065/T1 in Appendix 'A' of this report.

The 'A' Weighted percentile levels measured over each 15 minute interval denoted by LA_{10} (15 mins), LA_{50} (15 mins) and LA_{90} (15 mins) are displayed as line graphs on the attached Sketch No QF/9065/T2 in Appendix 'A' of this report.

5.1. Summary of Results

The table QF/9065/D1 below summarises the noise levels taken over the 24-hour period in terms of the maximum and minimum Sound Pressure Levels recorded.

Table QF/9065/D1 – Summary of Maximum and Minimum Noise Levels

	LA_{eq}	**LA_{1}**	**LA_{10}**	**LA_{50}**	**LA_{90}**	**LA_{99}**
Minimum	55.3 dBA	57.2 dBA	56.1 dBA	55.2 dBA	54.3 dBA	53.8 dBA
Maximum	64.1 dBA	75.8 dBA	68.1 dBA	61.0 dBA	57.7 dBA	56.4 dBA

5.2. Summary of the Local Authority's planning requirements regarding noise for noise sensitive properties

The local planning authority is the London Borough of Camden Council.

Camden council has published a document entitled Development Policies (DPD) which was adopted in 2010. It is part of their Local Development Framework and should be used in conjunction with their Core Strategy document which was also adopted in 2010.

Noise from external plant and machinery must be at least 5dB less than the lowest measured LA_{90} when measured at 1 metre external to the nearest sensitive façade.

Where noise has a distinguishable discrete continuous note (while, hiss, screech, hum) the Development Plan states that noise from external plant and machinery must be at least 10dB less than the lowest measured LA_{90} when measured at 1 metre external to the nearest sensitive façade.

Where noise has distinct impulses (bangs, clicks, clatters, thumps) the Development Plan states that noise from external plant and machinery must be at least 10dB less

than the lowest measured LA_{90} when measured at 1 metre external to the nearest sensitive façade.

Where the lowest background level exceeds 60dB, then noise from external plant and machinery must be no more than 55dB when measured at 1 metre external to the nearest sensitive façade.

The background noise level should be expressed as the lowest LA_{90} during which plant or machinery is or may be in operation.

5.3. Determination of noise sensitive property design criteria

The new plant will may be intermittent and may contain tones. Based on the local authority's planning requirements outlined above, the new plant should be designed to be 10dB below the minimum existing LA_{90} background noise level during the relevant operational period.

The lowest recorded LA_{90} level measured during the 24-hour period was 54.3 dBA. This occurred during the time period starting at 03:29am. The new plant should therefore be designed to achieve 44.3 dBA at 1 metre from the nearest affected noise sensitive window if the plant is to be operated on a 24-hour basis.

As we suspect that existing plant contributes to the background noise level, and because the measurement position was 10 metres closer to the plant than the nearest residential building (measurement position 50 metres from existing plant versus nearest residential window 60 metres from the plant) it may be that the actual background noise level at 1 metre outside the nearest residential window is slightly lower than the measured values. To protect against this possibility we propose a further 3 dB reduction is applied to the recommended design noise limit for noise sensitive properties i.e. 41.3 dBA.

5.4. Determination of commercial design criteria

The uses of the commercial premises that surround the development site generally consist of offices. It is therefore proposed that the recommendations given in BS8233:1999, Section 7.6 be considered.

	Good	Reasonable
Open plan office: $L_{Aeq,T}$	45dBA	50dBA

We propose that the lower of these rating levels is adopted, i.e. 45dBA.

Assuming a 10dB noise reduction due to a partially open window, as per the lower limit of the range given in BS8233:1999 section 8.4.7, the rating level at 1 metre external to the nearest affected office windows would be 45dBA + 10dB = 55dBA.

5.5. Summary of external noise criteria

Based upon the results of the survey and the above design criteria we summarise the actual design rating levels to be adopted for this project in table QF/9065/D2: -

Table QF/9065/D2 – recommended design rating levels $L_{Ar,T}$

Type of premises	**$L_{Ar,T}$ (24-hour)**
Noise sensitive	41.3 dBA
Commercial	55.0 dBA

6.0. DISCUSSION OF RESULTS

The results show a very steady background noise level throughout the 24-hour measurement period. This we attribute to the noise emissions of the existing roof mounted plant.

It is understood that the proposal is to install an air handling unit and several air cooled condensers onto a steel frame located on the central portion of the top of building roof adjacent to existing roof mounted plant – see Photo C in Appendix 'B' of this report.

The nearest residential windows to the proposed plant were identified as the top floor of windows of 15 Albany Street (approximately 50 metres away) and the 9th floor windows of 1 Osnaburgh Street (approximately 60 metres away). As the windows belonging to 15 Albany Street are much lower than the plant, and completely screened by the hotel roof, our analysis will concentrate on the effect of plant noise on the windows at 1 Osnaburgh Street as these are in direct line of sight of the proposed new plant.

There are also commercial windows overlooking the proposed plant that are approximately 40 metres away - see Photo C in Appendix 'B' of this report.

The schedule of plant and their associated noise levels are listed in Appendix 'C' or this report.

The recommended design noise limits for the proposed plant are listed in table QF/9065/D2 above.

Our analysis of the effect of the plant is shown in Appendix 'D' of this report: see tables QF/9065/D3, QF/9065/D4, QF/9065/D5, QF/9065/D6 and QF/9065/D7.

Our analysis shows that in order to achieve the requirements set by the Local Authority it will be necessary to attenuate the air handling unit by fitting silencers to its inlet air and outlet air atmospheric connections. A suitable type of silencer is listed in the calculation table that should reduce duct borne noise to a level of 38dBA at 1 metre from the nearest noise sensitive window. Tables QF/9065/D4 and QF/9065/D5 show that breakout noise through the casing of the air handling unit is sufficiently low that the air handling unit will not require further acoustic treatment other than the silencers in order to meet the recommended design noise limit.

The analysis in tables QF/9065/D6 and QF/9065/D7 shows that it will not be necessary to acoustically treat the air cooled condensers in order to achieve the requirements set by the Local Authority. We predict the noise level of all the condensers will be 40dBA at 1 metre from the nearest noise sensitive window, and the combined noise level of the air handling unit (with silencers fitted) and the condensers is 41 dBA at 1 metre from the nearest noise sensitive window which is below the recommended design noise limit of 41.3 dBA.

A similar analysis can be repeated for assessing the noise impact outside the nearest commercial windows. These are approximately 40 metres away from the proposed location of the plant as opposed to 60 metres from the nearest residential window. The reduction in distance translates to a 3.5dB increase in noise at the receptor i.e. the combined noise of the air handling unit and condensers at 1 metre outside the nearest commercial window is 44.5dBA which is well below the recommended commercial building noise limit of 55dBA. So by designing the plant to meet the requirements for the nearest affected residential property automatically meets the requirements for the nearest commercial building.

We would also recommend that all the proposed new plant is isolated from the structure of the building using double deflection neoprene-in-shear anti-vibration mounts to prevent the transmission of structure borne noise.

7.0. SUMMARY

A 24-hour noise survey has been undertaken at the Meliá White House Hotel, Albany Street, London NW1 3UP.

Design noise limits have been recommended, based on the results of the survey and the local authority's planning guidelines. These limiting LA_{eq} noise levels are listed in table QF/9065/D2 in section 5.5 of this report.

Plant noise levels have been predicted and an assessment has been carried out to determine whether the plant meets the recommended design noise limits.

In order to meet the recommended design noise limits it will be necessary to incorporate certain noise control measures in the design of the new plant. Suitable noise control measures have been described in section 6.0 of this report.

If the recommended noise control measures are implemented and the design rating levels are achieved, the operation of the proposed new roof mounted plant should meet the conditions set out in the Camden Council's planning policies and therefore reservations should not be expected from the planning authority on the grounds of noise.

EMTEC PRODUCTS LTD
31st May 2017

APPENDIX ‘A’

Raw Data – Noise Survey

24th to 25th May 2017

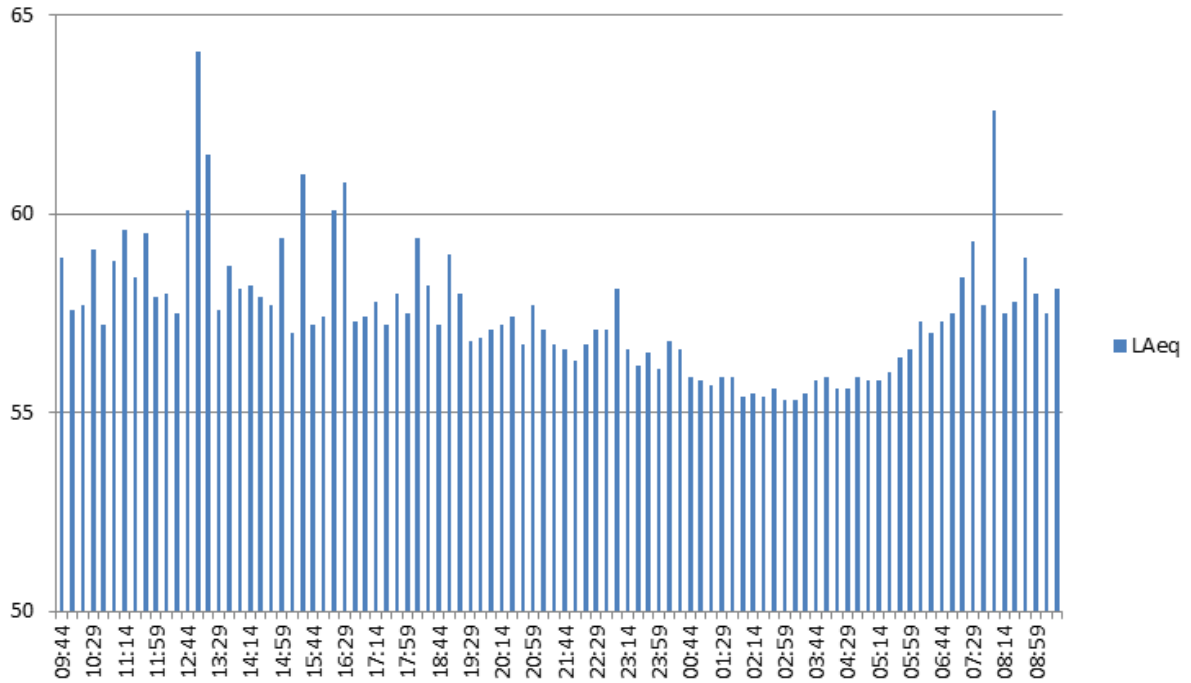
RAW NOISE DATA - Melia White House Hotel, London NW1

Ref: **QF9065/PF5968/RP1**
Client: **Melia White House Hotel**
Date: **24th to 25th May 2017**

Address	Start Time	LAeq	LE	Lmax	Lmin	LA1	LA10	LA50	LA90	LA99
1	09:44	58.9	88.5	76.8	54.6	66.5	60.7	57.4	56.1	55.3
2	09:59	57.6	87.2	67.9	54.4	63.2	59	56.9	56	55.4
3	10:14	57.7	87.3	67.3	54.5	62.8	59	57.2	56.2	55.5
4	10:29	59.1	88.7	74.5	54.1	70	59.9	57.1	56	55.3
5	10:44	57.2	86.8	65.1	54.3	61.4	58.3	56.8	55.9	55.2
6	10:59	58.8	88.4	75.5	54.9	63.6	60.7	58	56.5	55.6
7	11:14	59.6	89.2	72.3	54.7	69.8	60.5	57.4	56.3	55.6
8	11:29	58.4	88	71.1	54.8	63.9	60.1	57.7	56.4	55.7
9	11:44	59.5	89.1	76.8	54.5	69.1	60.4	57.4	56.1	55.3
10	11:59	57.9	87.5	68.8	54.2	64.8	59.4	57	55.8	55
11	12:14	58	87.6	70.8	54.3	64	59.4	57.2	56.1	55.2
12	12:29	57.5	87.1	70.7	54.6	63.6	58.4	56.9	55.9	55.4
13	12:44	60.1	89.7	75.6	54.5	69.7	62.1	57.3	56.1	55.4
14	12:59	64.1	93.7	77.1	55.5	71.6	68.1	61	57.7	56.4
15	13:14	61.5	91.1	74.3	54.9	69.2	65.1	59	56.6	55.5
16	13:29	57.6	87.2	66.7	54.4	62.3	59.1	57.2	56	55.3
17	13:44	58.7	88.3	76	54.3	67.5	59.9	57.3	56.1	55.2
18	13:59	58.1	87.7	72	54.3	64.5	59.5	57.2	56.1	55.3
19	14:14	58.2	87.8	74.6	54.1	63.3	59.7	57.5	56.1	55.2
20	14:29	57.9	87.5	71.2	54.2	64.9	58.9	57.1	55.8	55
21	14:44	57.7	87.3	74.6	54.4	63.2	58.9	57	55.9	55.2
22	14:59	59.4	89	78	54.2	69.5	60.5	56.9	55.9	55.2
23	15:14	57	86.6	65	54.6	60.5	58.2	56.8	55.8	55.2
24	15:29	61	90.6	75	54.2	71.7	63.8	57.1	55.8	55
25	15:44	57.2	86.8	71.2	54.2	63	58.5	56.5	55.6	54.8
26	15:59	57.4	87	67.7	54.2	62.2	58.6	56.9	55.8	55.1
27	16:14	60.1	89.7	76.6	54.3	70.4	61.5	57.2	56.1	55.3
28	16:29	60.8	90.4	83.5	53.9	70.1	59.4	57.1	55.8	55
29	16:44	57.3	86.9	72.2	54.3	62.4	58.7	56.7	55.7	55.1
30	16:59	57.4	87	70.9	54.3	63.6	58.4	56.8	55.7	55.1
31	17:14	57.8	87.4	74	54.3	63.1	59.5	57.1	56	55.4
32	17:29	57.2	86.8	69.1	53.9	60.9	58.5	56.9	55.8	55
33	17:44	58	87.6	72.4	54.3	67.3	58.3	56.7	55.7	55.1
34	17:59	57.5	87.1	66.4	54.8	62.2	58.8	57.1	56	55.4
35	18:14	59.4	89	76.6	54.4	69.8	59.8	57.2	56.1	55.3

36	18:29	58.2	87.8	73.8	54.5	64.9	58.9	57.2	56.1	55.4
37	18:44	57.2	86.8	65.9	54.3	60.6	58.5	56.8	55.8	55.1
38	18:59	59	88.6	78.3	54.7	70.1	58.9	57	56	55.4
39	19:14	58	87.6	76.5	54.1	64.9	58.8	56.8	55.8	55.1
40	19:29	56.8	86.4	64.1	54.2	60.4	58	56.6	55.6	55
41	19:44	56.9	86.5	65.4	54.4	61.7	58	56.6	55.6	55.1
42	19:59	57.1	86.7	68.1	54.4	63	58.2	56.6	55.6	55
43	20:14	57.2	86.8	67.9	53.9	62.7	58.5	56.6	55.7	55.1
44	20:29	57.4	87	74.1	54	63.1	58.2	56.7	55.7	54.9
45	20:44	56.7	86.3	62.2	54.2	59.9	57.8	56.4	55.6	55
46	20:59	57.7	87.3	72.3	54	65	59.3	56.5	55.6	55.1
47	21:14	57.1	86.7	66.5	53.9	61.8	58.5	56.5	55.5	54.8
48	21:29	56.7	86.3	67.7	53.8	62.5	57.8	56.2	55.3	54.7
49	21:44	56.6	86.2	71.1	54.2	61.7	57.4	56.2	55.4	54.8
50	21:59	56.3	85.9	70.2	54.4	58.7	57.1	56.1	55.4	54.9
51	22:14	56.7	86.3	74.8	53.9	63.2	57.2	56.2	55.4	54.7
52	22:29	57.1	86.7	71.9	54.4	64	58	56.3	55.5	55
53	22:44	57.1	86.7	70.1	53.7	63.7	58.1	56.4	55.4	54.6
54	22:59	58.1	87.7	72.6	54.3	67.3	59.1	56.8	55.8	55.1
55	23:14	56.6	86.2	68.9	54.3	59.9	57.4	56.3	55.5	54.9
56	23:29	56.2	85.8	62.4	53.4	58.8	57.1	56.1	55.2	54.6
57	23:44	56.5	86.1	73.5	53.8	60.3	57.1	56	55.2	54.6
58	23:59	56.1	85.7	63.8	53.5	58.9	57	56	55.1	54.4
59	00:14	56.8	86.4	68.4	54.1	62	57.8	56.3	55.4	54.7
60	00:29	56.6	86.2	68.3	53.2	62.8	57.4	55.9	55	54.1
61	00:44	55.9	85.5	63	53.5	57.7	56.8	55.9	55	54.3
62	00:59	55.8	85.4	66.2	53.5	58.3	56.7	55.6	54.8	54.3
63	01:14	55.7	85.3	63.3	53	58.1	56.7	55.7	54.7	53.9
64	01:29	55.9	85.5	68.4	53.4	59.2	56.6	55.6	54.8	54.2
65	01:44	55.9	85.5	65.9	53.4	61.6	56.6	55.5	54.6	54.1
66	01:59	55.4	85	59.7	52.9	57.2	56.3	55.4	54.5	54
67	02:14	55.5	85.1	59.3	53.7	57.3	56.3	55.4	54.7	54.3
68	02:29	55.4	85	63.5	53.2	58.8	56.3	55.2	54.4	54
69	02:44	55.6	85.2	61.9	53.3	58.6	56.6	55.4	54.6	54.1
70	02:59	55.3	84.9	61.2	53.1	57.3	56.1	55.2	54.4	54
71	03:14	55.3	84.9	66.9	52.9	58	56.3	55.2	54.4	53.8
72	03:29	55.5	85.1	68	53.1	58.3	56.4	55.4	54.3	53.8
73	03:44	55.8	85.4	66.3	53.3	60	56.9	55.4	54.5	54.1
74	03:59	55.9	85.5	65.9	53.6	59.5	56.9	55.7	54.8	54.3
75	04:14	55.6	85.2	61.2	53.5	57.9	56.5	55.5	54.8	54.2
76	04:29	55.6	85.2	60.9	53.5	57.5	56.4	55.5	54.6	54.2
77	04:44	55.9	85.5	64.4	53.3	59.6	57	55.7	54.7	54.1
78	04:59	55.8	85.4	64.4	53.7	58.3	56.8	55.6	54.7	54.3

79	05:14	55.8	85.4	61.4	53.4	57.9	56.8	55.7	54.7	54.3
80	05:29	56	85.6	64.3	53.4	58.5	57	56	54.8	54.3
81	05:44	56.4	86	67	53.7	59.8	58.1	56.1	54.9	54.3
82	05:59	56.6	86.2	65	54.1	60.4	57.8	56.4	55.2	54.6
83	06:14	57.3	86.9	71.5	54	63.1	58.3	56.7	55.4	54.8
84	06:29	57	86.6	68.4	54.1	61.5	58.1	56.5	55.5	54.9
85	06:44	57.3	86.9	72.1	54.5	62.1	58.5	56.8	55.9	55.3
86	06:59	57.5	87.1	76.4	54.5	62.2	58.6	57	56	55.4
87	07:14	58.4	88	79.3	54.7	61.5	59.2	57.6	56.4	55.6
88	07:29	59.3	88.9	76	55.1	69.2	59.8	57.8	56.6	55.9
89	07:44	57.7	87.3	66.8	54.8	62.4	58.9	57.2	56.2	55.5
90	07:59	62.6	92.2	83.6	54.3	75.8	61.3	57.6	56.1	55.2
91	08:14	57.5	87.1	68.1	54.5	61.7	58.7	57.2	56.2	55.5
92	08:29	57.8	87.4	67.1	55.2	61.1	59.2	57.5	56.4	55.9
93	08:44	58.9	88.5	72.8	54.8	68.5	60.3	57.2	56	55.4
94	08:59	58	87.6	72.6	54.9	64	59.4	57.2	56.1	55.4
95	09:14	57.5	87.1	70.8	54.3	63.1	58.6	57	55.9	55.2
96	09:29	58.1	87.7	68.7	54.6	62.9	60	57.3	56.2	55.6



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CLIENT: Melia White House Hotel	*PF No. 5968*				*APPROVED BY: MGR*	*REVISION*							
PROJECT: Melia White House Hotel, London	*Q*	*A*	*M*	*I*	*DESIGN AUTH: JT*	*SKETCH No. QF/9065/T1*							

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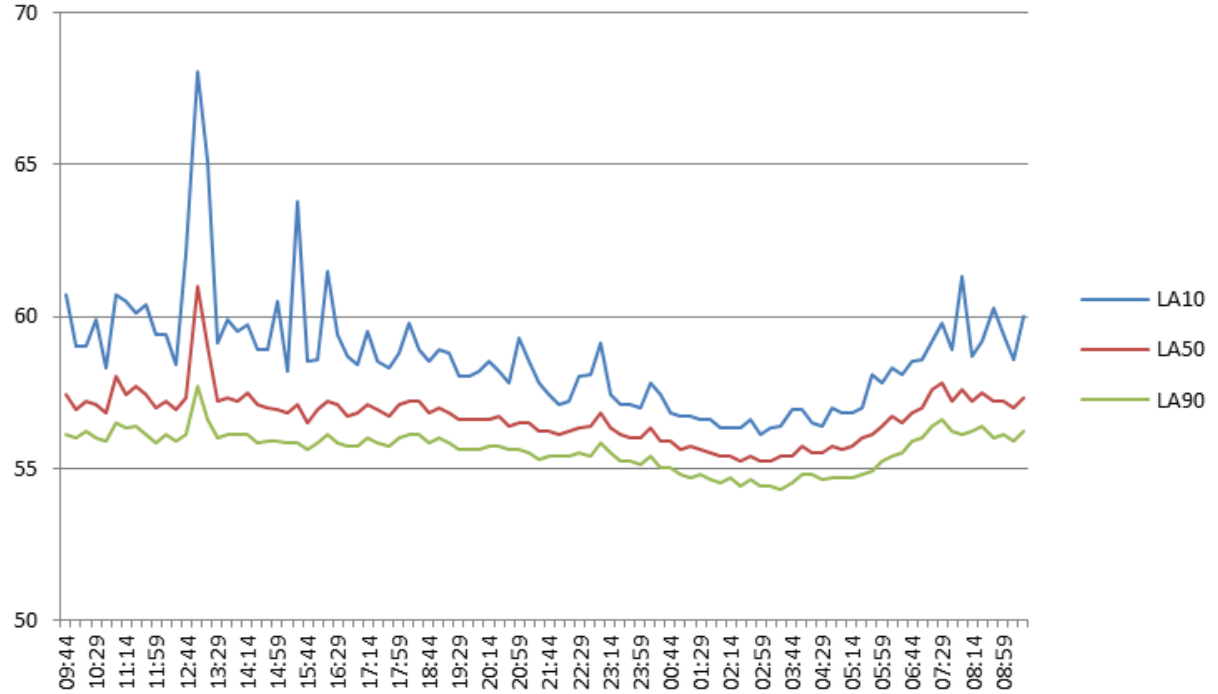

TITLE: L10, L50 & L90 Levels	*ISSUE DATE: 26/5/17*				*DRAWN BY: JT*	*A*	*B*	*C*	*D*	*E*	*F*	*G*	*H*
CLIENT: Melia White House Hotel	*PF No. 5968*				*APPROVED BY: MGR*	*REVISION*							
PROJECT: Melia White House Hotel, London	*Q*	*A*	*M*	*I*	*DESIGN AUTH: JT*	*SKETCH No. QF/9065/T2*							

Unit L, Turnpike Way, High Wycombe, Bucks, HP12 3TF
Tel: 020 8848 3031

APPENDIX ‘B’

Photos

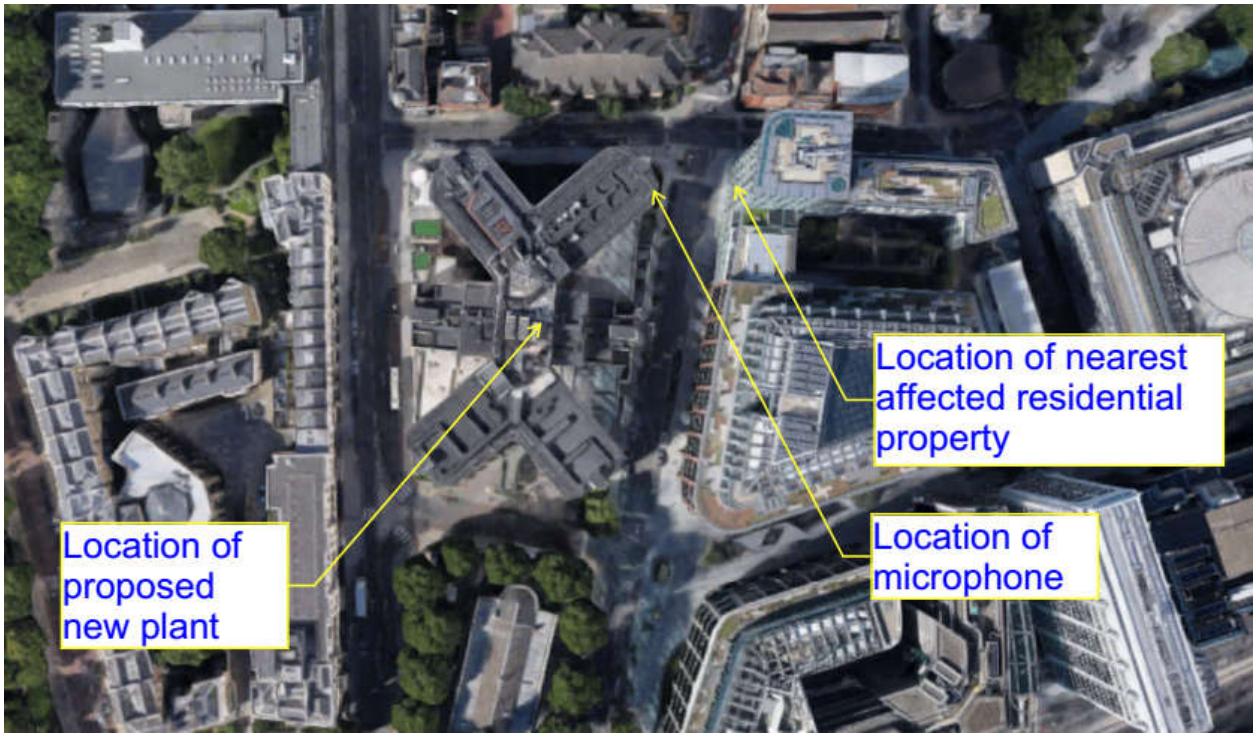

PHOTO 'A' – Showing plan of the Melia White House Hotel, location of the proposed new plant and the nearest affected residential window on the 9th floor of No. 1 Osnaburgh Street

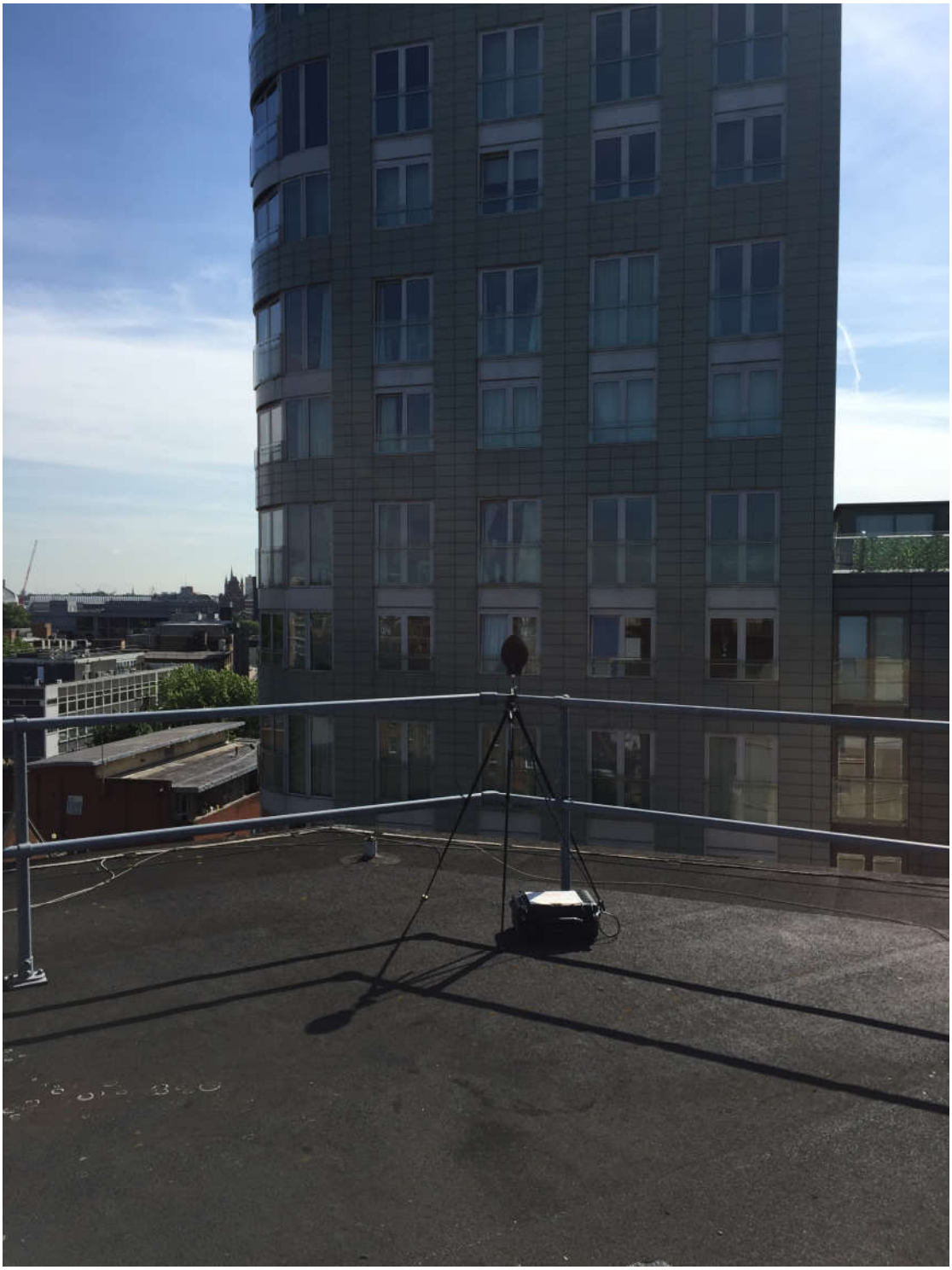

PHOTO ‘B’ – Showing location of the microphone on the north east corner of the roof and the proximity of the residential flats at No. 1 Osnaburgh Street

PHOTO ‘C’ – Showing location of the proposed new plant and proximity of nearest affected commercial offices in the background

APPENDIX ‘C’

Schedule of Plant and Associated Noise Levels

Air Handling Unit

Air Handlers type Envirofresh 70-5500BEW/P handling 5.5m^3/s @300Pa

Fan	Sound Power Level (dB ref. 10-^{12} W) at Octave Band Centre Frequencies (Hz)							
	63	125	250	500	1k	2k	4k	8k
Supply fan intake	84	88	92	92	88	84	80	75
Extract fan discharge	86	90	94	94	90	86	81	77
Combined SWL	88	92	96	96	92	88	83	79
Breakout	63	62	67	64	55	58	52	49

Note: The above sound pressure level data was taken from data provided by the M&E consultant - M H Assocs.

Condensers

Unit Type	No. Off	Airflow (m^3/s)	SPL @ 1 metre free field
Mitsubishi PURY-P600YSJM-A	1	6.17	62 dBA
Mitsubishi PURY-P600YSJM-A	1	6.17	62 dBA
Mitsubishi PURY-P600YSJM-A	1	6.17	62 dBA
Mitsubishi PURY-P600YSJM-A	1	6.17	62 dBA
Mitsubishi PURY-P600YSJM-A	1	6.17	62 dBA
Mitsubishi PURY-P600YSJM-A	1	6.17	62 dBA
Mitsubishi PURY-P450YJM-A	1	6.00	62 dBA
Mitsubishi PURY-P450YJM-A	1	6.00	62 dBA
Mitsubishi PURY-P450YJM-A	1	6.00	62 dBA
Mitsubishi PURY-P450YJM-A	1	6.00	62 dBA
Total	**10**	**61.02**	**72 dBA**

Note: The above sound pressure level data was taken from Mitsubishi published data sheets.

APPENDIX ‘D’

Calculation of Predicted Noise Levels

Table QF/9065/D3 – Predicted noise level of air handling unit at 1m outside nearest residential window – duct borne noise

Noise Level/ Attenuation	Sound Power or Sound Pressure Levels (dB) at octave band Mid frequencies (Hz) 63	125	250	500	1k	2k	4k	8k	dBA
Sound Power Level (dB ref 10^{-12}W) (combined inlet and outlet)	88	92	96	96	92	88	83	79	
A-weighting	-26	-16	-9	-3	0	+1	+1	-1	
Reverberation / reflections	+3	+3	+3	+3	+3	+3	+3	+3	
Distance Correction to 60 metres SPL = SWL-20log(r)-11+D (D = +3 for semi-hemispherical radiation)	-43	-43	-43	-43	-43	-43	-43	-43	
Barrier Attenuation	-	-	-	-	-	-	-	-	
Resultant SPL at 1 metre from residential window	22	36	47	53	52	49	44	38	57
Attenuation of Emtec RAAC/38/600S silencers	-3	-5	-11	-19	-23	-22	-17	-9	
Resultant silenced SPL at 1 metre from neighbours window	19	31	36	34	29	27	27	29	**38**

Table QF/9065/D4 – Predicted noise level of air handling unit at 1m outside nearest residential window – breakout noise

Noise Level/ Attenuation	Sound Power or Sound Pressure Levels (dB) at octave band Mid frequencies (Hz) 63	125	250	500	1k	2k	4k	8k	dBA
Sound Power Level (dB ref 10^{-12}W) (breakout)	63	62	67	64	55	58	52	49	
A-weighting	-26	-16	-9	-3	0	+1	+1	-1	
Reverberation / reflections	+3	+3	+3	+3	+3	+3	+3	+3	
Distance Correction to 60 metres SPL = SWL-20log(R_{60})-11+D (D = +3 for semi-hemispherical radiation)	-43	-43	-43	-43	-43	-43	-43	-43	
Barrier Attenuation	-	-	-	-	-	-	-	-	
Resultant SPL at 1 metre from residential window	-	6	18	21	15	19	13	8	**23**
Attenuation not required									

Table QF/9065/D5 – Predicted noise level of air handling unit at 1m outside nearest residential window – duct borne and breakout noise

Air Handling Unit – Combined Duct Borne and Breakout Noise		
Resultant SPL at 1 metre from residential window – duct borne	Resultant SPL at 1 metre from residential window - breakout	Resultant SPL at 1 metre from residential window – duct borne and breakout
38 dBA	**23 dBA**	**38 dBA**

Table QF/9065/D6 – Predicted combined noise level of all condensers at 1m outside nearest residential window

Noise Level/ Attenuation	Sound Power or Sound Pressure Levels (dB) at octave band Mid frequencies (Hz) 63 125 250 500 1k 2k 4k 8k	dBA
Combined Sound Pressure Level at 1m free-field (dBA ref 2 x 10^{-5} Pa)		72
A-weighting		-
Reverberation / reflections		+3
Distance Correction to 60 metres $SPL_{60} = SPL_1 - 20\log(R_{60}/R_1)$		-35
Barrier Attenuation	- - - - - - - -	-
Resultant SPL at 1 metre from residential window		**40**
Attenuation not required		

Table QF/9065/D7 – Predicted noise level of air handling unit at 1m outside nearest residential window – duct borne and breakout noise

Air Handling Unit and Condensers – Combined Resultant Noise		
Resultant SPL at 1 metre from residential window – air handling unit (with silencers)	Resultant SPL at 1 metre from residential window - condensers	Resultant SPL at 1 metre from residential window – air handling unit and condensers combined
38 dBA	**40 dBA**	**41 dBA**