THE DIORAMA, 17 PARK SQUARE EAST

Acoustic Assessment

Reference: 9616.RP01.EBF.1
Prepared: 15 April 2020
Revision Number: 1

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Revision	Comment	Date	Prepared By	Approved By
0	First issue of report	11 November 2019	Maxim Billingham	Stuart Heather
1	Updated plant criteria		Maxim Billingham	Stuart Heather
2	Response to Camden comments	15 April 2020	Maxim Billingham	Stuart Heather

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Contents

1.0 INTRODUCTION

It is proposed to redevelop existing properties at 17 Park Square East, London into a residential space. Specifically, number 17 Park Square East will be converted to C3 residential usage.

An assessment has been carried out in relation to the noise levels likely to be incident on the building façades and to provide acoustic performance specifications such that acceptable internal noise criteria can be achieved for the use of the building.

This report details the results of the noise survey and sets out the acoustic performance requirements of the external building fabric elements. In addition, suitable plant noise emission criteria have also been developed based upon the survey results and the likely requirements of Camden Council.

2.0 ENVIRONMENTAL NOISE SURVEY

2.1 Survey Methodology

In accordance with the requirements of Camden Council, monitoring of the prevailing background noise was undertaken over the following period:

17:00 hours Thursday 26 September to 13:00 hours Tuesday 01 October 2019.

As the survey was mostly unattended it is not possible to comment with certainty regarding meteorological conditions throughout the entire survey period. However based on observations during the site visits and weather reports for the area, it was generally considered suitable for obtaining representative noise measurements, it being predominantly dry with little wind. Periods where weather conditions were not suitable for noise measurements have been removed from analyses as appropriate.

Measurements were made of the L_{A90}, L_{Amax} and L_{Aeq} noise levels over sample periods of 15 minutes duration.

2.2 Measurement Location

To determine the existing noise climate around the site, measurements were undertaken at the following locations:

Noise monitoring position 1 (N1) – Park Square East balcony (west façade)

Measurements were taken on the small western balcony of the existing 17-19 Park Square East Diorama building at second floor level, overlooking Park Square East road. The second floor level balcony is approximately 5m above ground level. The microphone was fixed to a balcony railing positioned 1m from the façade of the building.

Noise monitoring position 2 (N2) – Rear façade overlooking car park (east façade)

Measurements were taken extended from a window on the eastern façade of the existing 17-19 Park Square East Diorama building at third floor level, overlooking the existing car park. The third floor level window is approximately 8m above ground level. The microphone was fixed to a frame extended 1m from the façade of the building.

The prevailing noise climate was noted to mainly consist of road traffic from Park Square East, Marylebone Road, Albany Street and other local roads. The car park at the rear of the site was also noted to be affecting the noise climate at N2. Noise from overhead aircraft and helicopters was also occasionally audible at both locations.

The measurement positions are also illustrated photographs in Figures 1 and 2 and the Site Plan in Figure 3.

2.3 Instrumentation

For information regarding the equipment used for the measurements please refer to Appendix C.

The sound level meters were calibrated both prior to and on completion of the survey with no calibration drifts observed.

2.4 Results

The noise levels measured are shown as time-histories on the attached Graphs 1-4.

In order to ensure a worst-case assessment the lowest background L_{A90} noise levels measured have been used in our analyses. The lowest L_{A90} and the period averaged L_{Aeq} noise levels measured are summarised in Table 1, along with typical L_{AFmax} levels measured during the night time.

Table 1 – Measured Levels

Measurement Period	N1 – Park Square East Balcony			N2 – Rear façade (overlooking carkpark)		
	L_{eq} (dBA)	Lowest $L_{90,15min}$ (dBA)	Typical $L_{max,15min}$ (dBA Fast)	L_{eq} (dBA)	Lowest $L_{90,15min}$ (dBA)	Typical $L_{max,15min}$ (dBA Fast)
Daytime (07:00 – 19:00)	65	59	N/A	56	47	N/A
Evening (19:00 – 23:00)	64	56	N/A	56	47	N/A
Night-time (23:00 – 07:00)	60	46	78	53	42	74

3.0 NOISE ASSESSMENT CRITERIA

This section outlines typical assessment criteria in terms of the relevant local policy and standards. A brief explanation of the acoustic terminology used in this report is shown within Appendix A.

3.1 Camden Local Plan

The London Borough of Camden's Local Plan refers to environmental noise and vibration in the following policies:

Policy A1 – Managing the Impact of Development

The policy contains direct reference to managing the impacts of various environmental pollutants, including noise and vibration. The following wording refers (amongst other factors) to noise and vibraiton:

"The Council will seek to protect the quality of life of occupiers and neighbours. We will grant permission for development unless this causes unacceptable harm to amenity. We will:

a. seek to ensure that the amenity of communities, occupiers and neighbours is protected;

b. seek to ensure development contributes towards strong and successful communities by balancing the needs of development with the needs and characteristics of local areas and communities;

c. resist development that fails to adequately assess and address transport impacts affecting communities, occupiers, neighbours and the existing transport network; and

d. require mitigation measures where necessary."

The policy contains no quantitative guidance on noise and vibration and no further technical information. It does refer, however, to World Health Organisation guidelines which are discussed in more detail later in this section of the report.

Policy A4 – Noise and Vibration

The policy details Camden's approach to ensuring that noise and vibration is controlled and managed, with reference to their Noise and Vibration thresholds:

The council will seek to ensure that noise and vibration is controlled and managed.

Development should have regard to Camden's Noise and Vibration (Appendix 3). We will not grant planning permissions for:

a. development likely to generate unacceptable noise and vibration impacts; or
b. development sensitive to noise in locations which experience high levels of noise, unless appropriate attenuation measures can be provided and will not harm the continued operation of existing uses.

We will only grant permission for noise generating development, including any plant any machinery, if it can be operated without causing harm to amenity. We will also seek to minimise the impact on local amenity from deliveries and from the demolition and construction phase of development.

Appendix 3 of the Camden Local Plan reads as follows:

The significance of noise impact varies dependent on the different noise sources, receptors and times of operation presented for consideration within a planning application. Therefore, Camden's thresholds for

noise and vibration evaluate noise impact in terms of various 'effect levels' described in the National Planning Policy Framework and Planning Practice Guidance:

- *NOEL – No Observed Effect Level*
- *LOAEL – Lowest Observed Adverse Effect Level*
- *SOAEL – Significant Observed Adverse Effect Level*

Three basic design criteria have been set for proposed developments, these being aimed at guiding applicants as to the degree of detailed consideration needed to be given to noise in any planning application. The design criteria outlined below are defined in the corresponding noise tables. The values will vary depending on the context, type of noise and sensitivity of the receptor:

- *Green – where noise is considered to be at an acceptable level.*
- *Amber – where noise is observed to have an adverse effect level, but which may be considered acceptable when assessed in the context of other merits of the development.*
- *Red – where noise is observed to have a significant adverse effect.*

The noise levels provided for the above categories above include guidance on noise levels during day and night periods in sensitive bedrooms. This guidance is underpinned by British Standard 8233:2014 and World Health Organisation guidance which are referred to in more detail later in this section of the report.

Policy A4 also provides the following information regarding the required noise levels for proposed plant items:

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' (BS4142) will be used. For such cases a 'Rating Level' of 10dB below background (15dB if tonal components are present) should be considered as the design criterion.

In line with the above requirements we have proposed limits for items of mechanical services in Section 5.0 of this report.

3.2 British Standard 8233:2014

With reference to the limits in Policy A4/Appendix 3 of Camden's Local Plan 2017, consideration has been given to noise levels in internal living spaces of the development, which are consistent with the Local Plan's "Green" criteria. BS 8233:2014 *Guidance on Sound insulation and noise reduction for buildings* draws on the results of research and experience to provide information on achieving internal acoustic environments appropriate to their functions.

The noise level values given are in terms of an average (L_{Aeq}) level.

The standard advises internal ambient noise levels for achieving suitable resting and sleeping conditions as set out in Table 2. A brief explanation of the acoustic terminology used in this report is shown in Appendix A attached.

Table 2 – BS 8233:2014 Criteria

Room	07:00 to 23:00	23:00 to 07:00
Living Rooms	35 dB $L_{Aeq,16hour}$	--
Dining Room/area	40 dB $L_{Aeq,16hour}$	--
Bedrooms	35dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

3.3 World Health Organisation: Guidelines for Community Noise

The document describes guideline levels that are *"essentially values for the onset of health effects from noise exposure".*

A table of guideline values is included, relating to adverse health effects, referred to as any temporary or long term deterioration in physical, psychological, or social functioning that is associated with noise exposure.

Table 3 sets out the guidance from *Table 4.1: Guideline values for community noise in specific environments*, as stated in the document.

Table 3 – Guideline Values for Community Noise

Specific Environment	Critical Health Effect(s)	L_{Aeq} (dB)	Time Base (hours)	$L_{Amax,f}$ (dB)
Outdoor living area	Serious annoyance, daytime and evening	55	16	-
	Moderate annoyance, daytime and evening	50	16	-
Indoor habitable spaces	Speech intelligibility and moderate annoyance, daytime and evening	35	16	-
Inside sleeping areas	Sleep disturbance, night-times	30	8	45
Outside sleeping areas	Sleep disturbance, window open (outdoor values)	45	8	60

With reference to maximum noise levels the following guidance is provided within the WHO guidance:

> *"For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45dB L_{Amax} more than 10-15 times per night (Vallet & Vernet 1991) and most studies show an increase in the percentage of awakenings at SEL values of 55-60 dBA (Passchier-Vermeer 1993; Finegold et al. 1994; Pearsons et al. 1995). For intermittent events that approximate aircraft noise, with an effective duration of 10-30s, SEL values of 55-60 corresponds to a L_{Amax} value of 45dB. Ten to 15 of these events during an 8 hour night-time implies a $L_{Aeq,\ 8h}$ of 20-25dB. This is 10-15dB below the $L_{Aeq,\ 8h}$ or 30dB for continuous night-time noise exposure, and shows that intermittent character of noise must be taken into account when setting night-time noise limits for noise exposure. For example, this can be achieved by considering the number of noise events and the difference between the maximum sound pressure level and the background of these events."*

Therefore the frequency of occurrence of maximum noise events should not typically exceed 10-15 times in any night.

It is noted that the "Green" criteria for L_{AFmax} events in Camden's Local Plan is 42 dB, and therefore, while the guidance from WHO regarding effects of maximum noise levels is considered, 42 dB L_{AFmax} is adopted as part of the project criteria.

3.4 Summary

The project criteria adopted are therefore as follows;

Residential		
Bed spaces	Night-time (23:00-07:00)	30dB L_{Aeq} 42dB $L_{Amax,f}$
Living Rooms	Daytime (07:00-23:00)	35dB L_{Aeq}

4.0 EXTERNAL BUILDING FABRIC ASSESSMENT

4.1 Background

Analyses of the external building fabric have been undertaken in order to ascertain the required acoustic performance of the glazing and other external fabric elements to achieve the project criteria. Assessment has been focused on bedrooms, as these are the most sensitive proposed types of rooms in terms of internal noise criteria during both day and night periods.

4.2 Assumptions

Our external building fabric analyses have assumed the following:

(a) Drawings

The assessment has been based on the information provided in the following drawings:

19011_17 18 & 19 Park Square East_The Diorama (Marek Wojciechowski Architects)

(b) Noise Levels

The assessment has been based on the measured noise levels as detailed in Section 2.4.

(c) Room Absorption

The bedrooms are assumed to be acoustically "soft" with carpets, curtains and other soft furnishings. For the purposes of our analyses we have assumed the absorption coefficients detailed in Table 4.

Table 4 – Bedroom Absorption Coefficients

Absorption Coefficient (α) at Octave Band Centre Frequency (Hz)							
63	125	250	500	1k	2k	4k	8k
0.15	0.18	0.25	0.27	0.31	0.32	0.32	0.32

(d) External Wall

We understand the external non-glazed areas will generally retain the current brickwork construction.

As such, we have assumed the following sound reduction indices (equating to an overall R_W of 52dB) for all non-glazed façade areas comprising this construction:

Table 5 – Sound Reduction of Non-Glazed Façade Elements

Assumed Sound Reduction Index (dB) at Octave Band Centre Frequency (Hz)							
63	125	250	500	1k	2k	4k	8k
36	41	45	45	54	58	58	58

Should the proposals for non-glazed areas change, it is critical we are informed at the earliest opportunity as this could have a significant impact on the sound insulation performance requirements of the glazing systems.

(e) Ventilation

It is understood that ventilation strategies will not involve trickle vents and therefore these have not been included in the external building fabric noise break-in calculations.

During those periods where windows are opened for purge/rapid ventilation, noise levels will naturally be increased internally.

(f) Glazing

The chosen strategy for glazing is understood to be based around retaining the current single glazed sash windows of 17 Park Square East. These assumptions have therefore been included in the calculation of the performance of the external building fabric and resultant internal noise level.

4.3 Specification & Guidance Constructions

Appendix B details the sound reduction performance specification for the glazed elements of the external building fabric. The guidance in this document relates solely to the acoustic performance requirements.

The glazing performance specifications apply to the glazing package as a whole inclusive of glazing, louvres, spandrel panels, framing, opening lights, doors, seals, etc. The performance of the glazing system will depend on many factors such as the glazing configuration, size of window panels, quality of framing, quality of sealing, etc.

For guidance purposes we would typically expect the following glazing configurations detailed below to prove commensurate with achieving the sound insulation performance specifications detailed within Appendix B.

Please note – *The glazing configurations described in Table 6 are given for costing purposes only. All window systems should be capable of meeting the performance specifications shown in Appendix B, with laboratory test certificates being made available in support of the quoted performance. Glazing proposals which simply reflect the guidance constructions indicated in this report will not, in isolation, be sufficient evidence that a window configuration will meet the performance specification.*

Table 6 – Glazing Guidance Constructions

Glazing Type	Glazing Configuration
G1	Standard single glazing of thickness 6mm

5.0 PLANT NOISE CRITERIA

The requirements of Camden Council's Environmental Health Department regarding new building services plant are confirmed in Policy A4/Appendix 3 of their Local Plan, which are detailed in Section 3.0 of this report.

The measurement results from N1 and N2 have been used to set the appropriate operational plant noise rating limits at the nearest receptors in order to comply with the "Green" standards detailed in Camden's Local Plan. Table 7 and Table 8 present recommendations for these limits. Limits have been determined using the summary of measured background sound levels (L_{A90}) at each measurement position presented earlier in this report.

Table 7 – Operational Noise Limits (N1, Park Square East balcony, west façade)

Time period	Receptor	Typical existing background noise level, dB $L_{A90, T}$	Operational noise rating level limit (assuming no corrections)*, dB
Daytime (07:00 – 19:00)	Nearest existing residential: • Front windows of Park Square East.	54	44
Evening (19:00 – 23:00)		56	46
Night –(23:00 – 07:00)		46	36

Table 8 – Operational Noise Limits (N2, rear Car Park, east façade)

Time period	Receptor	Typical existing background noise level, dB $L_{A90, T}$	Operational noise rating level limit (assuming no corrections)*, dB
Daytime (07:00 – 19:00)	Nearest existing residential: • Albany Terrace. • Rear windows of Park Square East	47	37
Evening (19:00 – 23:00)		47	37
Night –(23:00 – 07:00)		42	32

*Should the proposed plant be identified as having distinguishable discrete continuous note, or distinct impulses, a further 5 dB correction should be subtracted from any of the above proposed noise emission limits.

It should be noted that the above requirements are applied at the nearest residential adjacencies and alternative criteria should be incorporated if there are also commercial properties affected by the proposed plant installations.

6.0 CONCLUSION

RBA Acoustics have undertaken noise monitoring at the site of the proposed redevelopment of The Diorama, 17 Park Square East, London. The measured noise levels are presented within this report. The resultant noise levels have been used in the assessment of the glazing requirements to ensure suitable internal noise levels are achieved at the proposed development with reference to BS 8233 and WHO.

We do not consider planning approval should be rejected on the basis of noise and can confirm internal noise levels can be effectively controlled by fairly simple glazing configurations on the whole.

General guidance configurations have been suggested for the glazing constructions that should be capable of achieving the required specifications detailed within Appendix B. The proposals to retain single glazed sash windows are adequate in the worst affected rooms to protect the tenants from adverse noise impact.

Suitable limits for emissions of plant noise have also been recommended based on Camden Council's criteria.

Appendix A - Acoustic Terminology

dB	Decibel - Used as a measurement of sound pressure level. It is the logarithmic ratio of the noise being assessed to a standard reference level.
dB(A)	The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise, the 'A' weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average human. It is also possible to calculate the 'A' weighted noise level by applying certain corrections to an un-weighted spectrum. The measured or calculated 'A' weighted noise level is known as the dB(A) level. Because of being a logarithmic scale noise levels in dB(A) do not have a linear relationship to each other. For similar noises, a change in noise level of 10dB(A) represents a doubling or halving of subjective loudness. A change of 3dB(A) is just perceptible.
L_{eq}	L_{eq} is defined as a notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (1 hour).
L_{Aeq}	The level of notional steady sound which, over a stated period of time, would have the same A-weighted acoustic energy as the A-weighted fluctuating noise measured over that period.
L_{An} (e.g L_{A10}, L_{A90})	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time, hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the average minimum level and is often used to describe the background noise.
$L_{max,T}$	The instantaneous maximum sound pressure level which occurred during the measurement period, T. It is commonly used to measure the effect of very short duration bursts of noise, such as for example sudden bangs, shouts, car horns, emergency sirens etc. which audibly stand out from the general level of, say, traffic noise, but because of their very short duration, maybe only a very small fraction of a second, may not have any effect on the L_{eq} value.

Appendix B – External Building Fabric Acoustic Specification

External facade constructions and components, such as brise soleil, grilles, ventilators, curtain walling systems or other architectural features, are not to give rise to intrusive whistling, creaking, rattling or other noises as a result of wind or other climatic effects.

The Contractor shall take reasonable precautions to avoid unwanted noise including creaking, rattling and whistling being generated by the Contractors works when subject to environmental conditions (including wind) and thermal expansion over the life of the façade.

1.0 Window Sound Insulation Performance

Glazed units (inclusive of glazing, louvres, timber panels, spandrel panels, infill panels, framing, opening lights, balcony/terrace doors, seals, etc. as appropriate) should achieve the following minimum sound reduction indices as tested in general accordance with BS EN ISO 10140-2:2010:

Type	Minimum Recommended Sound Reduction Index (dB) at Octave Band Centre Frequency (Hz)								R_w (dB)
	63	125	250	500	1k	2k	4k	8k	
G1	16	20	24	31	35	29	36	36	32

Note: R_W is the "overall weighted sound reduction index" tested in a laboratory.

N.B. as the internal noise criteria are expressed in dBA terms, other frequency-specific performance levels may ultimately prove acoustically acceptable. Test data for representative samples of all glazing systems shall be submitted to RBA Acoustics for approval to demonstrate compliance with the above performance specifications.

N.B. as the internal noise criteria are expressed in dBA terms, other frequency specific performance levels may ultimately prove acoustically acceptable.

Appendix C - Instrumentation

The following equipment was used for the measurements

Manufacturer	Model Type	Serial No.	Calibration	
			Certificate No.	Valid Until
Norsonic Type 1 Sound Level Meter	Nor140	1406969	U32668	22 August 2021
Norsonic Pre Amplifier	1209	21204		
Norsonic ½" Microphone	1225	285599	32667	22 August 2021
Norsonic Sound Calibrator	1251	34966	U32666	22 August 2021
Norsonic Type 1 Sound Level Meter	Nor140	1406255	U31223	12 March 2021
Norsonic Pre Amplifier	1209	20491		
Norsonic ½" Microphone	1225	225529	31222	12 March 2021
Norsonic Sound Calibrator	1251	34391	U31221	12 March 2021

Appendix D – CDM Considerations

The likelihood the harm will occur can be assessed by applying an indicative score (from 1 to 5) as follows:

1 – Remote (almost never)
2 – Unlikely (occurs rarely)
3 – Possible (could occur, but uncommon)
4 – Likely (recurrent but not frequent)
5 – Very likely (occurs frequently)

The severity of harm can be assessed by applying an indicative score (from 1 to 5) as follows:

1 – Trivial (e.g. discomfort, slight bruising, self-help recovery)
2 – Minor (e.g. small cut, abrasion, basic first aid need)
3 – Moderate (e.g. strain, sprain, incapacitation > 3 days)
4 – Serious (e.g. fracture, hospitalisation > 24 hrs, incapacitation > 4 weeks)
5 – Fatal (single or multiple)

The rating value is obtained by multiply the two scores and is then used to determine the course of action.

Rating Bands (Severity x Likelihood)		
Low Risk (1 – 8)	Medium Risk (9 -12)	High Risk (15 – 25)
May be ignored but ensure controls remain effective	Continue, but implement additional reasonable practicable controls where possible	Avoidance action is required; therefore alternative design solutions must be examined. Activity must not proceed until risks are reduced to a low or medium level

The following hazards pertinent to our design input have been identified and control measures suggested:

Hazard	Risk Of	At Risk	Rating			Control Measures	Controlled		
			L	S	R		L	S	R
Mineral wool within drywalls and linings	Skin and respiratory irritation	Contractors	4	3	12	Wear gloves and mask	1	3	3
Acoustic glazing - weight	Strain of neck, limbs or back. Fall from height.	Contractors	3	5	15	Provide sufficient manpower, lifting gear and structural support	1	5	5

L: Likelihood S: Severity R: Rating

Appendix E – Graphs and Site Plans

The Diorama

L_{Aeq} Time History

Measurement Position 1, Thursday 26 September to Tuesday 1st October 2019

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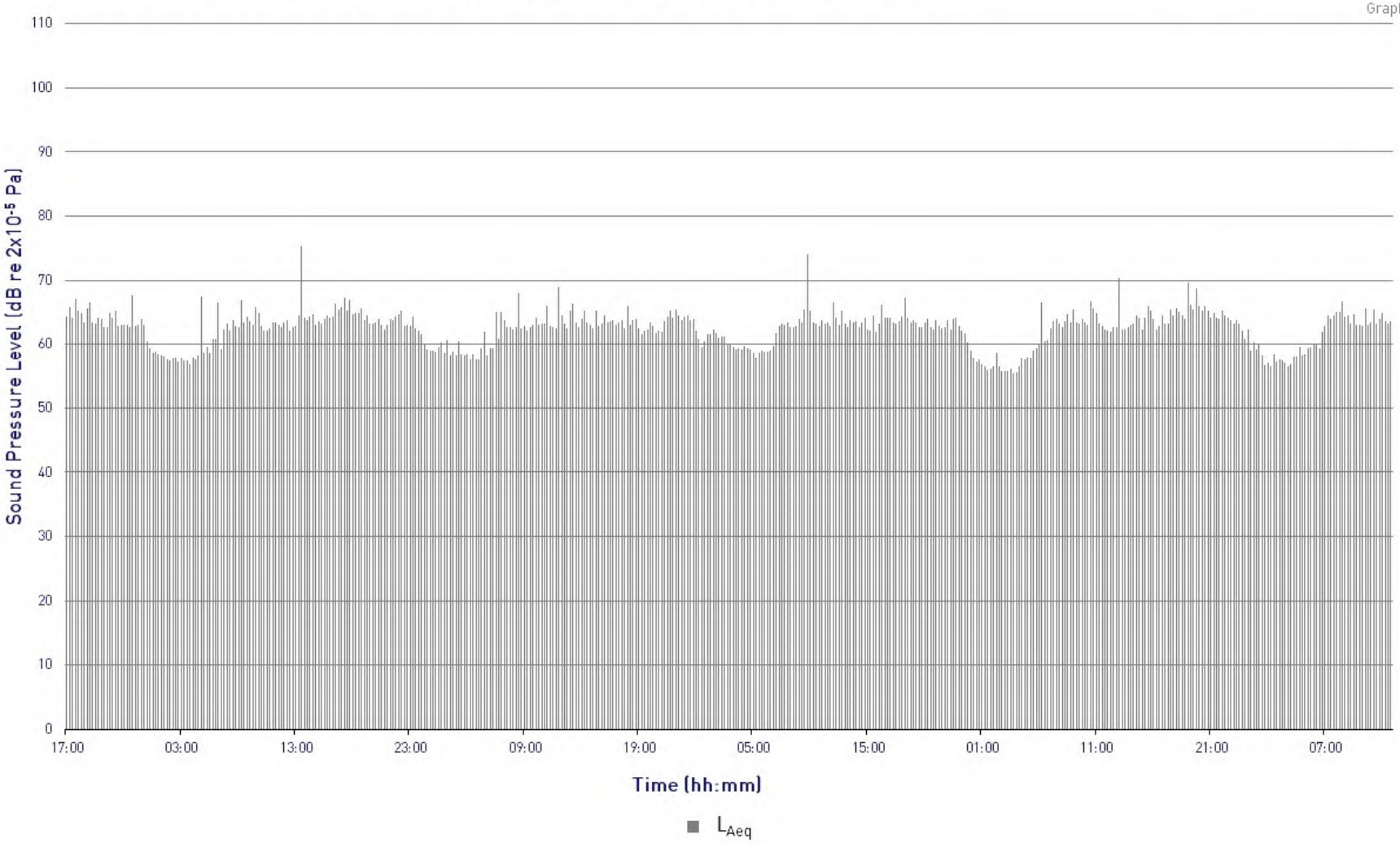
Project: 9616

Graph 1



The Diorama

$L_{Amax,f}$ and L_{A90} Time History

Measurement Position 1, Thursday 26 September to Tuesday 1st October 2019

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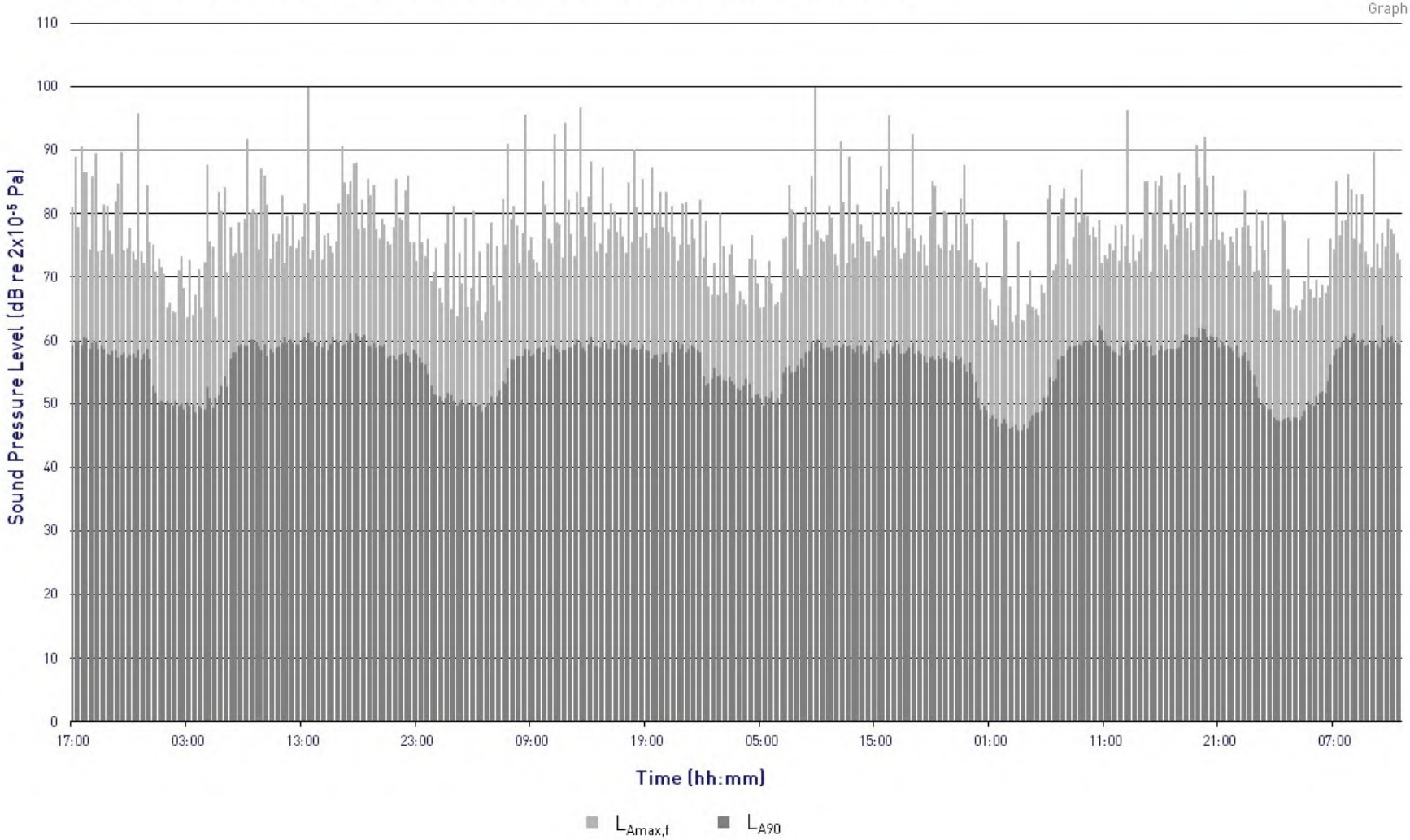
Project: 9616

Graph 2



The Diorama

L_{Aeq} Time History

Measurement Position 2, Thursday 26 September to Tuesday 1st October 2019

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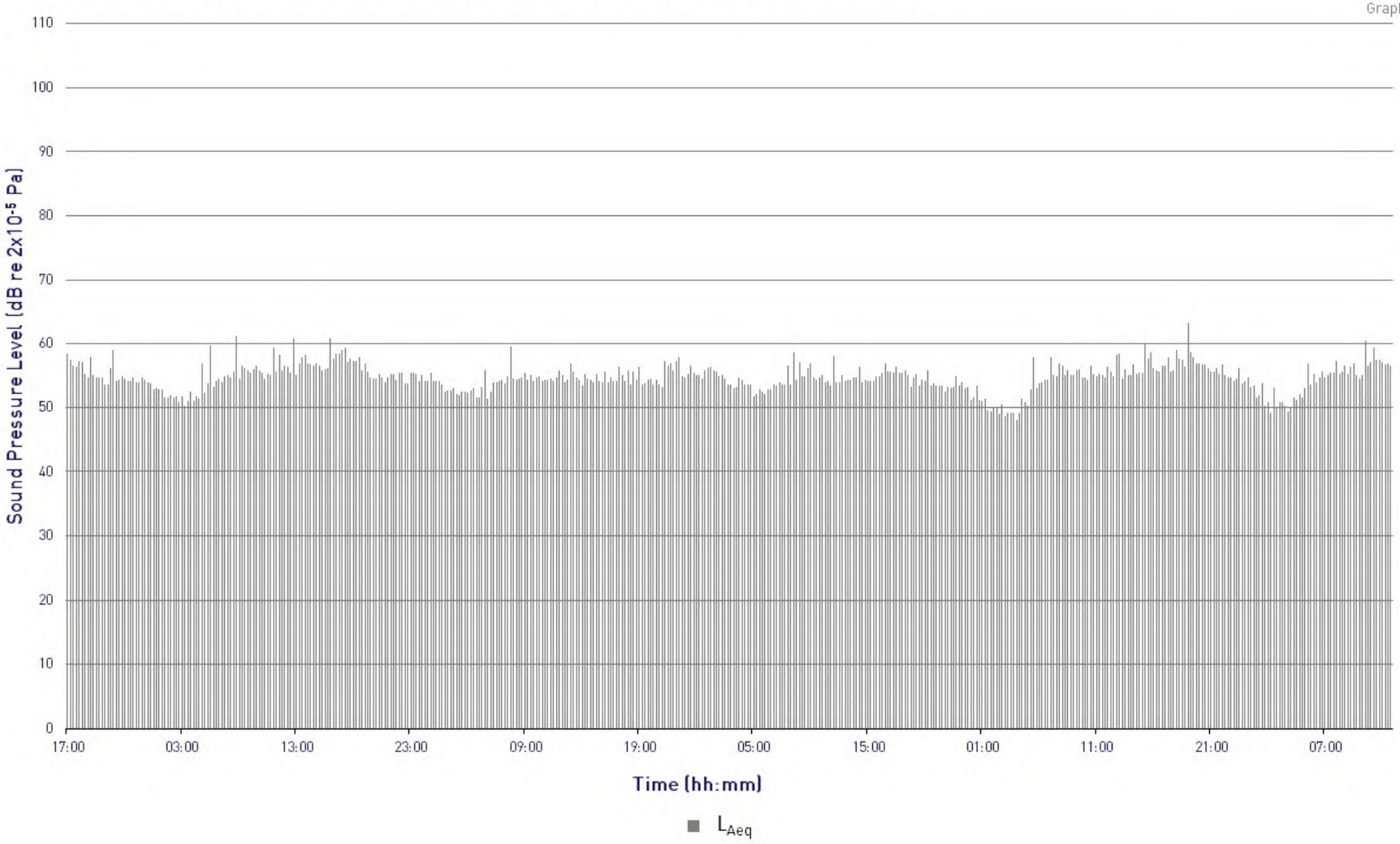
Project: 9616

Graph 3



The Diorama

$L_{Amax,f}$ and L_{A90} Time History

Measurement Position 2, Thursday 26 September to Tuesday 1st October 2019

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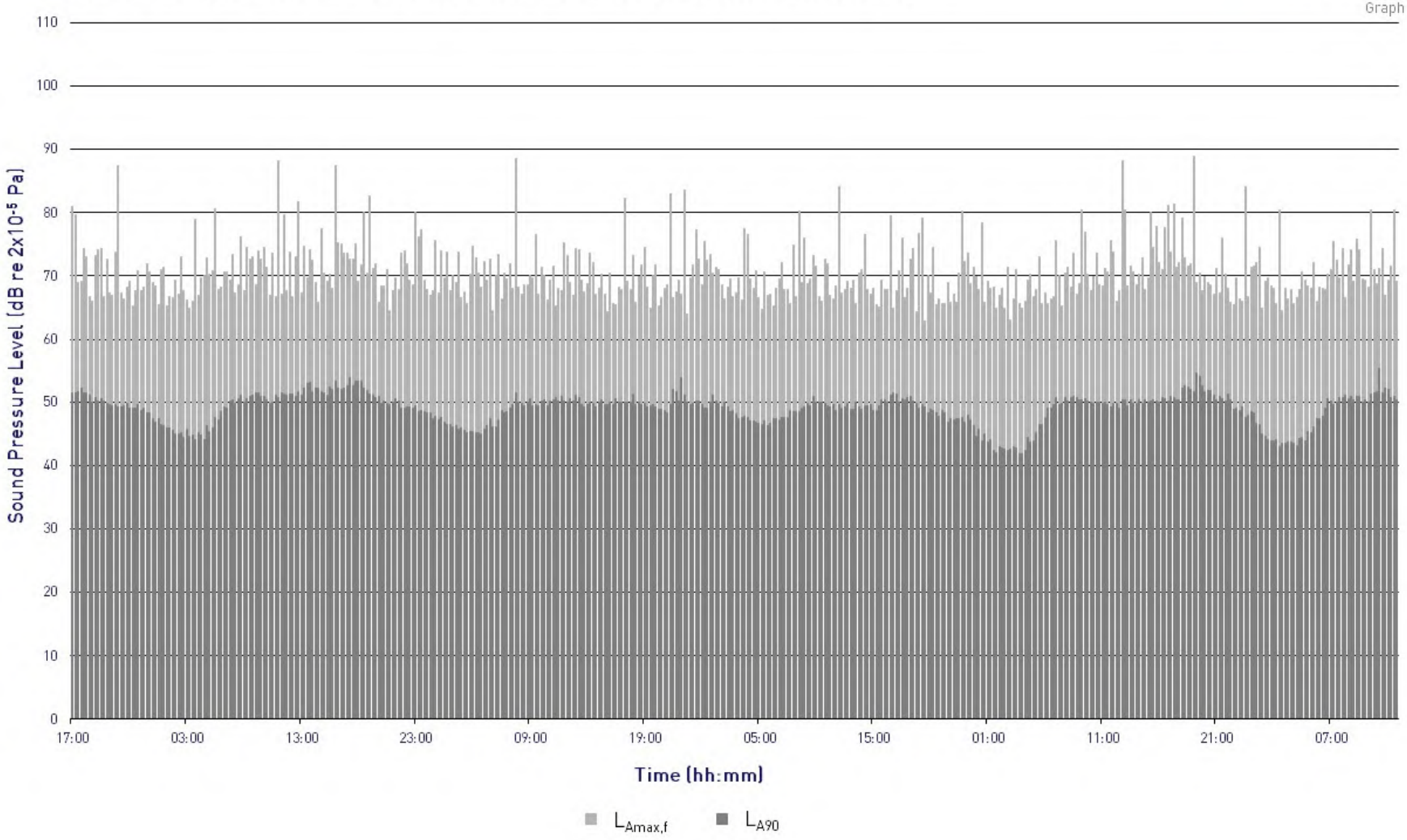
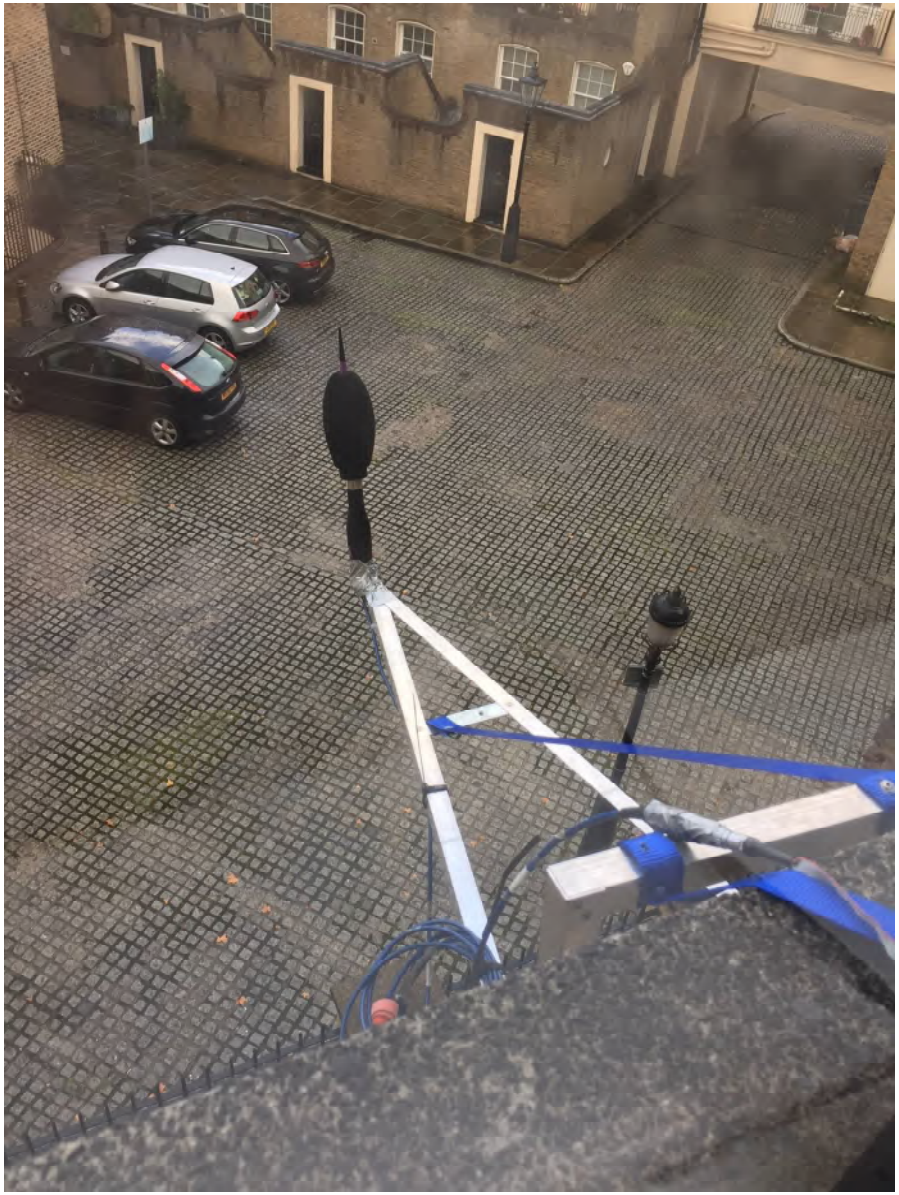
Graph 4





The Diorama, 17 Park Square East
Measurement location photographs
Project 9616

Figure 1 & 2
15 April 2020
Not to Scale

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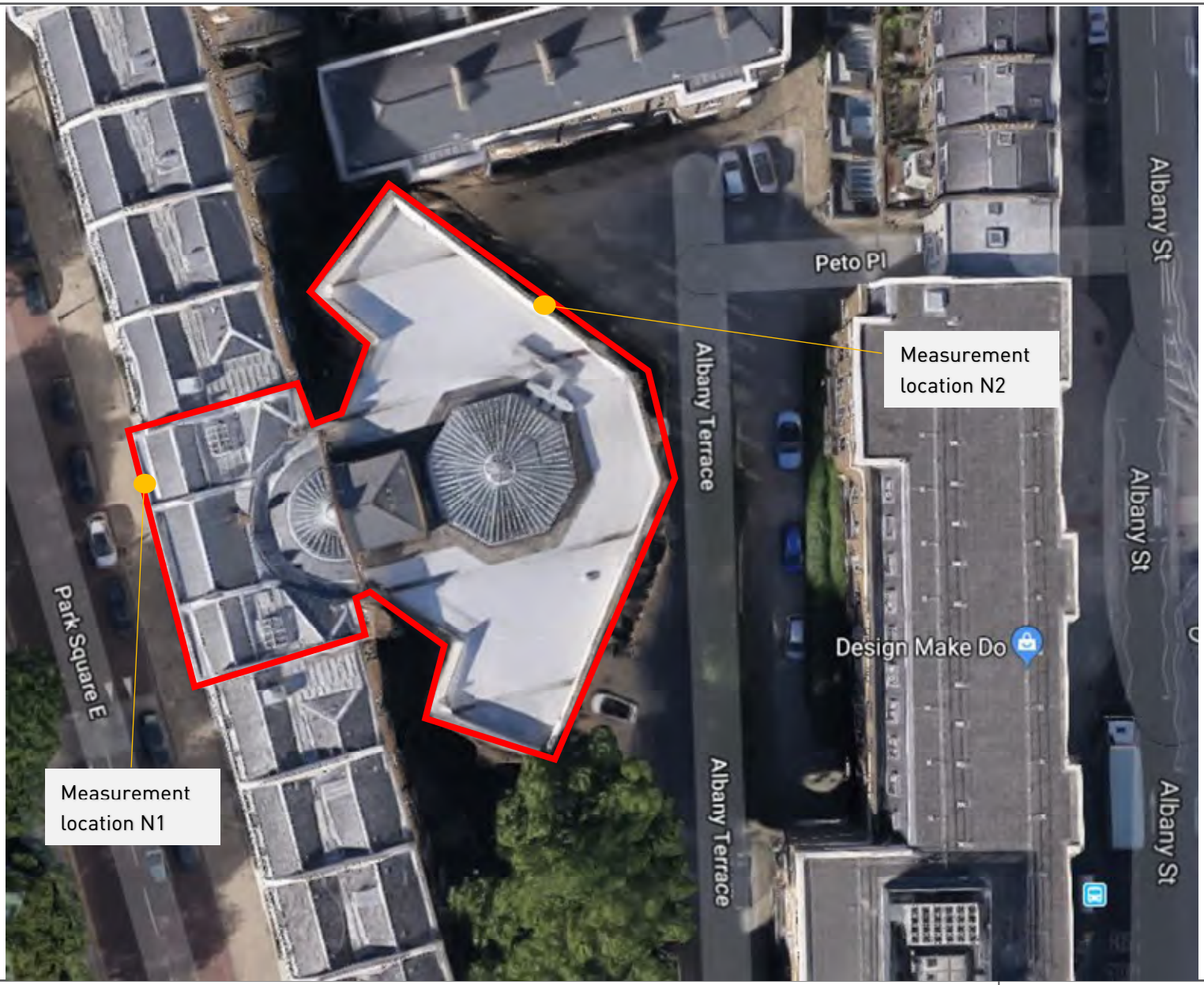

The Diorama, 17 Park Square East
Site plan of Diorama development (17-19 Park Square East)
Project 9616

Figure 3
15 April 2020
Not to Scale

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