



11 Rosslyn Hill, NW3

# Plant Noise Assessment

Report 14/0692/R2-1

11 Rosslyn Hill, NW3

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Report 14/0692/R2-1

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## Thomas Croft Architects

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Issue	Description	Date	Prepared by	Checked by
0	First Issue	23 March 2015	Matthew White	Lee Montague
1	Second Issue	25 March 2015	Matthew White	Lee Montague

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Prepared by

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Checked by

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25 March 2015

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## Attachments

### **14/0692/SP1-1**

Site Plan showing location of new mechanical plant and nearest noise sensitive receivers

### **14/0692/SP2**

Site Plan showing measurement location

### **14/0692/TH01**

Noise Level Time History at Position MP1

### **14/0692/PNS1**

Plant Noise Levels

### **14/0692/AP1/CS1-4**

Calculations to assessment position AP1

### **14/0692/AP2/CS1-4**

Calculations to assessment position AP1

### **14/0692/SS1**

Silencer Schedule

## **Glossary of Acoustic Terms**



## 1 Introduction

- 1.1 As part of extension works at 11 Rosslyn Hill, NW3, there will be new mechanical plant installed.
- 1.2 In order to obtain planning permission, suitable plant noise limits must be derived and met to comply with the criteria set by the London Borough of Camden. Cole Jarman has been appointed to conduct a noise survey and an assessment of new plant.
- 1.3 This report presents the existing noise levels at the site and sets out plant noise limits to which new equipment will need to adhere. The new proposed equipment has then been assessed against the plant noise limits and mitigation measures have been recommended where necessary.
- 1.4 For the purpose of our assessment, it is assumed that all plant will operate 24 hours a day.

## 2 Site Description

- 2.1 The site is located at 11 Rosslyn Hill, Hampstead, London NW3 5UL. A plan of the site and the surrounding area is attached in figure 14/0692/SP1-1.
- 2.2 The proposed plant items are to be located as marked up in the figure.
- 2.3 The site is set back from the major roads and is afforded some screening by the existing buildings. To the east of the site is Rosslyn Hill which experiences high levels of road traffic. To the south of the site is Belsize Lane. To the north of the site is Air Studios. The surrounding properties are predominantly residential.
- 2.4 The nearest noise sensitive receivers are the rear windows of the properties on Rosslyn Hill and Belsize Lane.

## 3 Noise Survey

### 3.1 Methodology and Instrumentation

- 3.1.1 An unattended noise survey was undertaken commencing at 1500 hours on 22<sup>nd</sup> December 2014 and concluding at 1500 hours on 23<sup>rd</sup> December 2014. Noise measurements were made at a location chosen to be representative of the nearest noise sensitive receptors. The location is marked as MP1 on attached site plan 14/0692/SP2.
- 3.1.2 The microphone was located in a free-field position approximately 4m above ground.



- 3.1.3 Measurements in terms of  $L_{Amax}$ ,  $L_{Aeq}$  and  $L_{A90}$  indices were made over consecutive 15 minute periods (see the Glossary of Acoustic Terms for an explanation of the noise units used).
- 3.1.4 Noise measurements were made the equipment listed in table T1 below.

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

T1 Equipment used during unattended noise survey.

- 3.1.5 The microphone was fitted with a weather-proof windshield and calibrated before and after the survey to ensure that a consistent and acceptable level of accuracy was maintained throughout.
- 3.1.6 The weather conditions during the setup of the equipment were dry with variable wind speeds ranging from calm to moderate, with wind speed predominantly less than 5m/s. The weather conditions at the collection were similar in nature. It is considered that the wind speed was below 5m/s for the majority of the noise survey. This is consistent with publically available weather data.

### 3.2 Results

- 3.2.1 A full time history of the noise survey results is presented in the attached figure 14/0692/TH01.
- 3.2.2 Results for the minimum measurement background noise levels are shown in table T2.

Position	Period	Lowest Measured Background Noise Level (dBA, L90)
MP1	Daytime (0700-2300)	44
	Night (24 hours)	39

T2 Lowest measured background noise levels (free-field)



#### 4 Plant Noise Limits

4.1 The site falls within the London Borough of Camden. In accordance with the current version of the 'Camden Council Noise Standards' the following section 1.52 will apply to the proposed plant, with regard to 'Disturbance from plant or machinery':

*The Council seeks to ensure that the level of noise/vibration from all plant and machinery does not increase existing ambient noise levels, therefore planning permission will only be granted for plant or machinery if it can be operated without causing a loss to local amenity and does not exceed the thresholds set out in Table E. In determining whether a proposal may be acceptable, the Council will require planning applications to include details of all proposed plant and machinery associated with a development, including an acoustic report. This may require close co-operation between an environmental or air handling engineer and the architect to agree an acceptable design solution for the particular premises and uses for which the system is designed. Supplementary guidance contains general guidance on minimising the impacts of plant and machinery.*

4.2 Table E referred to above is reproduced below:

**Table E: Noise levels from plant and machinery at which planning permission will not be granted**

Noise description and location of measurement	Period	Time	Noise level
Noise at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	5dB(A) <LA90
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive facade	Day, evening and night	0000-2400	10dB(A) <LA90
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive facade	Day, evening and night	0000-2400	10dB(A) <LA90
Noise at 1 metre external to sensitive façade where LA90 >60dB	Day, evening and night	0000-2400	55dB L <sub>Aeq</sub>

4.3 Based on these requirements and the results of the survey, plant noise limits for nearby properties are listed in table T3 below. They correspond to a level of 5dB below the minimum existing background noise level, including for a façade correction.



**Noise Emission Limit, dB(A)**

**Daytime  
(0700-2300)**  
42

**Night time  
(24-hour)**  
37



T3 Plant noise emission limits at 1m from the façade of the nearest residential properties.

4.4 Noise limits are to apply to the combined effect of all plant items that run during any particular period and should be assessed to a position 1m from the façade of the nearest or worst affected noise sensitive properties.

## 5 Plant Noise Assessment

### 5.1 Mechanical Services Installation

5.1.1 The extension works at 11 Rosslyn Hill will see the following items of plant installed that will terminate to the atmosphere:

- Swimming Pool Fresh Air Supply (ducted from basement plant room)
- Swimming Pool Exhaust (ducted from basement plant room)
- Air Source Heat Pump (x2)
- Condenser Unit (x1)

5.1.2 Information on the mechanical services installation has been provided to Cole Jarman by Thomas Croft Architects for review. A schedule of the Plant and Air Handling Equipment Sound Levels can be seen in attachment 14/0692/PNS1. These Sound Power and Sound Pressure levels have formed the basis of our assessment.

5.1.3 An assessment has been carried out at two positions as described below:

- AP1: Rear windows of houses on Rosslyn Hill
- AP2: Rear windows of houses on Belsize Lane

5.1.4 The locations of the assessment positions and the proposed new items of plant are shown in attachment 14/0692/SP1-1.

5.1.5 For the purpose of assessment it is presume that plant will operate 24 hours a day.

### 5.2 Mitigation

5.2.1 In order to achieve the target plant noise limit it will be necessary to specify an atmospheric side in-duct silencer within the exhaust air which should achieve the following specification.



<b>Insertion Loss (dB) @ Octave Band Centred Frequency (Hz)</b>							
<b>63</b>	<b>125</b>	<b>250</b>	<b>500</b>	<b>1k</b>	<b>2k</b>	<b>4k</b>	<b>8k</b>
1	2	7	10	11	9	8	7

T4 Atmospheric side silencer insertion loss performance requirement for swimming pool exhaust air

- 5.2.2 This performance is expected to be achieved with a standard 600mm long splitter silencer with a free area of 50%. The silencer should be sized so that any pressure drops are limited to <40Pa.
- 5.2.3 The air source heat pumps and condenser unit are expected to meet the Local Authority requirements without any mitigation. These items will be housed within a plant compound with a louvered frontage, which is not required for acoustic control purposes.

**5.3 Assessment**

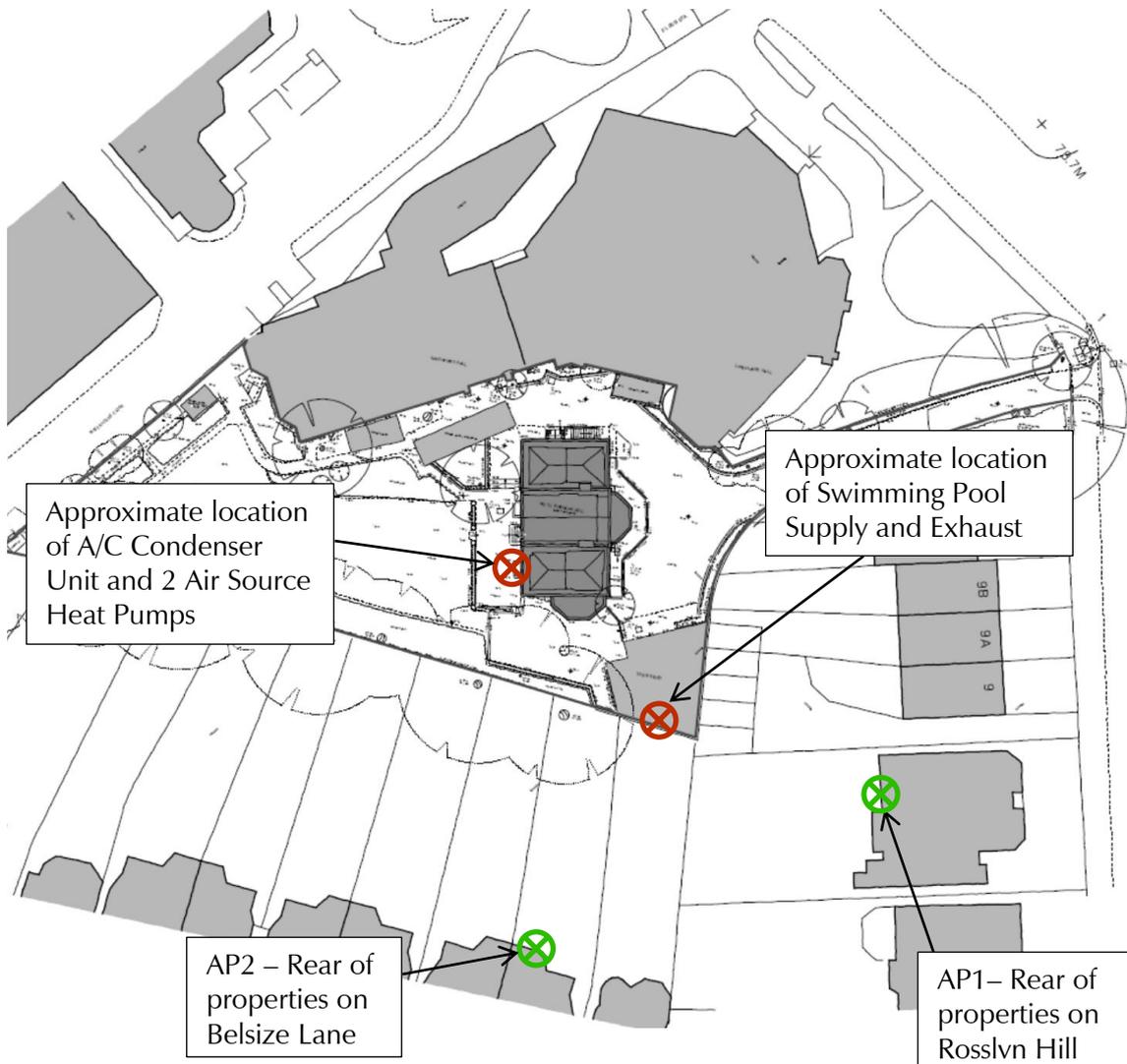
- 5.3.1 Calculations have been undertaken for all of the proposed items of plant to both assessment locations and the results compared against the design limit of 37 dBA at the nearest noise sensitive windows.
- 5.3.2 With the inclusion of the mitigation described above, the noise level at 1m from the nearest noise sensitive receiver has been assessed as 33dBA with all items of plant operating. This is 4dB within the noise limits and therefore meets the criteria.
- 5.3.3 Full details of the calculations are presented in attachments 14/0692/AP1/CS1-4 and 14/0692/AP2/CS1-4 for the two assessment positions.

**6 Conclusion**

- 6.1 As part of extension works at 11 Rosslyn Hill, NW3, new mechanical plant will be installed .
- 6.2 Cole Jarman have conducted an environmental noise survey at a location representative of the nearest residential properties to determine the lowest background noise levels at the façade.
- 6.3 Using the results of the survey, plant noise limits have been set in accordance with criteria set out by the London Borough of Camden.
- 6.4 Proposed new plant associated with the swimming pool and heating and cooling plant have been assessed and mitigation measures provided to comply with the Local Authority limits.

■ End of Section

Figure 14/0692/SP1-1



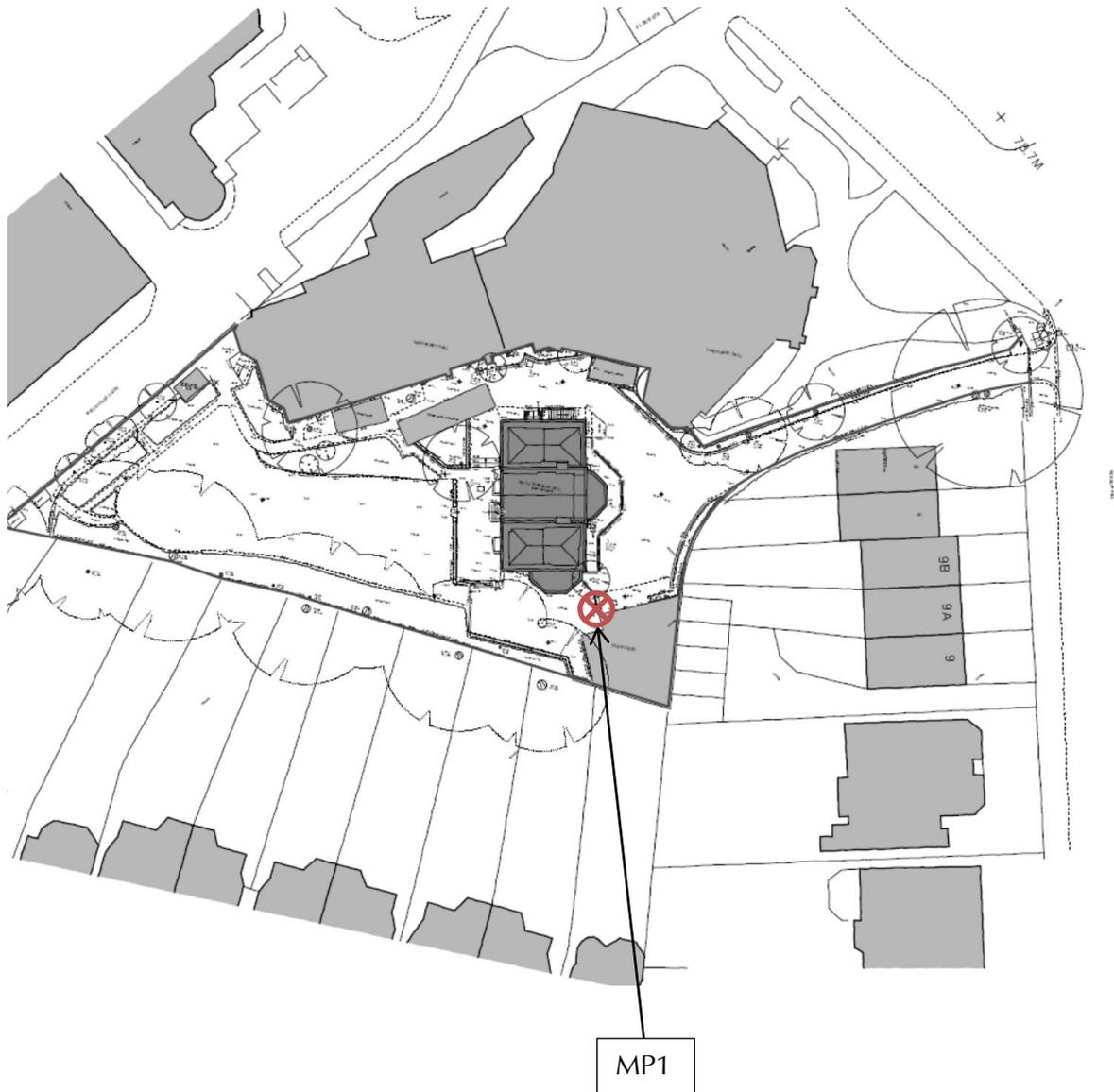
Title: Site Plan showing location of proposed new mechanical plant and nearest noise sensitive receivers

Project: 11 Rosslvn Hill, NW3

Date: March 2015

Scale: Not to scale

Figure 14/0692/SP2



Title: Site Plan showing measurement location

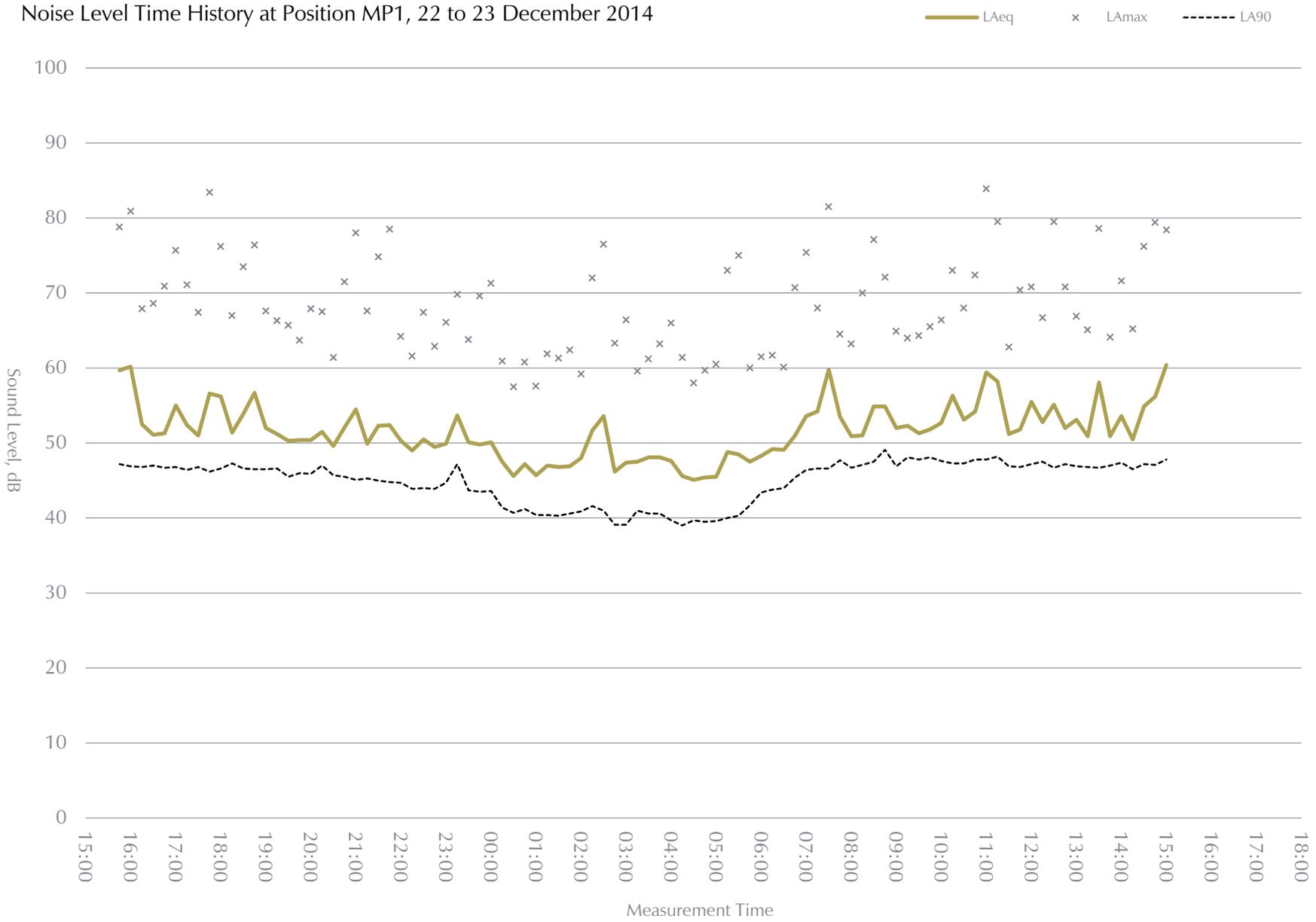
Project: 11 Rosslyn Hill, NW3

Date: December 2014

Scale: Not to scale



Figure 14/0692/TH01





Schedule of Plant and Air Handling Equipment Sound Levels, dB

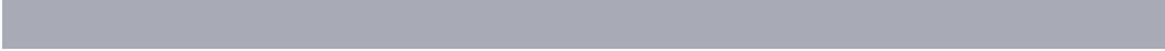
Reference	Description	Volume (m3/s)	Data <sup>1</sup> Source	Noise Level Type	Noise Levels (dB)							
					63	125	250	500	1k	2k	4k	8k
Swimming Pool Fresh Air	Swimming Pool Fresh Air	0.39	Man	Sound Power, Lw	65.6	66.2	63.8	64.5	61.7	63.4	60.9	52.4
Swimming Pool Exhaust	Swimming Pool Exhaust	0.39	Man	Sound Power, Lw	67.7	69.5	67.7	69.1	66.3	68.1	65.3	56
Air Source Heat Pump	PUHZ-HW140YHA2		Man	Sound Pressure, Lp @ 1m	61	56	52	51	48	43	38	30
AC Condenser	PUMY-P140YKM		Man	Sound Pressure, Lp @ 1m	58.6	52.6	49.6	49.6	45.6	41.6	34.6	38.6

Notes

1 - Man refers to data supplied by the equipment manufacturer or supplier, Emp refers to data calculated using empirical formulae, and Meas refers to data measured by Cole Jarman



Swimming Pool Fresh Air to Rear of Houses on Rosslyn Hill at Night



	Octave Band Centre Frequency (Hz)						
	63	125	250	500	1k	2k	4k

**Noise Source**

Noise Source - Swimming Pool Fresh Air

<b>Sound Power Levels</b>	<b>65.6</b>	<b>66.2</b>	<b>63.8</b>	<b>64.5</b>	<b>61.7</b>	<b>63.4</b>	<b>60.9</b>	<b>52.4</b>
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**Rect Unlined Duct Losses CJ**

Width (m)	0.3							
Height (m)	0.3							
Length (m)	10.0							
Octave Band Read	4.5	6.0	4.5	3.0	2.0	2.0	2.0	1.5
	-4.5	-6.0	-4.5	-3.0	-2.0	-2.0	-2.0	-1.5

**Bend Loss CJ**

Dimension (mm)	300.0							
No. of Bends (no.)	2.0							
Type - Unlined Square Bend - With Vanes								
Octave Band Read	0.0	0.0	0.0	0.0	2.0	4.0	6.0	6.0
	0.0	0.0	0.0	0.0	-2.0	-4.0	-6.0	-6.0

**End Reflection**

Width/Diameter	0.3							
Length	0.3							
Rec or Circ - Rectangular								
Free or Flush - Flush								
Octave Band Read	-11.9	-7.4	-2.9	0.0	0.0	0.0	0.0	0.0
	-11.9	-7.4	-2.9	0.0	0.0	0.0	0.0	0.0

**Point Source Radiation Loss**

Radiation - Hemispherical	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0
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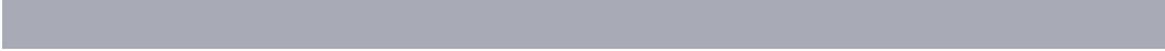


14/0692/AP1/CS1

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
<b>Point Source Distance Loss</b>									
Start Distance (m)	1.0								
End Distance (m)	22.0								
		-26.8	-26.8	-26.8	-26.8	-26.8	-26.8	-26.8	-26.8
<b>Facade Reflection</b>									
Reflection (dB)	3.0								
		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
<b>External Receiver</b>									
External Receiver - Rear of Houses on Rosslyn Hill at Night									
<b>Sound Pressure, Lp</b>		<b>17.4</b>	<b>21.0</b>	<b>24.6</b>	<b>29.7</b>	<b>25.9</b>	<b>25.6</b>	<b>21.1</b>	<b>13.1</b>



Swimming Pool Exhaust to Rear of Houses on Rosslyn Hill at Night



	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k

**Noise Source**

Noise Source - Swimming Pool Exhaust

<b>Sound Power Levels</b>	<b>67.7</b>	<b>69.5</b>	<b>67.7</b>	<b>69.1</b>	<b>66.3</b>	<b>68.1</b>	<b>65.3</b>	<b>56.0</b>
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**Rect Unlined Duct Losses CJ**

Width (m)	0.3							
Height (m)	0.3							
Length (m)	10.0							
Octave Band Read	4.5	6.0	4.5	3.0	2.0	2.0	2.0	1.5
	-4.5	-6.0	-4.5	-3.0	-2.0	-2.0	-2.0	-1.5

**Bend Loss CJ**

Dimension (mm)	300.0							
No. of Bends (no.)	2.0							
Type - Unlined Square Bend - With Vanes								
Octave Band Read	0.0	0.0	0.0	0.0	2.0	4.0	6.0	6.0
	0.0	0.0	0.0	0.0	-2.0	-4.0	-6.0	-6.0

**End Reflection**

Width/Diameter	0.3							
Length	0.3							
Octave Band Read	-11.9	-7.4	-2.9	0.0	0.0	0.0	0.0	0.0
Rec or Circ - Rectangular								
Free or Flush - Flush								
	-11.9	-7.4	-2.9	0.0	0.0	0.0	0.0	0.0

**Silencer**

Silencer - Silencer	-1.0	-2.0	-7.0	-10.0	-11.0	-9.0	-8.0	-7.0
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14/0692/AP1/CS2

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
<b>Point Source Radiation Loss</b>									
Radiation - Hemispherical									
		-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0
<b>Point Source Distance Loss</b>									
Start Distance (m)	1.0								
End Distance (m)	22.0								
		-26.8	-26.8	-26.8	-26.8	-26.8	-26.8	-26.8	-26.8
<b>Facade Reflection</b>									
Reflection (dB)	3.0								
		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
<b>External Receiver</b>									
External Receiver - Rear of Houses on Rosslyn Hill at Night									
<b>Sound Pressure, Lp</b>		<b>18.5</b>	<b>22.3</b>	<b>21.5</b>	<b>24.3</b>	<b>19.5</b>	<b>21.3</b>	<b>17.5</b>	<b>9.7</b>



Air Source Heat Pump (PUHZ-HW140YHA2) to Rear of Houses on Rosslyn Hill at Night

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
<b>Noise Source</b>									
Noise Source - Air Source Heat Pump (PUHZ-HW140YHA2)									
<b>Sound Pressure Levels @ 1m</b>		<b>61.0</b>	<b>56.0</b>	<b>52.0</b>	<b>51.0</b>	<b>48.0</b>	<b>43.0</b>	<b>38.0</b>	<b>30.0</b>
<b>Source number correction</b>									
No. of sources	2.0								
		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
<b>Point Source Distance Loss</b>									
Start Distance (m)	1.0								
End Distance (m)	47.0								
		-33.4	-33.4	-33.4	-33.4	-33.4	-33.4	-33.4	-33.4
<b>Maekawa Screening Loss</b>									
Path Difference (m)	0.1								
		-5.7	-6.5	-7.7	-9.5	-11.7	-14.2	-17.0	-19.8
<b>Facade Reflection</b>									
Reflection (dB)	3.0								
		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
<b>External Receiver</b>									
External Receiver - Rear of Houses on Rosslyn Hill at Night									
<b>Sound Pressure, Lp</b>		<b>27.8</b>	<b>22.1</b>	<b>16.8</b>	<b>14.1</b>	<b>8.9</b>	<b>1.4</b>	<b>-6.4</b>	<b>-17.3</b>

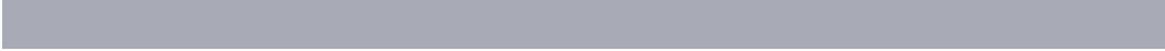


AC Condenser (PUMY-P140YKM) to Rear of Houses on Rosslyn Hill at Night

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
<b>Noise Source</b>									
Noise Source - AC Condenser (PUMY-P140YKM)									
<b>Sound Pressure Levels @ 1m</b>		<b>64.0</b>	<b>59.7</b>	<b>51.3</b>	<b>52.4</b>	<b>46.8</b>	<b>41.7</b>	<b>36.7</b>	<b>31.2</b>
<b>Point Source Distance Loss</b>									
Start Distance (m)	1.0								
End Distance (m)	47.0								
		-33.4	-33.4	-33.4	-33.4	-33.4	-33.4	-33.4	-33.4
<b>Maekawa Screening Loss</b>									
Path Difference (m)	0.1								
		-5.7	-6.5	-7.7	-9.5	-11.7	-14.2	-17.0	-19.8
<b>Facade Reflection</b>									
Reflection (dB)	3.0								
		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
<b>External Receiver</b>									
External Receiver - Rear of Houses on Rosslyn Hill at Night									
<b>Sound Pressure, Lp</b>		<b>27.8</b>	<b>22.8</b>	<b>13.1</b>	<b>12.5</b>	<b>4.7</b>	<b>-2.9</b>	<b>-10.7</b>	<b>-19.1</b>



Swimming Pool Fresh Air to Rear of Houses on Belsize Lane at Night



	Octave Band Centre Frequency (Hz)						
	63	125	250	500	1k	2k	4k

**Noise Source**

Noise Source - Swimming Pool Fresh Air

<b>Sound Power Levels</b>	<b>65.6</b>	<b>66.2</b>	<b>63.8</b>	<b>64.5</b>	<b>61.7</b>	<b>63.4</b>	<b>60.9</b>	<b>52.4</b>
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**Rect Unlined Duct Losses CJ**

Width (m)	0.3							
Height (m)	0.3							
Length (m)	10.0							
Octave Band Read	4.5	6.0	4.5	3.0	2.0	2.0	2.0	1.5
	-4.5	-6.0	-4.5	-3.0	-2.0	-2.0	-2.0	-1.5

**Bend Loss CJ**

Dimension (mm)	300.0							
No. of Bends (no.)	2.0							
Type - Unlined Square Bend - With Vanes								
Octave Band Read	0.0	0.0	0.0	0.0	2.0	4.0	6.0	6.0
	0.0	0.0	0.0	0.0	-2.0	-4.0	-6.0	-6.0

**End Reflection**

Width/Diameter	0.3							
Length	0.3							
Octave Band Read	-11.9	-7.4	-2.9	0.0	0.0	0.0	0.0	0.0
Rec or Circ - Rectangular								
Free or Flush - Flush								
	-11.9	-7.4	-2.9	0.0	0.0	0.0	0.0	0.0

**Point Source Radiation Loss**

Radiation - Hemispherical	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0
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14/0692/AP2/CS1

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
<b>Point Source Distance Loss</b>									
Start Distance (m)	1.0								
End Distance (m)	27.0								
		-28.6	-28.6	-28.6	-28.6	-28.6	-28.6	-28.6	-28.6
<b>Facade Reflection</b>									
Reflection (dB)	3.0								
		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
<b>External Receiver</b>									
External Receiver - Rear of Houses on Belsize Lane at Night									
<b>Sound Pressure, Lp</b>		<b>15.6</b>	<b>19.2</b>	<b>22.8</b>	<b>27.9</b>	<b>24.1</b>	<b>23.8</b>	<b>19.3</b>	<b>11.3</b>



Swimming Pool Exhaust to Rear of Houses on Belsize Lane at Night



	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k

**Noise Source**

Noise Source - Swimming Pool Exhaust

<b>Sound Power Levels</b>	<b>67.7</b>	<b>69.5</b>	<b>67.7</b>	<b>69.1</b>	<b>66.3</b>	<b>68.1</b>	<b>65.3</b>	<b>56.0</b>
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**Rect Unlined Duct Losses CJ**

Width (m)	0.3							
Height (m)	0.3							
Length (m)	10.0							
Octave Band Read	4.5	6.0	4.5	3.0	2.0	2.0	2.0	1.5
	-4.5	-6.0	-4.5	-3.0	-2.0	-2.0	-2.0	-1.5

**Bend Loss CJ**

Dimension (mm)	300.0							
No. of Bends (no.)	2.0							
Type - Unlined Square Bend - With Vanes								
Octave Band Read	0.0	0.0	0.0	0.0	2.0	4.0	6.0	6.0
	0.0	0.0	0.0	0.0	-2.0	-4.0	-6.0	-6.0

**End Reflection**

Width/Diameter	0.3							
Length	0.3							
Octave Band Read	-11.9	-7.4	-2.9	0.0	0.0	0.0	0.0	0.0
Rec or Circ - Rectangular								
Free or Flush - Flush								
	-11.9	-7.4	-2.9	0.0	0.0	0.0	0.0	0.0

**Silencer**

Silencer - Silencer	-1.0	-2.0	-7.0	-10.0	-11.0	-9.0	-8.0	-7.0
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14/0692/AP2/CS2

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
<b>Point Source Radiation Loss</b>									
Radiation - Hemispherical									
		-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0
<b>Point Source Distance Loss</b>									
Start Distance (m)	1.0								
End Distance (m)	27.0								
		-28.6	-28.6	-28.6	-28.6	-28.6	-28.6	-28.6	-28.6
<b>Facade Reflection</b>									
Reflection (dB)	3.0								
		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
<b>External Receiver</b>									
External Receiver - Rear of Houses on Belsize Lane at Night									
<b>Sound Pressure, Lp</b>		<b>16.7</b>	<b>20.5</b>	<b>19.7</b>	<b>22.5</b>	<b>17.7</b>	<b>19.5</b>	<b>15.7</b>	<b>7.9</b>



Air Source Heat Pump (PUHZ-HW140YHA2) to Rear of Houses on Belsize Lane at Night

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
<b>Noise Source</b>									
Noise Source - Air Source Heat Pump (PUHZ-HW140YHA2)									
<b>Sound Pressure Levels @ 1m</b>		<b>61.0</b>	<b>56.0</b>	<b>52.0</b>	<b>51.0</b>	<b>48.0</b>	<b>43.0</b>	<b>38.0</b>	<b>30.0</b>
<b>Source number correction</b>									
No. of sources	2.0								
		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
<b>Point Source Distance Loss</b>									
Start Distance (m)	1.0								
End Distance (m)	37.0								
		-31.4	-31.4	-31.4	-31.4	-31.4	-31.4	-31.4	-31.4
<b>Facade Reflection</b>									
Reflection (dB)	3.0								
		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
<b>External Receiver</b>									
External Receiver - Rear of Houses on Belsize Lane at Night									
<b>Sound Pressure, Lp</b>		<b>35.6</b>	<b>30.6</b>	<b>26.6</b>	<b>25.6</b>	<b>22.6</b>	<b>17.6</b>	<b>12.6</b>	<b>4.6</b>



AC Condenser (PUMY-P140YKM) to Rear of Houses on Belsize Lane at Night



	Octave Band Centre Frequency (Hz)						
	63	125	250	500	1k	2k	4k

**Noise Source**

Noise Source - AC Condenser (PUMY-P140YKM)

<b>Sound Pressure Levels @ 1m</b>	<b>64.0</b>	<b>59.7</b>	<b>51.3</b>	<b>52.4</b>	<b>46.8</b>	<b>41.7</b>	<b>36.7</b>	<b>31.2</b>
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**Point Source Distance Loss**

Start Distance (m) 1.0

End Distance (m) 37.0

	-31.4	-31.4	-31.4	-31.4	-31.4	-31.4	-31.4	-31.4
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**Facade Reflection**

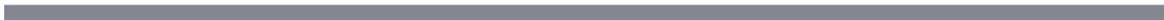
Reflection (dB) 3.0

	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
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**External Receiver**

External Receiver - Rear of Houses on Belsize Lane at Night

<b>Sound Pressure, Lp</b>	<b>35.6</b>	<b>31.3</b>	<b>22.9</b>	<b>24.0</b>	<b>18.4</b>	<b>13.3</b>	<b>8.3</b>	<b>2.8</b>
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Schedule of silencers and required insertion loss, dB<sup>1</sup>

Reference	Location	Silencer Type	Face Velocity <sup>2</sup> (m/s)	Insertion Losses (dB)							
				63	125	250	500	1k	2k	4k	8k
Silencer	Exhaust	600mm Standard Splitter Silencer - 50% Free Area	5	1	2	7	10	11	9	8	7

Notes

- 1 - To be read in conjunction with silencer specification
- 2 - Silencers should be sized such that the stated air velocity (in m/s) is not exceeded. Air velocity is evaluated by dividing the flow rate by the entire cross-sectional area of the silencer, not just the open or free area.



## 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).

