NSL
Noise Solutions Ltd

Product Madness
Saffron House

6-10 Kirby Street
London
EC1N 8EQ

Plant Noise
Impact Assessment

On behalf of

MARIS

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A	06/10/17	Change of plant and location	MP	NAC

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Appendices

1.0 Introduction

1.1. Noise Solutions Ltd (NSL) has been commissioned by Maris Interior LLP to undertake a noise impact assessment for 2No. air conditioning (AC) units to be located externally on the first floor of Saffron House, 6-10 Kirby Street, London.

1.2. An environmental sound survey has been undertaken to establish the prevailing background sound pressure levels at a location representative of the sound levels outside the nearest noise sensitive receptors to the site.

1.3. Cumulative plant noise emission levels for the proposed plant have been predicted at the most affected noise sensitive receptors and assessed using the typical requirements of the local authority.

1.4. A glossary of acoustic terminology is given in Appendix A.

2.0 Details of development proposals

2.1. The company Product Madness will occupy the first floor of a six storey building located on Kirby Street in Camden.

2.2. Proposal is for 2No. AC condensers to be located externally on the south elevation of the building, adjacent to an outside terrace on the first floor.

2.3. The AC units serving the communication room will operate 24 hours a day.

3.0 Nearest noise sensitive receptors

3.1. The area surrounding the site contains a mix of residential and commercial properties. The nearest noise sensitive properties will be the student accommodation flats at 3 Kirby Street (Receptor R1).

3.2. Appendix B contains an aerial photograph showing the site and surrounding area.

4.0 Existing noise climate

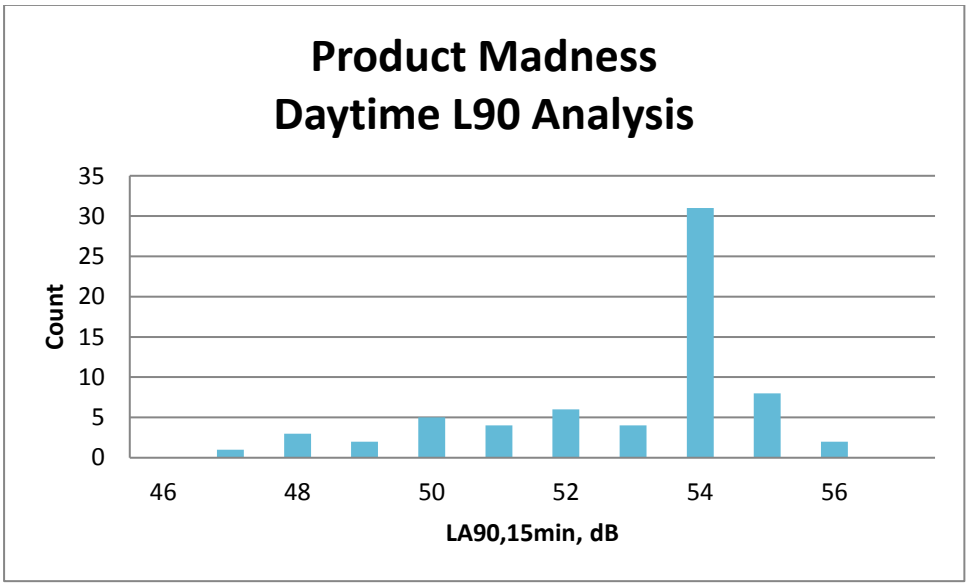
4.1. An environmental noise survey was undertaken to establish the typical background sound levels at a location representative of the noise climate outside the façades of the nearest noise sensitive receptors to the proposed plant area during the quietest times at which the plant will operate.

4.2. The results of the environmental sound survey are summarised in Table 1 below. The full set of measurement results and details of the survey methodology are presented in Appendix C.

Table 1 Summary of survey results

Measurement period	Range of recorded sound pressure levels (dB)			
	$L_{Aeq(15mins)}$	$L_{Amax(15mins)}$	$L_{A10(15mins)}$	$L_{A90(15mins)}$
Daytime (07.00 – 23.00 hours)	48-65	57-87	52-72	47-56
Night-time (23.00 – 07.00 hours)	45-52	51-72	50-55	41-52

Figure 1 Histogram of daytime L_{A90} background sound pressure levels



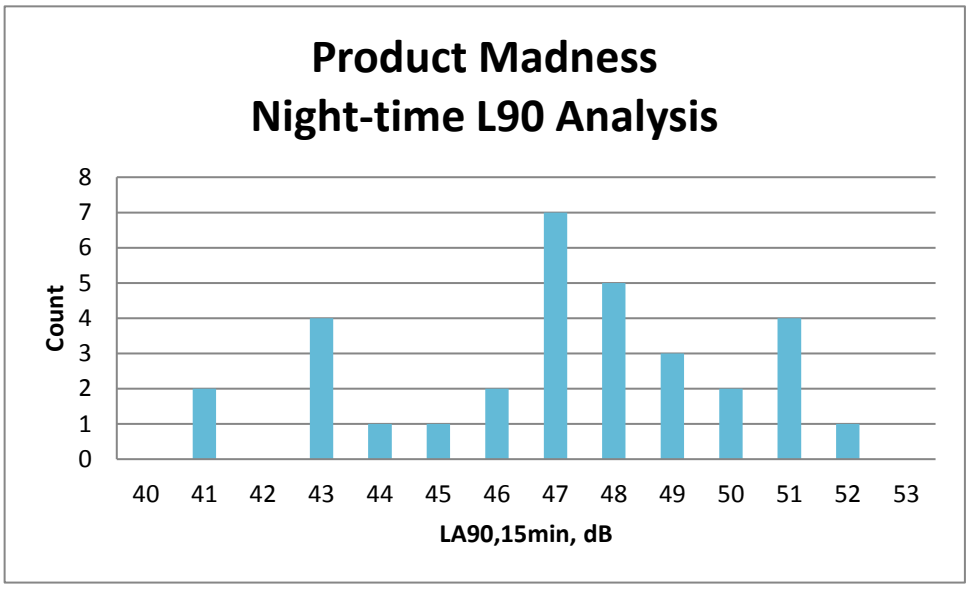
4.3. Additional statistical analysis has been undertaken. As shown in Table 2, the mean, median, and modal values have been calculated:

Table 2 Statistical analysis of $L_{A90,15min}$ levels during the daytime period

dB, L_{A90} daytime period	
Mean	53
Median	54
Mode	54

4.4. The mean, median and modal values range between 53dB L_{A90} and 54dB L_{A90}. Due to the difference between those figures and the lowest measured background noise level (47dB L_{A90}), it is considered reasonable to use a value between the mean and the lowest measurement. Therefore, 50dB L_{A90} has been considered as representative of the typical background sound level during the daytime period at Kirby Street.

Figure 2 Histogram of night-time L_{A90} background sound pressure levels



4.5. 47dB L_{A90} has been considered as representative of the typical background sound level during the night-time period at Kirby Street.

4.6. Therefore, the following values are considered as representative of the existing background sound pressure levels at nearby noise sensitive premises:

- 50dB L_{90} during the daytime period; and
- 47dB L_{90} during the night-time period

5.0 Plant noise design criteria

National Planning Policy Framework

5.1. The *National Planning Policy Framework (NPPF)* was introduced in March 2012. The document sets out the Government's planning policies for England and how these are expected to be applied.

5.2. Paragraph 123 of the *NPPF* states that 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 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 businesses 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 [subject to the provisions of the Environmental Protection Act 1990 and other relevant law]; and*

- *identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.*

5.3. Furthermore the NPPF gives weight to the requirements of the local authority as it states the following:

> *11. Planning law requires that applications for planning permission must be determined in accordance with the development plan unless material considerations indicate otherwise.*
>
> *12. This National Planning Policy Framework does not change the statutory status of the development plan as the starting point for decision making. Proposed development that accords with an up-to-date Local Plan should be approved, and proposed development that conflicts should be refused unless other material considerations indicate otherwise. It is highly desirable that local planning authorities should have an up-to-date plan in place.*
>
> *13. The National Planning Policy Framework constitutes guidance for local planning authorities and decision-takers both in drawing up plans and as a material consideration in determining applications.*

BS 4142:2014

5.4. This standard is intended to be used to assess the likely effects of sound on people residing in nearby dwellings. The scope of BS 4142:2014 includes "sound from fixed plant installations which comprise mechanical and electrical plant and equipment".

5.5. The procedure contained in BS 4142:2014 provides an assessment of the likely effects of sound on people when comparing the specific noise levels from the source with representative background noise levels. Where the noise contains "a tone, impulse or other characteristic" then various corrections can be added to the specific (source) noise level to obtain the "rating level".

5.6. The likely effects of sound on people is assessed by subtracting the background noise level from the rating level. BS 4142:2014 states the following:

- Typically, the greater this difference, the greater the magnitude of the impact.

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;

- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context;

- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

London Borough of Camden

5.7. The Camden Local Policy document dated 2016 states in Policy A1 *'Managing the impact of development'* that for noise and vibration:

> *"Noise and vibration can have a major effect on amenity. The World Health Organisation (WHO) for example states that excessive noise can seriously harm human health, disturb sleep and have cardiovascular and behavioural effects. Camden's high density and mixed-use nature means that disturbance from noise and vibration is a particularly important issue in the borough.*
>
> *Where uses sensitive to noise are proposed close to an existing source of noise or when development that is likely to generate noise is proposed, the Council will require an acoustic report to accompany the application. Further detail can be found in Policy A4 - Noise and Vibration and our supplementary planning document Camden Planning Guidance 6: Amenity."*

5.8. Policy A4 *'Noise and Vibration'* states under the section titled *'Plant and other noise generating equipment'* that:

> *"Planning conditions will be imposed to require that plant and equipment which may be a source of noise is kept working efficiently and within the required noise limits and time restrictions. Air conditioning will only be permitted where it is demonstrated that there is a clear need for it after other measures have been considered (Policy CC2 Adapting to climate change). Conditions may also be imposed to ensure that attenuation measures are kept in place and are effective throughout the life of the development."*

5.9. The policy document goes on to describe noise thresholds in Appendix 2 and states in the *'Industrial and Commercial Noise Sources'* section:

> *"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)."

5.10. Table C of the appendix states the criteria at which development related noise levels will be acceptable:

Table C: Noise levels applicable to proposed industrial and commercial development (including plant and machinery)

Existing Noise sensitive receptor	Assessment Location	Design Period	LOAEL (green)	LOAEL to SOAEL (Amber)	SOAL (Red)
Dwellings**	Garden used for main amenity (free field) and Outside living or dining or bedroom window (façade)	Day	'Rating level' 10dB* below background	'Rating level' between 9dB below and 5dB above background	'Rating level' greater than 5dB above background
Dwellings**	Outside bedroom window (façade)	Night	'Rating level' 10dB* below background and no events exceeding 57dBL_{Amax}	'Rating level' between 9dB below and 5dB above background or noise events between 57dB and 88dBL_{Amax}	'Rating level' greater than 5dB above background and/or events exceeding 88dBL_{Amax}

**10dB should be increased to 15dB if the noise contains audible tonal elements. (day and night). However, if it can be demonstrated that there is no significant difference in the character of the residual background noise and the specific noise from the proposed development then this reduction may not be required. In addition, a frequency analysis (to include, the use of Noise Rating (NR) curves or other criteria curves) for the assessment of tonal or low frequency noise may be required.*

***levels given are for dwellings, however, levels are use specific and different levels will apply dependent on the use of the premises.*

5.11. Based on Camden Council's guidance it would be considered initially appropriate for noise from the plant to be at level that is lower than 10dB below the L_{A90} background level.

5.12. The cumulative noise rating level for the proposed plant at the nearest residential windows should not therefore exceed the limits shown in the table below:

Table 3 Proposed plant noise emissions limits at residences

Period	Cumulative plant noise rating level, dB(A)
Daytime (07.00 – 23.00 hours)	40
Night-time (23.00 – 07.00 hours)	37

6.0 Plant noise assessment

6.1. The cumulative plant noise level at the most affected noise sensitive receptors has been predicted. The assessment has taken into consideration distance attenuation and directivity corrections.

6.2. The predictions during the day and night-time period have been based on the proposed AC plant operating at full capacity.

6.3. It should be noted that the proposed plant is not anticipated to exhibit any tonal or impulsive characteristics provided it is well maintained. All proposed external plant will be inverter driven and, therefore, will gently ramp up and down depending on the demands of the system.

6.4. Table 4, below, summarises the results of the assessment at the most affected residential properties. All other nearby receptors benefit from increased distance/screening to the plant. The full set of calculations can be found in Appendix E.

Table 4 Assessment of predicted noise levels at nearby receptors

Receptor	Period	Predicted rating level at receptor, L_{Aeq} (dB)	Proposed design criterion (dB)	Difference (dB)
R1	Daytime (07.00 – 23.00 hours)	37	40	-3
	Night-time (23:00 – 07:00 hours)	37	37	0

6.5. The above assessment demonstrates that noise from the proposed plant will meet London Borough of Camden's typical noise requirement during both the day and night-time periods. The assessment also demonstrates that the predicted level at the receptor will be classed as a Green LOAEL in relation to the council noise criteria.

6.6. The impact must be considered within the context of the site and the surrounding acoustic environment. The following must, therefore, also be taken into consideration when determining the potential impact that may be experienced:

- The assessment is undertaken at the nearest residential windows. The impact on all other nearby residential windows will be lower due to screening and distance attenuation.
- It should be noted that predictions for the day and night time period have been based on the proposed AC condenser plant operating at full capacity.
- The site is located within a mixed use area where noise from plant and aircraft is part of the existing noise climate.

7.0 Summary

7.1. Noise Solutions Ltd (NSL) has been commissioned by Maris Interior LLP to undertake a noise impact assessment for proposed external plant serving Product Madness located on the first floor of Saffron House, 6-10 Kirby Street, London.

7.2. An environmental noise survey has been undertaken to establish the existing prevailing noise levels at a location representative of the noise climate outside the nearest noise sensitive receptors to the proposed plant area.

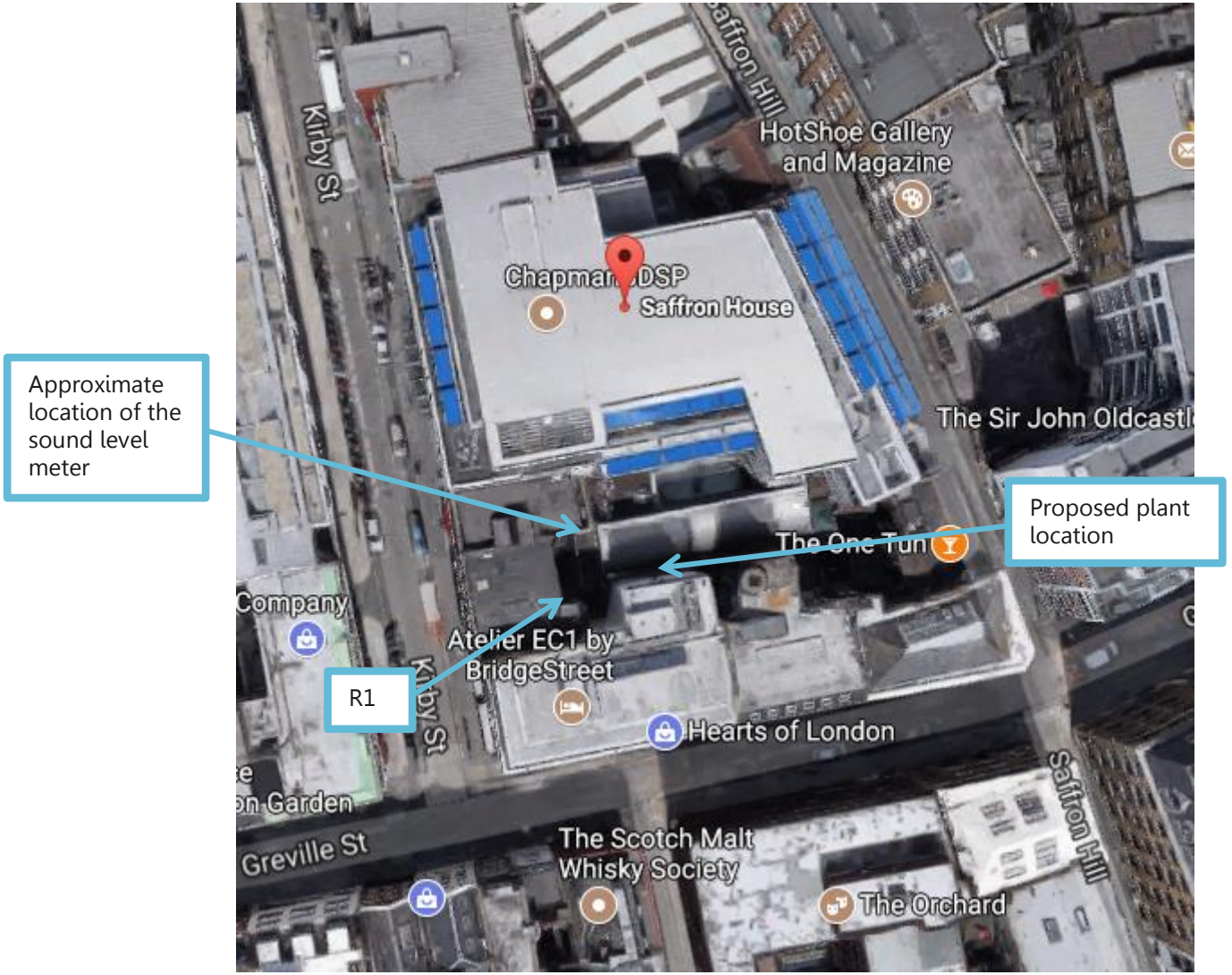
7.3. An assessment has demonstrated that noise from proposed plant will meet London Borough of Camden typical noise requirements during both the day-time and night-time periods.

7.4. The results of this assessment demonstrate that noise emissions from proposed plant should be considered acceptable to the London Borough of Camden. Noise from proposed fixed plant should not be grounds for refusal of planning permission.

Appendix A Acoustic terminology

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1/s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A), L_{Ax}	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Fast Time Weighting	Setting on sound level meter, denoted by a subscript F, that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds.
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level recorded during a noise event with a period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. $L_{A10,18h}$ is the A –weighted arithmetic average of the 18 hourly $L_{A10,1h}$ values from 06:00-24:00.
$L_{90,T}$	A noise level index. The noise level that is exceeded for 90% of the measurement time interval, T. It gives an indication of the lower levels of fluctuating noise. It is often used to describe the background noise level and can be considered to be the "average minimum" noise level and is a term used to describe the level to which non-specific noise falls during quiet spells, when there is lull in passing traffic for example.

Appendix B Aerial photograph of site showing areas of interest



Photograph 1 Courtesy of Google Earth © Infoterra Ltd and Bluesky

Appendix C Environmental sound survey

Details of environmental sound surveys

C.1 Measurements of the existing background sound levels were undertaken from 11:38 hours on Tuesday 4 July 2017 to 12:10 hours on Wednesday 5 July 2017.

C.2 The sound level meter was programmed to record the A-weighted L_{eq}, L_{90}, L_{10} and L_{max} noise indices for consecutive fifteen-minute sample periods for the duration of the survey.

Measurement position

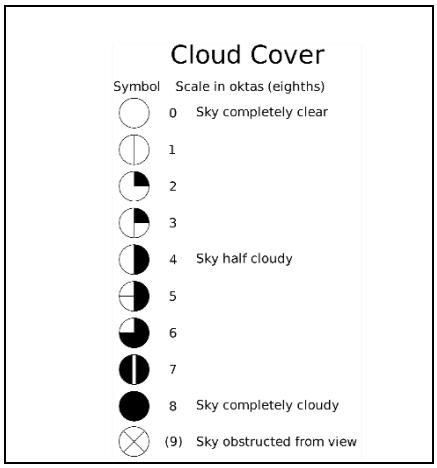
C.3 The sound level meter was positioned outside on the first floor. The approximate location of the microphone is indicated on the aerial photograph in Appendix B.

Equipment

C.4 Details of the equipment used during the survey are provided in the table below. The sound level meter was calibrated before and after the survey; no significant change (+/-0.2 dB) in the calibration level was noted.

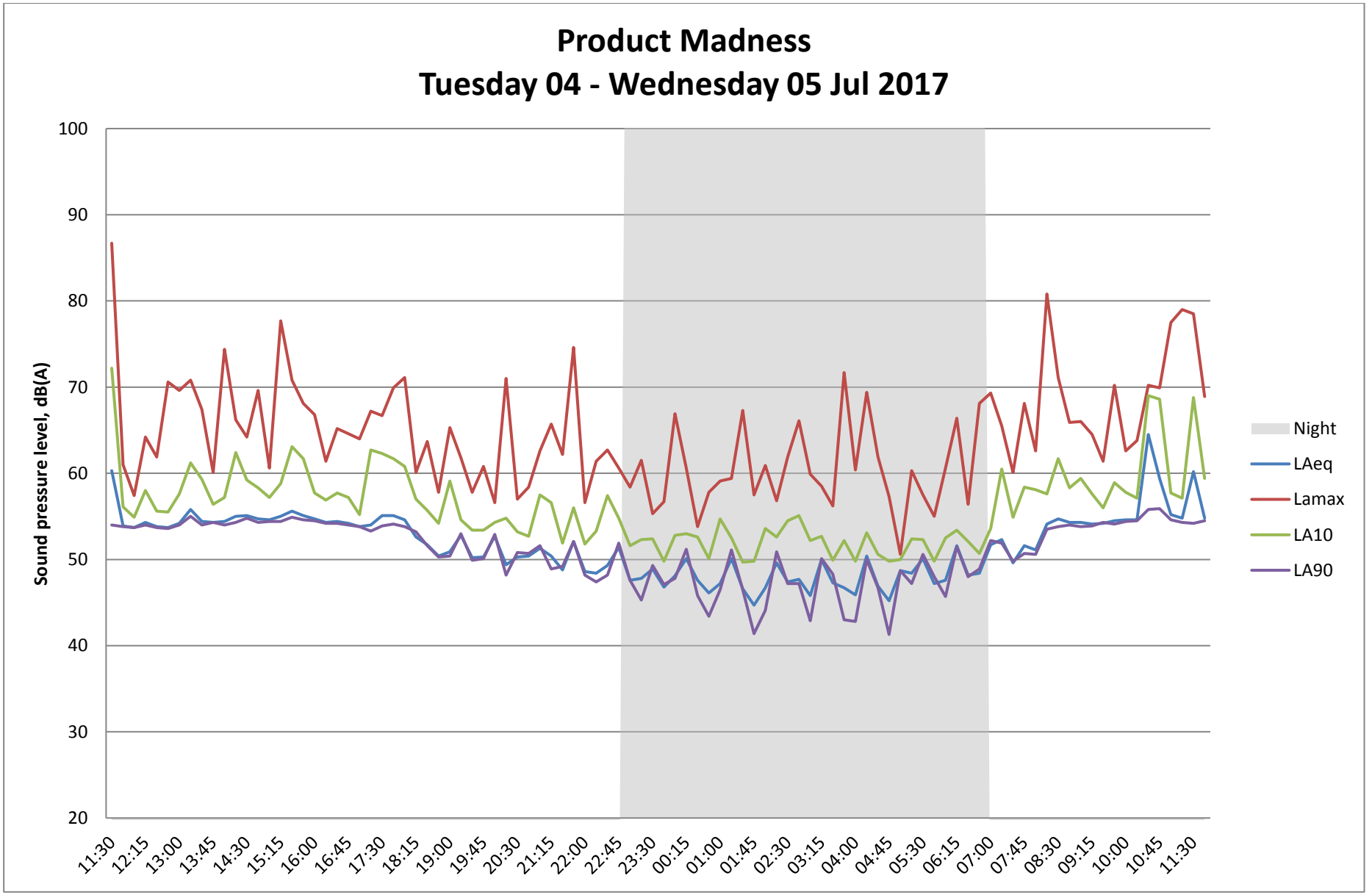
Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Rion NL-31 / 00593603	18/05/2016	14990
Condenser microphone	Rion UC-53A / 316133		
Preamplifier	Rion NH-21 / 30367		
Calibrator	Rion NC-74 /35094453	18/05/2016	14918

C.5 Weather conditions were determined both at the start and on completion of the survey. It is considered that the meteorological conditions were appropriate for environmental noise measurements. The table below presents the weather conditions recorded on site at the beginning and end of the survey.

Weather Conditions				
Measurement Location	**Date/Time**	**Description**	**Beginning of Survey**	**End of Survey**
As indicated on Appendix B	11:38 4/7/2017-12:10 5/7/2017	Temperature (°C)	27	26
		Precipitation:	No	No
		Cloud cover (oktas – see guide)	7	1-2
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	No	No
		Wind Speed (m/s)	0	0
		Wind Direction	-	-
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	No	No

Results

C.6 The results of the survey are considered to be representative of the background sound pressure levels at the façades of the most affected noise sensitive receptors to the plant area during the quietest times at which the plant will operate. The noise climate at the measurement position was dominated by plant noise from the top floor of the building along with other plant noise and aircraft. The results of the survey are presented in a time history graph overleaf.


Product Madness
Tuesday 04 - Wednesday 05 Jul 2017
Sound pressure level, dB(A)
100
90
80
70
60
50
40
30
20
11:30
12:15
13:00
13:45
14:30
15:15
16:00
16:45
17:30
18:15
19:00
19:45
20:30
21:15
22:00
22:45
23:30
00:15
01:00
01:45
02:30
03:15
04:00
04:45
05:30
06:15
07:00
07:45
08:30
09:15
10:00
10:45
11:30
Night
LAeq
Lamax
LA10
LA90

Appendix D Manufacturer noise levels

Plant item	Make/Model	Quantity	Period	Sound Pressure Level	
				dBA	Distance (m)
Air Conditioner	Mitsubishi / PUHZ-ZRP100VKA2	2	Daytime period (07:00 – 23:00 hours)	51	1
			Night-time period (23:00 – 07:00 hours)	51	1

Appendix E Noise level predictions

Receptor R1 Day and night-time

Plant item	Manufacturer noise data		Distance correction		Directivity correction (dB)	Resultant at receptor, L_{Aeq} (dB)
	Noise level, L_{Aeq} (dB)	Distance (m)	Distance (m)	Correction (dB)		
AC	51	1	10	-20	3	34
AC	51	1	10	-20	3	34
					Cumulative (dB)	37

Appendix F Site photos