GILLIERON SCOTT
ACOUSTIC DESIGN

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Poetry Society Noise Impact Assessment 21112016.pdf

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For:
Poetry Society

POETRY SOCIETY

PLANT NOISE IMPACT ASSESSMENT

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REVISION SCHEDULE

Document Revision	Date	Document Title	Details	Prepared by	Approved by
00	23rd September 2016	Poetry Society Noise Impact Assessment 23092016	Draft	Mihalis Bourzoukos 	Tim Scott 
01	21st November 2016	Poetry Society Noise Impact Assessment 21112016	Revision	Mihalis Bourzoukos 	Tim Scott 

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INTRODUCTION

Proposals have been submitted to the London Borough of Camden for alterations and improvements at 22 Betterton Street, London W2CH 9BX, where Poetry Society has its base.

Gillieron Scott Acoustic Design have been commissioned to undertake a background noise survey and noise impact assessment in accordance with BS4142:2014.

This report assesses the proposed plant in accordance with the London Borough of Camden's noise policies.

The findings of the noise impact assessment are presented in the following sections of this report together with the supporting Figures and Appendices.

1.0 SUMMARY

An environmental noise survey was undertaken over an extended period at a position representative of the immediate noise environment of the neighbouring properties of Poetry Society.

The measurement position is shown in Appendix A.

It is proposed that the operational hours of all plant items are between 0700 and 2300 hours.

The survey results show that the representative background noise level measured over the survey period between the hours of 0700 and 2300 was 54 dB $L_{A90,15min}$.

GSAD's noise limits recommended in this report indicate a low likelihood of adverse impact.

2.0 PLANT NOISE ASSESSMENT CRITERIA

2.1 British Standard 4142: 2014

BS4142: 2014 provides methods for rating and assessing industrial and commercial sound. The standard is used to rate sound from fixed installations. The standard requires a "Specific Sound Level", in terms of L_{Aeq}, is determined either by measurement or calculation at a receptor location. This Specific Sound Level may then be corrected for the character of sound and is then termed the "Rating Level".

Once the Rating Level has been determined, the background sound level is subtracted from it and the greater the difference, the greater the likelihood of an '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. The standard advocates that each site and situation should take the context of the scenario into consideration and that "not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact".

The standard provides reference periods over which the assessment should take place which have been reproduced in the table below.

Table 1 - Reference periods

Period	Hours	Assessment Period
Typical Daytime	0700 – 2300	1 hour assessment period
Typical Night-time	2300 – 0700	15 minute assessment period

2.2 Local Authority

The noise strategy implemented in Camden's Developing Policies 2010-2025 states that at 1 metre external to a sensitive façade, noise from machinery or plant should be:

- 5 dB below the lowest background level (L_{A90}) measured over 24 hours or;

- 10 dB below the lowest background level (L_{A90}) if the plant noise has a distinguishable discrete continuous note (whine, hiss, screech, hum) or impulses (bangs, clicks, clatters, thumps).

Table 2 - Taken from LBC's policy DP28 regarding noise from plant and machinery

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 façade.	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 façade.	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$_{LAeq}$

2.3 Adopted criteria

The criteria adopted for this assessment is as described in 2.1 in accordance with the current version of BS4142.

3.0 NOISE SURVEY DETAILS

3.1 Noise Survey

Background noise levels have been measured over an extended period on 2nd floor level of the existing building. The measurement position is shown on the drawings in Appendix A.

The prevailing noise environment is dominated by ventilation noise from nearby commercial buildings.

The equipment was set up to integrate sound levels over 15-minute intervals between 14:30, Thursday 8th September and 13:00, Monday 12th September 2016.

Details of equipment and procedure used are shown in Appendix D.

The weather over the survey period was varied though mostly warm with light to moderate breeze and limited rain. Overall these conditions are considered conducive to acoustic measurements.

Time history charts of the weather are in the Appendix.

3.2 Noise indices

The equipment was set to record octave band sound pressure levels at 15minute intervals. The following noise indices used in this assessment are as follows:

$L_{Aeq,T}$: The A-weighted equivalent continuous sound pressure level over a period of time, T.

$L_{Amax,T}$: The A-weighted maximum sound pressure level that occurred during a given period. Measured using the fast (L_{AFmax}) or slow (L_{ASmax}) time weightings.

$L_{A90,T}$: The A-weighted sound pressure level exceeded for 90% of the measurement period. Indicative of the background noise level.

The L_{A90} is considered most representative of the background noise level for the purposes of complying with any Local Authority requirements.

Sound pressure level measurements are normally taken with an A-weighting (denoted by a subscript 'A', eg L_{A90}) to approximate the frequency response of the human ear.

4.0 SURVEY RESULTS

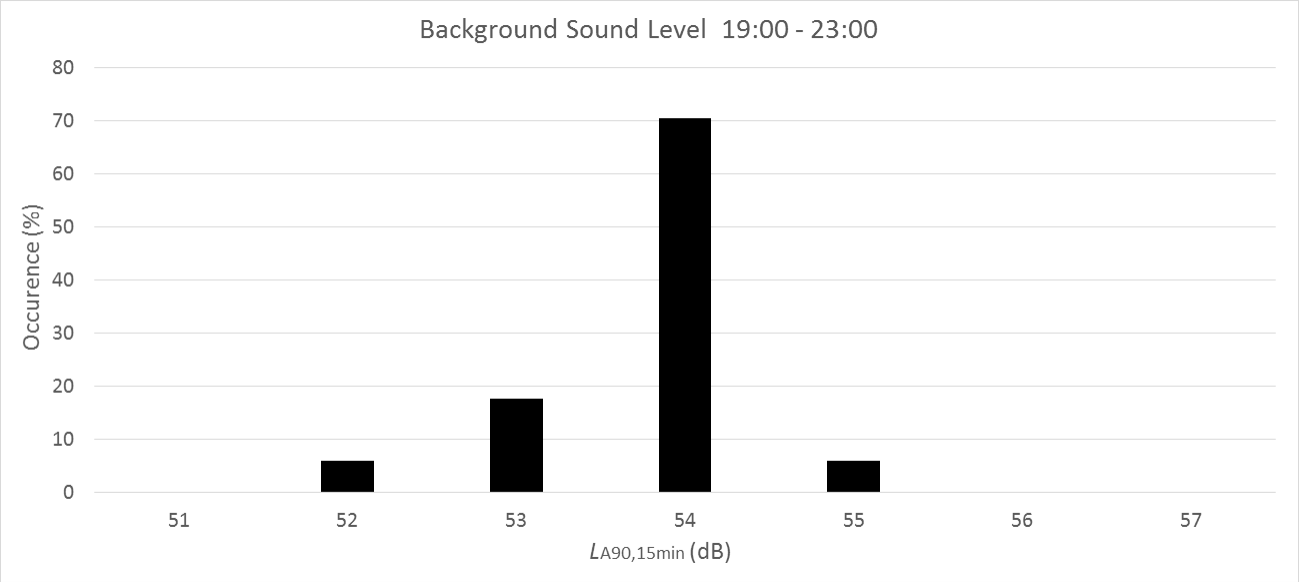
The table below shows the results from the noise survey undertaken at the measurement position.

Table 3 - Overview of background sound level

Period	Representative $L_{A90,\ 15min}$ (dB)
0700-2300	54 (Evening data used)
2300-0700	52

The representative $L_{A90,\ 15min}$ has been determined for the evening period using histogram shown below. During the survey there was construction work in the adjacent property and a representative background sound level of 54 dB $L_{A90,\ 15min}$ has been determined by using sound data from the evening hours only as daytime measurements were contaminated.

Figure 1 - Histogram of evening background sound level LA90



A representative measured evening background sound level of 54 dB $L_{A90,\ 15min}$ has been determined. This will be used to assess noise from the proposed plant items.

The full survey results (to one decimal place) are shown in Appendix G.

5.0 PLANT NOISE ASSESSMENT

GSAD have been advised that the proposed plant may operate from 07:00 until 23:00. The proposed location of the AC units is on the on 2nd floor level approximately 5m from the closest residential receptor located at the rear of the adjacent property on Betterton Street.

The proposed outdoor air condenser units are two Fujitsu AYOG18LALL and the manufacturer's published sound power level for each of these units is 62 dB(A).

During the survey there was construction work in the adjacent property and a representative background sound level of 54 dB $L_{A90,\,15min}$ has been determined by using sound data from the evening hours.

The plant noise assessment for the most affected facade has been carried out in the table below.

Table 4 - Assessment of condenser units

Element	Level		Comments
Source SWL	65	dB(A)	2x Fujitsu AYOG18LALL
Conversion factor	- 11	dB	SWL to SPL
Acoustic reflections	+ 7	dB	2 reflective surfaces in close proximity to units and 1 from opposite wall
Distance Attenuation	- 13	dB	Point source distance attenuation over approximately 5 m
Acoustic Screening	- 8	dB(A)	Acoustic screen provided by existing external walls
Acoustic feature corrections	+ 7	dB	+ 4 dB for Tonality and + 3 dB for Intermittency
Rating Level	47	dB(A)	At the receptor's location
Representative L_{A90}	54	dB(A)	
Excess of rating over background sound level	(47-54) = -7		
Assessment indicates little likelihood of adverse impact			The excess of the rating level over the background sound level is - 7 dB and in this instance the uncertainty of the measurement does not have any significance to the outcome of the assessment

The scheme also includes internal fresh air fans ducted to the front side of the property on Betterton Street. Although the background sound levels are expected to be higher at the street side, since they were not monitored at the front of the building, the representative background sound level from the rear of the building is used in this case as well.

The recommended sound level limit at 1m from the fresh air grille on the street side is 54 dB L_{Aeq}. As such it is considered that it would minimise the likelihood of adversely affecting the residential properties opposite as well as pedestrians using that side of the pavement.

An explanation for the acoustic feature corrections applied as part of this assessment is provided in Appendix G.

6.0 UNCERTAINTY

The measurement position was approximately 3 m away from the nearest window of the adjacent residential building therefore the author of this report has a high level of confidence that the microphone used in this assessment captured the noise environment of the deemed representative of the noise environment of the most affected noise sensitive receptors.

Uncertainty due to the effect of weather conditions on the acoustic measurements is considered minimal to negligible. The data from the weather station deployed next to the microphone position show that during the hours of interest for this assessment, neither of the key factors of wind speed and rain fall have affected the measurements nor amounted to environmental sound levels that were not representative.

The meter was calibrated before and after the measurement and a drift of 0.2 dB was noted. This amount of drift in calibration is considered insignificant.

The building next to Poetry Society was under refurbishment and light construction work noise was noted at the beginning and end of survey. It has been assumed that works took place within typical daytime hours. Although the background sound level L_{A90} appears unaffected, due to the low level of confidence in the daytime readings, only partial day and evening sound data were taken into account to determine the most representative background sound level, therefore minimising the uncertainty.

7.0 STATEMENT OF COMPETENCE

The assessment of the industrial sound has been undertaken by the author of this report, Mihalis Bourzoukos, MMus IOA Dip MIOA. The author is an acoustic consultant who has undertaken several noise assessments according to the 1997 version of the British Standard and the most recent 2014 revision, and attended several seminars on noise assessments and BS 4142:2014.

8.0 CONCLUSION

A noise survey has been deployed at Poetry Society building from Thursday 8th to Monday 12th September 2016 in order to determine background sound levels.

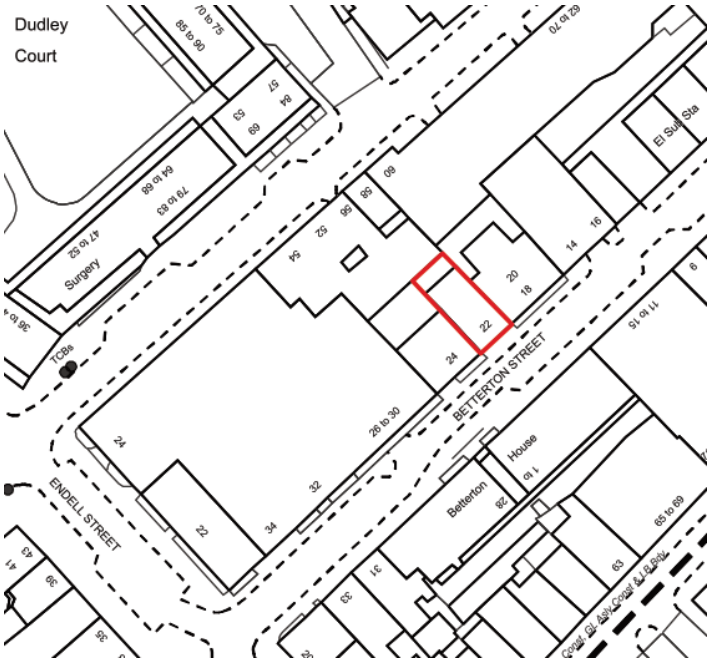
A representative background sound level over the daytime reference time intervals has been determined.

Acoustic feature corrections of 7 dB have been applied, based on GSAD's previous experience and the resultant noise emission limits from the proposed units have been calculated to ensure the resultant Rating Level at the most affected receptors adheres to the Local Authority's requirements.

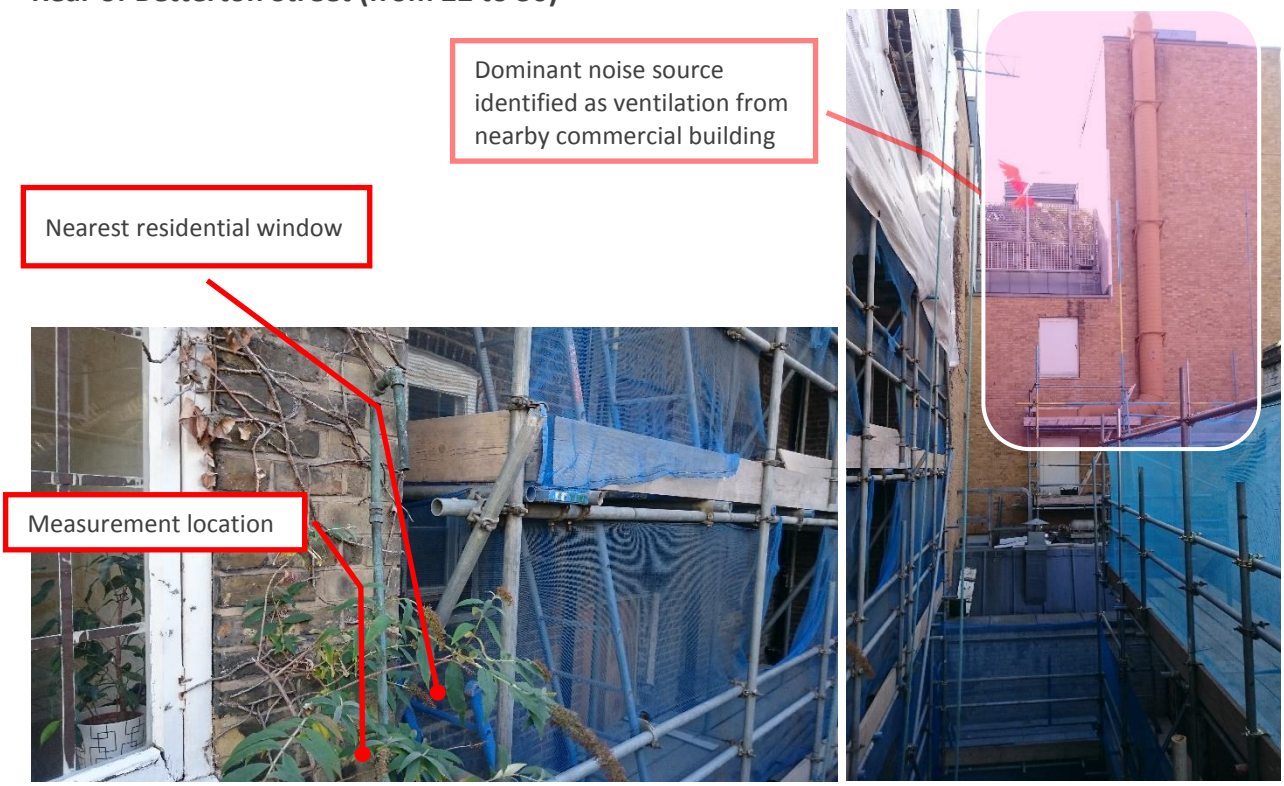
APPENDICES

APPENDIX A: Overview plan and site photo

Extract from OS map

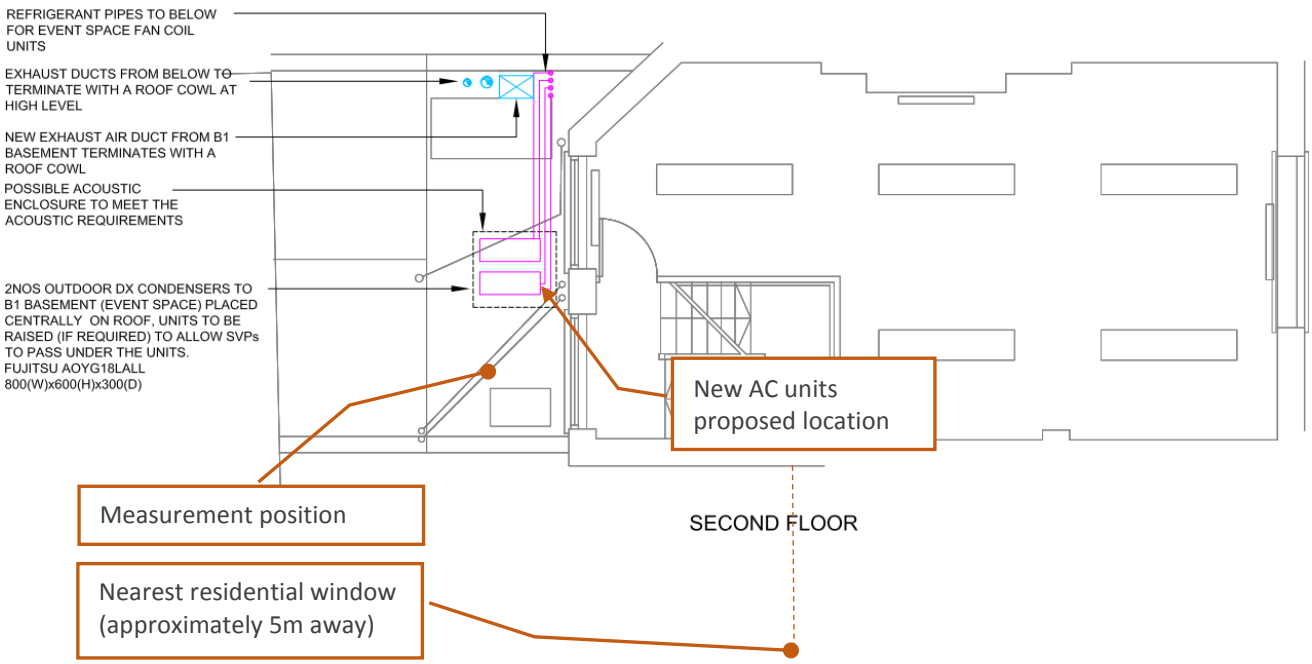


Rear of Betterton Street (from 22 to 30)

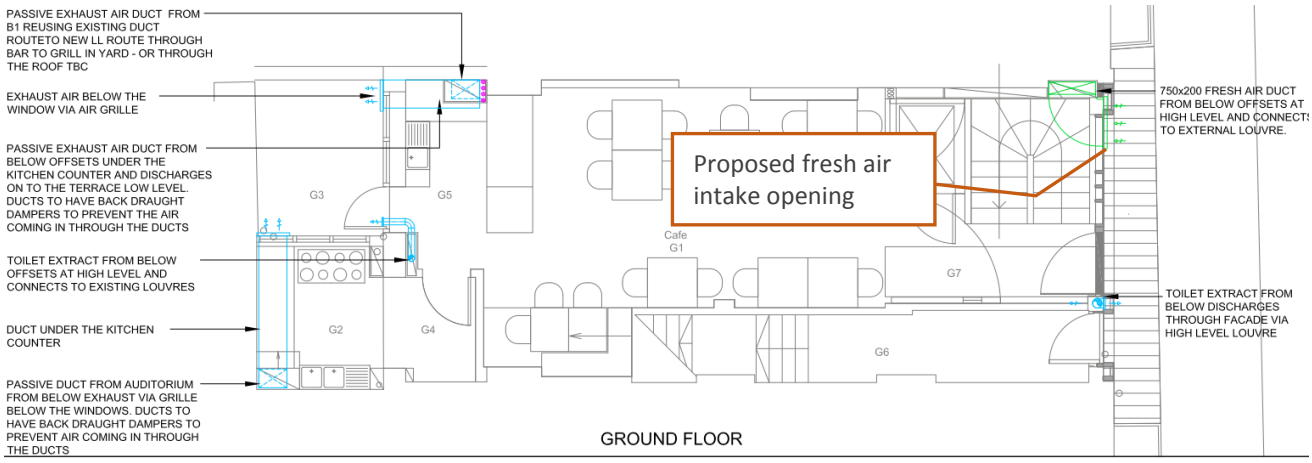


APPENDIX B: Proposed plant location

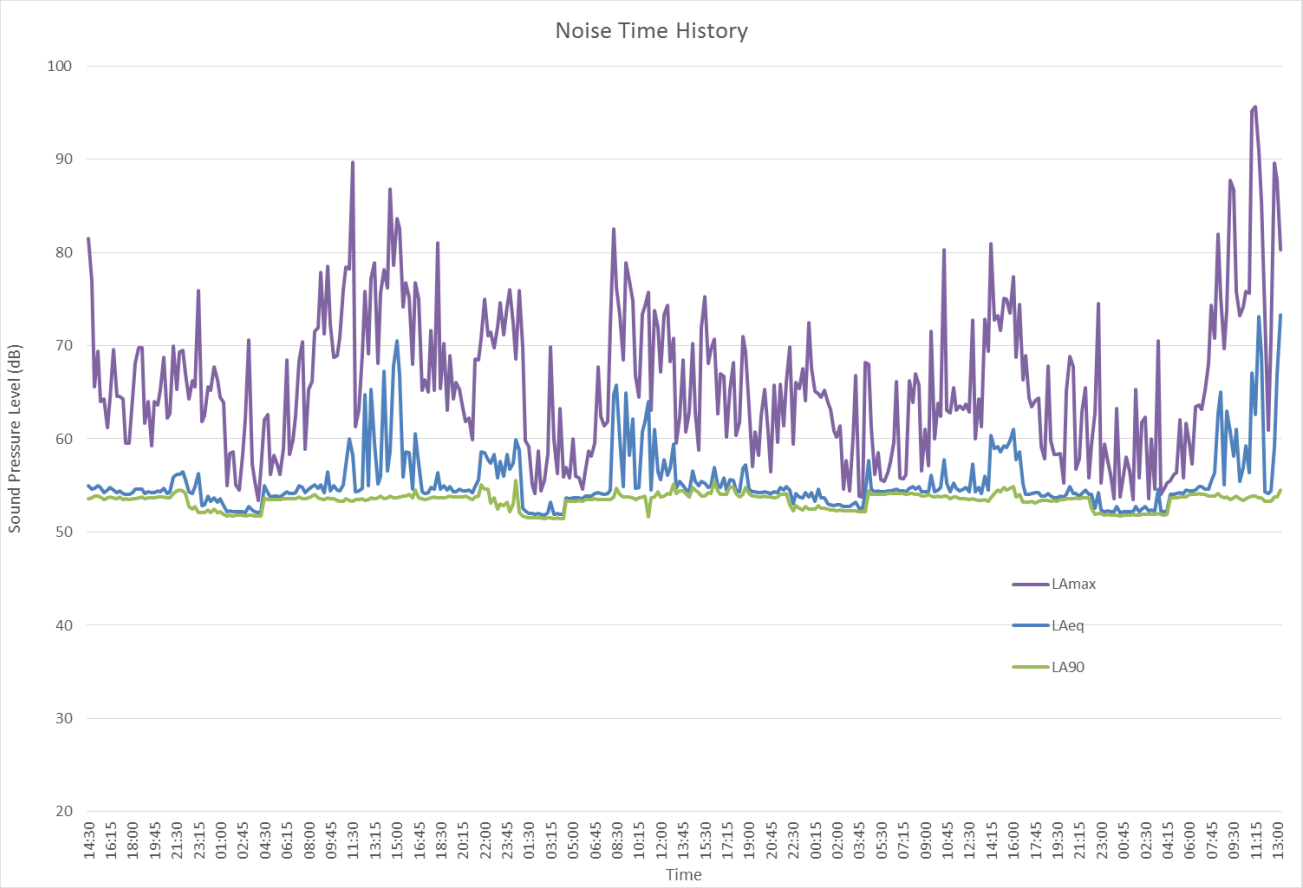
AC units – Rear side, 2nd floor level *(Extract from M&E drawing)*



Fresh air intake – Street side, Ground floor level *(Extract from M&E drawing)*



APPENDIX C: Time series survey results



APPENDIX D: Equipment and Procedure

Background noise levels have been measured over a 4-day period at the rear of the existing building. The measurement position is shown on the drawings in Appendices A and B.

The prevailing noise environment is dominated by ventilation noise from nearby commercial buildings.

The equipment was set up to integrate sound levels over 15-minute intervals between 14:30, Thursday 8th September and 13:00, Monday 12th September 2016.

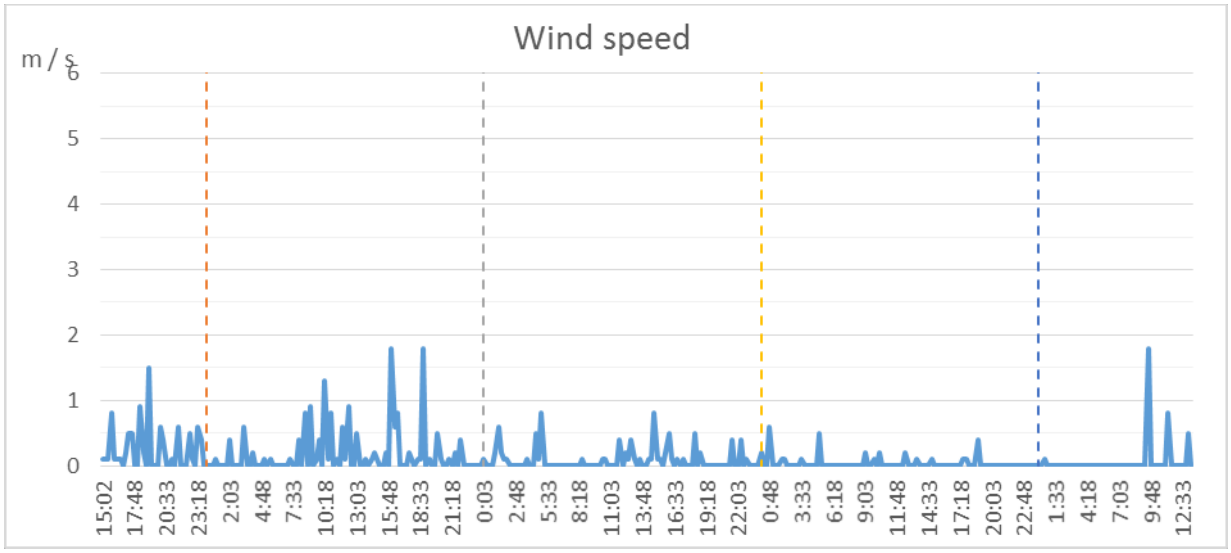
Measurements were undertaken according to the procedures set out in BS4142:2014.

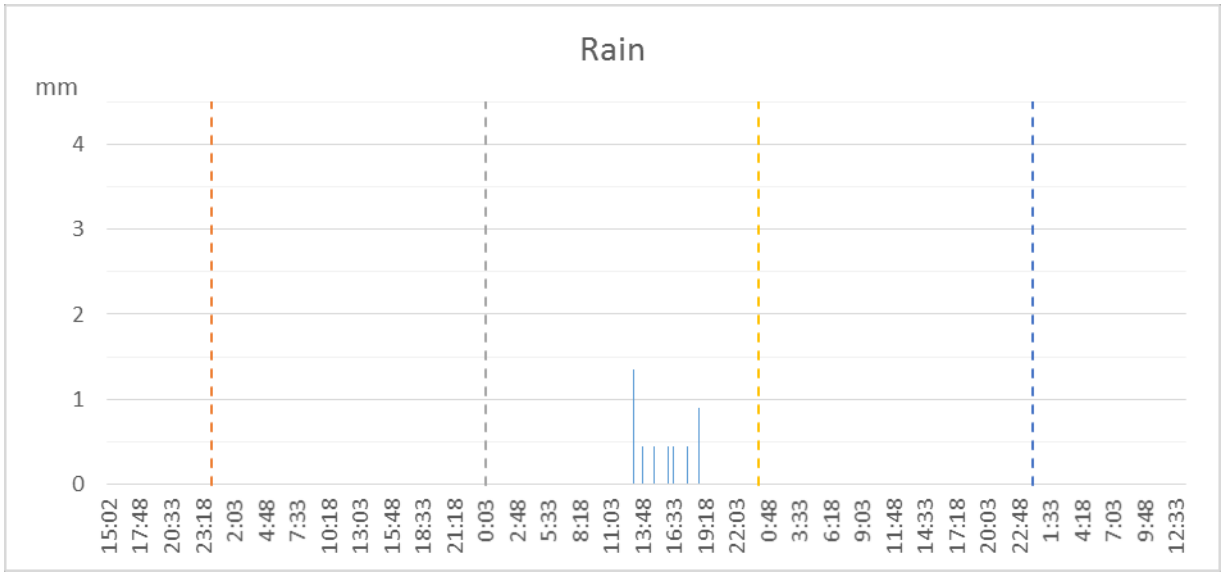
The levels were recorded as A-weighted and octave band L_{eq}, L_{max} and L_{90} using the following equipment.

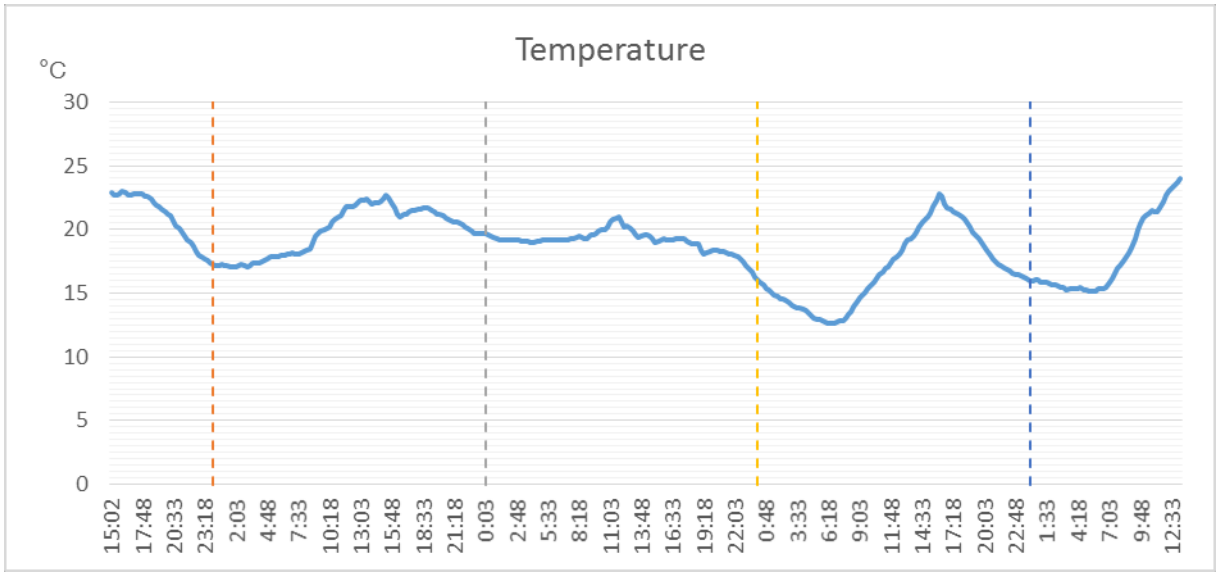
Norsonic 118 Real Time Analyser
Norsonic 1206 microphone in outdoor casing
Norsonic 1251 Calibrator

The equipment was field calibrated before and after the survey and 0.2 dB drift was noted.

APPENDIX E: Weather data







APPENDIX F: Manufacturer's sound data

Specifications

Model No.	Indoor unit			ABYG18LVTB
	Outdoor unit			AOYG18LALL
Power Source			V/Ø/Hz	230/1/50
Capacity	Cooling		kW	5.2 (0.9-5.9)
	Heating			6.0 (0.9-7.5)
Input Power	Cooling/Heating		kW	1.62/1.66
EER	Cooling		W/W	3.21
COP	Heating			3.61
Pdesign	Cooling/Heating		kW	5.2/5.2
SEER	Cooling		W/W	6.10
SCOP	Heating			4.00
Energy Efficiency Class	Cooling			A++
	Heating			A+
Running Current	Cooling/Heating		A	7.2/7.4
Annual Energy Consumption	Cooling		kWh/a	298
	Heating			1819
Moisture Removal			l/h	2.0
Sound Pressure (Cooling)	Indoor	H/M/L/Q	dB(A)	43/40/34/31
	Outdoor	High		50
Sound Power (Cooling)	Indoor	High		57
	Outdoor	High		62
Airflow Rate (High)	Indoor / Outdoor		m^3/h	780/2000
Net Dimension H x W x D	Indoor		mm	199x990x655
			kg(lbs)	27 (59)
	Outdoor		mm	578x790x300
			kg(lbs)	40 (88)
Piping Connections (Small / Large)			mm	6.35/12.70
Drain Hose Diameter (I.D./O.D.)				25/32
Max Pipe Length (Pre-Charge)			m	25 (15)
Max Height Difference				15
Operation Range	Cooling		°CDB	-10 to 46
	Heating			-15 to 24
Refrigerant (Global Warming Potential)				R410A (1,975)

APPENDIX G: Acoustic Feature Corrections

A rating penalty has been established based on a subjective assessment of characteristics. Penalties have been applied based on GSAD's previous experience of condenser units.

A total rating penalty of 7 dB has been applied.

4 dB penalty for tonality: typical condenser units can have tonal components that are perceptible. Tonal components may or may not be audible at the receptors, however, a correction has been applied to adopt a cautious approach.

3 dB penalty for intermittency: condenser units turn on / off during operation. On / off states may or may not be perceptible at the receptors, however, a small correction has been applied to adopt a cautious approach.

APPENDIX H: Survey Results - Data

Date	Time	L_{Aeq}	L_{A90}	L_{90}							
				63	125	250	500	1k	2k	4k	8k
08/09/2016	14:30:00	55.0	53.6	58.8	54.0	51.5	50.0	49.3	45.3	37.6	27.3
08/09/2016	14:45:00	54.6	53.7	59.0	53.9	51.8	50.1	49.4	45.5	37.7	27.3
08/09/2016	15:00:00	54.7	53.9	59.0	54.0	52.1	50.1	49.6	45.7	37.9	27.5
08/09/2016	15:15:00	55.0	53.9	59.0	54.0	52.3	50.3	49.6	45.5	37.8	27.3
08/09/2016	15:30:00	54.8	53.8	58.9	53.8	52.1	50.3	49.6	45.6	37.9	27.7
08/09/2016	15:45:00	54.2	53.5	58.6	53.7	51.7	49.8	49.2	45.3	37.5	27.4
08/09/2016	16:00:00	54.5	53.7	58.6	53.8	52.1	50.1	49.4	45.5	37.7	27.3
08/09/2016	16:15:00	54.8	53.8	58.8	54.1	52.2	50.2	49.5	45.6	38.0	27.7
08/09/2016	16:30:00	54.5	53.7	58.6	53.7	51.8	50.0	49.5	45.5	37.7	27.3
08/09/2016	16:45:00	54.2	53.6	58.4	53.3	51.7	49.9	49.4	45.5	37.6	27.2
08/09/2016	17:00:00	54.4	53.8	58.8	53.9	52.0	50.1	49.5	45.5	37.8	27.4
08/09/2016	17:15:00	54.1	53.5	58.7	53.7	51.7	49.7	49.2	45.3	37.4	26.8
08/09/2016	17:30:00	54.0	53.6	58.8	53.6	51.7	49.8	49.3	45.4	37.6	27.0
08/09/2016	17:45:00	54.0	53.5	58.9	53.9	51.9	49.8	49.3	45.3	37.5	27.1
08/09/2016	18:00:00	54.2	53.6	58.7	53.8	51.8	49.8	49.4	45.3	37.6	27.1
08/09/2016	18:15:00	54.6	53.6	59.0	53.9	52.0	50.0	49.4	45.4	37.8	27.3
08/09/2016	18:30:00	54.6	53.7	59.4	53.8	51.9	50.0	49.5	45.6	38.1	27.7
08/09/2016	18:45:00	54.6	53.8	59.5	54.1	52.2	50.1	49.5	45.6	38.0	27.6
08/09/2016	19:00:00	54.1	53.6	59.3	54.1	52.1	49.9	49.3	45.5	37.9	27.4
08/09/2016	19:15:00	54.3	53.7	59.3	54.3	52.4	49.8	49.4	45.5	37.9	27.4
08/09/2016	19:30:00	54.2	53.7	59.4	54.2	52.3	49.9	49.4	45.6	38.0	27.4
08/09/2016	19:45:00	54.2	53.7	59.2	53.8	51.9	50.0	49.3	45.6	38.0	27.5
08/09/2016	20:00:00	54.4	53.8	59.5	54.0	52.1	50.2	49.5	45.7	38.1	27.7
08/09/2016	20:15:00	54.3	53.8	59.4	54.1	52.3	50.0	49.4	45.6	38.2	28.0
08/09/2016	20:30:00	54.7	53.8	59.2	54.0	52.6	50.0	49.4	45.6	38.3	28.0
08/09/2016	20:45:00	54.1	53.7	59.4	54.1	52.4	49.8	49.3	45.5	38.3	29.0
08/09/2016	21:00:00	54.3	53.7	59.4	54.2	52.6	49.9	49.4	45.6	38.2	28.0
08/09/2016	21:15:00	55.9	54.1	59.8	54.2	52.9	50.5	49.7	45.9	38.5	28.2
08/09/2016	21:30:00	56.2	54.4	59.5	54.2	52.9	51.0	50.0	46.2	38.8	28.4
08/09/2016	21:45:00	56.2	54.5	59.6	54.5	53.2	51.0	50.1	46.3	38.8	28.3
08/09/2016	22:00:00	56.5	54.4	59.9	54.9	53.6	50.9	49.9	46.1	38.8	28.3
08/09/2016	22:15:00	55.6	54.1	59.7	54.7	53.4	50.5	49.5	45.3	36.5	25.0
08/09/2016	22:30:00	54.3	52.7	59.5	54.1	53.2	50.0	47.9	42.9	32.8	21.1
08/09/2016	22:45:00	54.1	52.5	59.3	54.0	53.0	49.8	47.7	42.8	32.3	20.5
08/09/2016	23:00:00	54.9	52.7	59.4	54.2	53.3	49.9	47.9	43.0	32.7	21.3
08/09/2016	23:15:00	56.3	52.1	59.5	54.2	53.2	48.9	47.3	42.7	31.9	20.2
08/09/2016	23:30:00	52.8	52.1	59.3	53.9	52.9	48.7	47.3	42.6	31.7	19.9
08/09/2016	23:45:00	52.9	52.1	59.3	53.3	52.4	48.8	47.5	42.8	31.9	20.3
09/09/2016	00:00:00	53.9	52.4	59.3	53.3	52.5	49.5	47.9	43.2	32.6	21.5
09/09/2016	00:15:00	53.3	52.1	59.3	53.3	52.5	49.0	47.4	42.8	32.0	20.2

09/09/2016	00:30:00	53.7	52.5	59.1	53.3	52.5	49.5	47.8	43.4	33.0	21.6
09/09/2016	00:45:00	53.2	52.1	59.2	52.9	52.2	49.0	47.5	42.8	32.1	20.5
09/09/2016	01:00:00	53.6	52.2	59.2	53.2	52.5	49.3	47.6	42.9	32.1	20.9
09/09/2016	01:15:00	52.8	51.9	59.2	53.4	52.3	48.8	47.3	42.5	31.7	20.2
09/09/2016	01:30:00	52.2	51.7	59.2	53.2	52.2	48.5	47.2	42.4	31.4	20.0
09/09/2016	01:45:00	52.3	51.8	59.1	53.2	52.3	48.5	47.3	42.5	31.6	20.2
09/09/2016	02:00:00	52.2	51.7	58.9	53.1	52.1	48.4	47.2	42.4	31.5	20.2
09/09/2016	02:15:00	52.2	51.8	59.1	53.3	52.2	48.5	47.3	42.5	31.6	20.4
09/09/2016	02:30:00	52.2	51.8	58.8	53.2	52.3	48.4	47.2	42.5	31.4	20.2
09/09/2016	02:45:00	52.2	51.8	58.7	53.2	52.3	48.3	47.2	42.4	31.5	20.2
09/09/2016	03:00:00	52.1	51.7	58.8	53.2	52.1	48.3	47.2	42.2	31.4	20.1
09/09/2016	03:15:00	52.7	51.8	58.8	53.2	52.4	48.4	47.3	42.3	31.5	20.2
09/09/2016	03:30:00	52.4	51.8	59.0	53.3	52.3	48.4	47.3	42.3	31.6	20.1
09/09/2016	03:45:00	52.2	51.7	58.9	53.2	52.3	48.4	47.3	42.1	31.4	20.1
09/09/2016	04:00:00	52.1	51.7	58.8	53.0	52.0	48.3	47.2	42.2	31.5	20.2
09/09/2016	04:15:00	52.2	51.7	58.9	53.1	52.0	48.4	47.2	42.4	31.6	20.3
09/09/2016	04:30:00	55.0	53.7	59.5	54.2	53.0	49.6	49.4	45.7	38.5	28.2
09/09/2016	04:45:00	54.2	53.5	59.1	53.8	52.5	49.2	49.2	45.4	38.4	28.2
09/09/2016	05:00:00	53.8	53.5	59.0	53.8	52.4	49.2	49.1	45.6	38.4	28.2
09/09/2016	05:15:00	53.9	53.5	59.2	53.9	52.6	49.2	49.2	45.4	38.4	28.3
09/09/2016	05:30:00	53.9	53.5	59.2	53.8	52.6	49.3	49.1	45.5	38.5	28.3
09/09/2016	05:45:00	53.8	53.5	59.2	53.7	52.5	49.3	49.1	45.5	38.4	28.3
09/09/2016	06:00:00	54.0	53.6	59.4	54.1	52.7	49.3	49.2	45.5	38.4	28.2
09/09/2016	06:15:00	54.3	53.6	59.5	54.4	53.0	49.4	49.2	45.5	38.5	28.3
09/09/2016	06:30:00	54.1	53.6	59.5	54.3	52.8	49.4	49.3	45.5	38.5	28.4
09/09/2016	06:45:00	54.1	53.6	59.6	54.2	52.7	49.3	49.3	45.5	38.5	28.4
09/09/2016	07:00:00	54.2	53.6	59.7	54.2	52.7	49.4	49.3	45.6	38.6	28.6
09/09/2016	07:15:00	55.0	53.8	60.1	54.6	53.1	49.6	49.4	45.6	38.6	28.5
09/09/2016	07:30:00	54.8	53.6	59.8	54.4	52.8	49.5	49.3	45.5	38.4	28.3
09/09/2016	07:45:00	54.2	53.6	59.7	54.1	52.4	49.5	49.3	45.6	38.5	28.3
09/09/2016	08:00:00	54.6	53.7	59.8	54.0	52.5	49.5	49.4	45.7	38.5	28.5
09/09/2016	08:15:00	54.9	53.9	59.8	54.3	52.8	49.8	49.6	46.0	38.8	28.8
09/09/2016	08:30:00	55.1	54.0	59.3	54.8	53.3	49.9	49.5	45.7	38.7	29.0
09/09/2016	08:45:00	54.7	53.7	59.0	54.3	52.7	49.7	49.3	45.6	38.7	29.2
09/09/2016	09:00:00	55.1	53.6	59.1	54.3	52.7	49.5	49.1	45.5	38.8	29.2
09/09/2016	09:15:00	54.2	53.5	59.3	54.4	52.8	49.4	49.0	45.3	38.5	28.5
09/09/2016	09:30:00	56.5	53.7	59.7	54.5	52.8	49.9	49.2	45.6	38.9	29.6
09/09/2016	09:45:00	54.4	53.6	59.6	54.3	52.5	49.6	49.1	45.4	38.7	29.3
09/09/2016	10:00:00	55.0	53.6	59.3	54.3	52.5	49.6	49.1	45.5	38.8	29.3
09/09/2016	10:15:00	54.5	53.4	59.5	54.1	52.4	49.6	48.9	45.3	38.5	28.7
09/09/2016	10:30:00	54.4	53.3	59.5	54.1	52.4	49.5	48.9	45.1	38.3	28.4
09/09/2016	10:45:00	55.1	53.3	59.2	54.0	52.3	49.5	48.9	45.1	38.4	28.3
09/09/2016	11:00:00	57.2	53.6	59.6	54.6	53.0	49.8	49.0	45.2	38.4	28.4
09/09/2016	11:15:00	60.0	53.4	59.2	54.0	52.3	49.6	49.0	45.2	38.4	28.5
09/09/2016	11:30:00	58.2	53.3	59.2	53.8	51.8	49.6	48.9	45.2	38.3	28.4
09/09/2016	11:45:00	54.3	53.5	59.4	54.2	52.1	49.8	49.1	45.3	38.5	28.5

09/09/2016	12:00:00	54.4	53.5	59.4	54.1	51.9	49.7	49.0	45.3	38.5	28.9
09/09/2016	12:15:00	54.7	53.6	59.3	54.1	52.2	49.9	49.0	45.4	38.7	29.5
09/09/2016	12:30:00	64.7	53.4	59.1	53.8	51.9	49.6	49.0	45.3	38.4	29.1
09/09/2016	12:45:00	55.0	53.5	59.2	53.8	51.8	49.7	49.2	45.3	38.5	29.4
09/09/2016	13:00:00	65.3	53.7	59.5	54.1	52.3	49.9	49.3	45.6	38.7	29.5
09/09/2016	13:15:00	59.5	53.6	59.1	53.9	52.0	50.1	49.3	45.3	38.4	28.6
09/09/2016	13:30:00	55.2	53.7	59.0	53.7	52.0	50.2	49.3	45.4	38.5	29.0
09/09/2016	13:45:00	56.0	53.9	59.2	54.0	52.1	50.4	49.5	45.7	38.8	29.2
09/09/2016	14:00:00	67.3	53.6	59.1	53.8	52.1	50.2	49.3	45.3	38.3	28.6
09/09/2016	14:15:00	56.6	53.7	59.3	54.1	52.3	50.2	49.4	45.4	38.2	28.5
09/09/2016	14:30:00	58.7	53.9	59.1	53.9	52.4	50.4	49.5	45.6	38.5	29.0
09/09/2016	14:45:00	67.8	53.7	59.2	53.8	52.2	50.1	49.3	45.4	38.5	29.4
09/09/2016	15:00:00	70.5	53.7	59.2	54.0	52.3	50.2	49.4	45.3	38.3	28.9
09/09/2016	15:15:00	66.8	53.8	59.2	54.4	52.6	50.3	49.5	45.5	38.4	28.5
09/09/2016	15:30:00	55.9	53.9	59.2	54.2	52.5	50.1	49.5	45.7	38.5	28.6
09/09/2016	15:45:00	58.6	53.9	59.1	54.4	52.9	50.2	49.5	45.7	38.6	29.2
09/09/2016	16:00:00	58.5	54.0	59.2	54.2	52.6	50.2	49.5	45.8	39.0	30.5
09/09/2016	16:15:00	54.6	53.7	59.2	54.4	52.8	50.1	49.3	45.5	38.4	28.7
09/09/2016	16:30:00	60.6	54.5	59.8	55.4	53.9	50.9	49.9	46.2	39.2	29.8
09/09/2016	16:45:00	57.3	53.7	59.5	54.4	52.6	50.1	49.3	45.5	38.3	28.2
09/09/2016	17:00:00	54.3	53.6	58.9	54.0	52.4	49.8	49.2	45.4	38.3	28.3
09/09/2016	17:15:00	54.1	53.5	59.0	54.0	52.2	49.8	49.1	45.3	38.1	28.0
09/09/2016	17:30:00	54.2	53.6	59.1	54.1	52.3	49.8	49.1	45.3	38.2	28.1
09/09/2016	17:45:00	54.8	53.7	59.1	54.4	52.6	50.0	49.2	45.3	38.1	28.1
09/09/2016	18:00:00	54.6	53.8	59.6	54.5	52.9	50.2	49.4	45.5	38.2	28.2
09/09/2016	18:15:00	56.4	53.7	59.8	53.7	51.9	50.3	49.3	45.5	38.2	28.0
09/09/2016	18:30:00	54.6	53.7	59.8	53.8	52.1	50.0	49.4	45.7	38.4	28.2
09/09/2016	18:45:00	55.0	53.7	59.7	53.9	52.2	50.0	49.4	45.7	38.5	28.3
09/09/2016	19:00:00	54.5	53.8	59.8	54.2	52.2	50.0	49.4	45.6	38.4	28.2
09/09/2016	19:15:00	54.9	53.9	60.1	54.2	52.3	50.1	49.5	45.8	38.5	28.2
09/09/2016	19:30:00	54.3	53.8	59.7	53.7	52.0	50.0	49.5	45.9	38.5	28.3
09/09/2016	19:45:00	54.3	53.8	59.6	53.6	51.9	50.0	49.5	45.9	38.4	28.3
09/09/2016	20:00:00	54.6	53.8	59.3	54.2	52.3	49.9	49.4	45.8	38.4	28.3
09/09/2016	20:15:00	54.4	53.8	59.5	54.5	52.7	49.9	49.4	45.8	38.4	28.3
09/09/2016	20:30:00	54.4	53.9	59.5	54.2	52.5	50.0	49.5	45.9	38.5	28.4
09/09/2016	20:45:00	54.5	53.7	59.6	54.3	52.3	49.9	49.4	45.8	38.4	28.2
09/09/2016	21:00:00	54.2	53.5	59.4	53.8	51.9	49.7	49.2	45.6	38.4	28.2
09/09/2016	21:15:00	54.9	53.8	59.3	54.1	52.3	50.0	49.5	45.8	38.5	28.4
09/09/2016	21:30:00	55.6	53.9	59.3	53.8	52.4	50.2	49.6	45.8	38.6	28.4
09/09/2016	21:45:00	58.6	55.1	59.4	54.5	53.4	52.0	50.6	46.5	39.1	29.1
09/09/2016	22:00:00	58.5	54.6	59.5	54.4	53.4	51.0	50.2	46.3	38.9	28.7
09/09/2016	22:15:00	57.8	54.6	59.5	54.0	53.3	51.3	50.3	46.2	38.6	26.8
09/09/2016	22:30:00	57.4	53.1	59.1	52.9	52.3	50.6	48.7	43.7	33.5	22.4
09/09/2016	22:45:00	58.3	53.7	59.1	53.5	53.0	51.2	49.1	44.1	34.1	23.3
09/09/2016	23:00:00	55.8	52.5	59.0	53.0	52.3	49.7	48.2	43.0	32.5	21.7
09/09/2016	23:15:00	57.6	53.0	59.0	53.2	52.5	50.3	48.7	43.5	33.1	22.1

09/09/2016	23:30:00	56.0	52.8	59.0	52.9	52.3	50.3	48.5	43.3	33.2	22.0
09/09/2016	23:45:00	58.3	53.2	59.0	53.2	52.8	50.7	48.7	43.7	33.8	23.7
10/09/2016	00:00:00	56.7	52.2	59.2	53.3	52.2	49.0	47.9	42.7	32.1	21.9
10/09/2016	00:15:00	57.4	53.0	58.9	52.6	52.3	50.2	48.8	43.8	33.6	23.0
10/09/2016	00:30:00	59.9	55.5	58.9	52.8	53.1	53.6	50.7	45.9	36.8	25.4
10/09/2016	00:45:00	58.8	52.1	59.1	52.9	52.5	49.2	47.9	42.9	32.0	21.6
10/09/2016	01:00:00	52.6	51.7	58.8	52.4	51.5	48.4	47.3	42.6	31.5	20.2
10/09/2016	01:15:00	52.3	51.6	58.7	52.3	51.4	48.2	47.3	42.7	31.4	20.1
10/09/2016	01:30:00	52.0	51.5	58.9	52.3	51.2	48.1	47.2	42.6	31.2	19.8
10/09/2016	01:45:00	52.0	51.5	58.8	52.3	51.3	48.2	47.3	42.5	31.3	19.8
10/09/2016	02:00:00	51.9	51.5	58.4	52.2	51.2	48.2	47.2	42.7	31.3	19.9
10/09/2016	02:15:00	52.0	51.5	58.6	52.3	51.2	48.1	47.2	42.7	31.2	19.9
10/09/2016	02:30:00	51.9	51.5	58.2	52.2	51.3	48.1	47.2	42.7	31.1	19.7
10/09/2016	02:45:00	51.8	51.4	58.3	52.4	51.4	48.1	47.1	42.1	30.9	19.6
10/09/2016	03:00:00	52.1	51.5	58.3	52.4	51.4	48.2	47.2	42.6	31.2	19.8
10/09/2016	03:15:00	53.2	51.5	58.3	52.4	51.5	48.1	47.2	42.2	31.1	19.9
10/09/2016	03:30:00	51.9	51.4	58.2	52.3	51.5	48.1	47.1	42.0	31.1	19.9
10/09/2016	03:45:00	52.0	51.5	58.2	52.3	51.5	48.1	47.1	42.0	31.0	19.8
10/09/2016	04:00:00	51.9	51.4	58.2	52.3	51.4	48.1	47.1	42.1	31.2	19.9
10/09/2016	04:15:00	51.9	51.4	58.3	52.3	51.4	48.1	47.1	42.0	31.1	19.9
10/09/2016	04:30:00	53.7	53.4	58.4	53.3	51.9	48.9	49.1	45.7	38.4	28.2
10/09/2016	04:45:00	53.6	53.3	58.5	53.3	52.0	49.0	49.1	45.5	38.3	28.1
10/09/2016	05:00:00	53.7	53.3	58.3	53.3	51.8	49.0	49.1	45.6	38.3	28.1
10/09/2016	05:15:00	53.7	53.3	58.4	53.4	52.0	49.0	49.1	45.5	38.3	28.0
10/09/2016	05:30:00	53.7	53.4	58.6	53.3	52.0	49.0	49.1	45.5	38.3	28.1
10/09/2016	05:45:00	53.6	53.3	58.4	53.2	51.9	49.0	49.1	45.6	38.3	28.0
10/09/2016	06:00:00	53.9	53.5	58.7	53.7	52.2	49.2	49.1	45.8	38.3	28.0
10/09/2016	06:15:00	53.9	53.5	58.7	53.7	52.3	49.3	49.2	45.8	38.3	28.1
10/09/2016	06:30:00	53.9	53.5	58.8	53.4	52.0	49.3	49.2	45.9	38.3	28.1
10/09/2016	06:45:00	54.1	53.6	59.0	53.5	52.1	49.3	49.3	45.9	38.4	28.2
10/09/2016	07:00:00	54.2	53.5	59.0	53.7	52.2	49.3	49.2	45.9	38.3	28.1
10/09/2016	07:15:00	54.1	53.5	58.9	53.7	52.2	49.3	49.2	45.7	38.3	28.1
10/09/2016	07:30:00	54.0	53.5	58.9	53.3	51.8	49.3	49.2	45.9	38.4	28.2
10/09/2016	07:45:00	54.1	53.5	58.9	53.3	51.7	49.4	49.3	45.7	38.5	28.2
10/09/2016	08:00:00	54.5	53.5	58.8	53.1	51.6	49.4	49.3	45.7	38.6	28.5
10/09/2016	08:15:00	64.7	53.8	59.0	53.1	51.6	49.6	49.6	46.1	39.1	29.4
10/09/2016	08:30:00	65.8	54.7	59.2	53.2	52.0	50.4	50.2	47.1	41.5	36.3
10/09/2016	08:45:00	59.9	54.0	59.3	53.6	52.3	49.9	49.7	46.2	39.3	30.2
10/09/2016	09:00:00	54.9	53.8	59.7	53.7	52.2	49.7	49.5	46.0	39.0	29.4
10/09/2016	09:15:00	64.9	53.8	59.6	53.7	52.1	49.8	49.6	46.1	39.0	29.7
10/09/2016	09:30:00	58.2	53.8	59.3	53.5	52.0	49.8	49.5	45.9	38.9	29.3
10/09/2016	09:45:00	62.1	53.7	59.4	53.7	52.1	49.8	49.4	45.8	38.7	28.7
10/09/2016	10:00:00	54.7	53.5	59.1	53.1	51.5	49.6	49.3	45.6	38.5	28.4
10/09/2016	10:15:00	54.8	53.7	59.2	53.7	51.9	49.7	49.4	45.7	38.6	28.4
10/09/2016	10:30:00	60.7	53.8	59.3	53.7	52.1	49.7	49.4	45.9	38.7	28.9
10/09/2016	10:45:00	61.9	53.9	59.3	54.0	52.5	49.9	49.5	46.0	38.8	28.7

10/09/2016	11:00:00	64.0	51.6	57.8	51.5	49.5	46.7	47.2	44.6	38.2	28.2
10/09/2016	11:15:00	54.5	53.7	58.9	53.7	52.0	49.6	49.3	45.8	38.5	28.4
10/09/2016	11:30:00	61.0	53.8	59.0	53.5	52.0	49.7	49.5	46.1	38.9	29.3
10/09/2016	11:45:00	56.5	54.3	59.3	53.9	52.4	50.0	49.8	46.5	39.6	31.5
10/09/2016	12:00:00	55.6	53.8	59.1	53.9	52.5	49.7	49.5	45.8	38.7	29.2
10/09/2016	12:15:00	57.8	53.9	59.2	54.1	52.7	49.8	49.5	45.9	38.7	28.9
10/09/2016	12:30:00	56.1	54.1	59.4	54.2	52.9	50.1	49.7	46.0	39.0	30.2
10/09/2016	12:45:00	56.8	54.0	59.3	54.3	52.9	50.0	49.6	45.9	38.6	28.6
10/09/2016	13:00:00	59.4	55.2	59.5	54.4	53.3	50.9	50.7	47.6	42.7	37.9
10/09/2016	13:15:00	54.7	54.1	59.3	54.2	52.9	49.8	49.6	46.1	39.7	31.9
10/09/2016	13:30:00	55.4	54.4	59.5	54.2	52.9	50.1	50.0	46.6	40.4	33.8
10/09/2016	13:45:00	55.0	54.4	59.5	54.2	52.9	50.1	49.9	46.6	40.5	33.9
10/09/2016	14:00:00	54.6	54.1	59.4	54.2	52.7	49.9	49.7	46.1	39.1	30.0
10/09/2016	14:15:00	54.3	53.8	59.4	54.5	53.1	49.7	49.4	45.8	38.5	28.6
10/09/2016	14:30:00	56.6	54.8	59.5	55.0	53.7	50.4	50.1	46.9	41.2	35.5
10/09/2016	14:45:00	55.4	54.5	59.3	54.6	53.2	50.2	49.9	46.6	40.7	34.5
10/09/2016	15:00:00	55.0	54.2	59.3	54.5	53.0	49.9	49.8	46.3	39.7	31.7
10/09/2016	15:15:00	55.4	53.9	59.3	54.6	53.0	49.7	49.4	45.9	38.6	28.8
10/09/2016	15:30:00	55.3	53.9	59.4	54.7	53.3	49.8	49.5	45.9	38.6	28.5
10/09/2016	15:45:00	54.8	54.2	59.1	54.5	53.1	49.9	49.7	46.3	39.5	31.3
10/09/2016	16:00:00	55.0	54.1	59.4	54.8	53.4	49.9	49.6	46.1	39.1	30.0
10/09/2016	16:15:00	56.9	55.4	59.4	54.7	53.4	50.7	50.6	47.9	43.4	39.0
10/09/2016	16:30:00	55.0	54.4	59.4	54.7	53.3	50.1	49.8	46.5	40.0	32.5
10/09/2016	16:45:00	54.8	54.0	59.5	54.6	53.2	49.9	49.5	46.0	38.8	29.0
10/09/2016	17:00:00	55.8	54.0	59.5	54.4	53.0	49.8	49.6	46.1	38.7	28.8
10/09/2016	17:15:00	54.5	54.0	59.3	54.1	52.6	49.7	49.6	46.1	38.9	29.2
10/09/2016	17:30:00	55.6	54.9	59.5	54.3	52.6	50.3	50.2	47.3	42.3	37.6
10/09/2016	17:45:00	55.5	54.8	59.7	54.5	53.1	50.2	50.2	47.1	41.6	36.4
10/09/2016	18:00:00	54.5	54.1	59.7	54.4	52.9	49.8	49.6	46.2	39.1	30.0
10/09/2016	18:15:00	54.3	53.8	59.5	54.3	52.7	49.6	49.5	46.0	38.7	28.8
10/09/2016	18:30:00	56.8	54.0	59.7	54.9	53.3	49.9	49.6	46.1	38.7	28.9
10/09/2016	18:45:00	57.2	54.8	59.5	55.0	53.6	50.5	50.3	47.0	41.6	36.1
10/09/2016	19:00:00	54.6	54.1	59.9	55.2	53.4	49.7	49.6	46.1	39.3	30.0
10/09/2016	19:15:00	54.3	53.9	59.7	55.2	53.5	49.6	49.4	45.9	38.9	28.8
10/09/2016	19:30:00	54.3	53.9	59.7	55.3	53.6	49.6	49.4	45.7	38.7	28.4
10/09/2016	19:45:00	54.2	53.8	59.5	54.7	53.1	49.6	49.3	45.8	38.6	28.3
10/09/2016	20:00:00	54.2	53.8	59.3	55.0	53.3	49.4	49.3	45.7	38.5	28.2
10/09/2016	20:15:00	54.3	53.9	59.4	55.3	53.7	49.5	49.3	45.7	38.6	28.3
10/09/2016	20:30:00	54.2	53.8	59.4	55.3	53.7	49.5	49.3	45.7	38.6	28.3
10/09/2016	20:45:00	54.1	53.8	59.4	55.0	53.3	49.4	49.3	45.7	38.5	28.2
10/09/2016	21:00:00	54.3	53.7	59.4	54.5	52.6	49.4	49.4	45.7	38.6	28.1
10/09/2016	21:15:00	54.2	53.8	59.3	55.1	53.3	49.4	49.4	45.7	38.6	28.1
10/09/2016	21:30:00	54.8	54.0	59.5	55.4	53.7	49.7	49.5	45.9	38.7	28.2
10/09/2016	21:45:00	54.5	54.0	59.7	55.6	53.9	49.7	49.5	45.9	38.7	28.2
10/09/2016	22:00:00	54.9	54.1	59.9	55.1	53.5	49.8	49.6	46.0	38.7	28.3
10/09/2016	22:15:00	54.5	52.9	59.8	54.5	52.9	49.7	48.6	43.7	33.4	23.6

10/09/2016	22:30:00	53.0	52.3	59.4	53.9	52.7	49.2	47.7	42.8	32.2	20.4
10/09/2016	22:45:00	54.1	52.8	59.6	54.5	53.4	49.9	48.0	43.3	32.6	21.2
10/09/2016	23:00:00	53.8	52.6	59.6	54.4	53.2	49.5	47.9	43.1	32.4	20.9
10/09/2016	23:15:00	53.7	52.4	59.2	54.5	53.3	49.3	47.7	42.8	32.2	20.4
10/09/2016	23:30:00	54.2	52.7	59.5	54.5	53.5	49.5	48.1	43.3	32.7	21.1
10/09/2016	23:45:00	53.8	52.5	59.5	54.5	53.3	49.1	47.8	43.0	32.3	20.2
11/09/2016	00:00:00	54.2	52.5	59.3	54.5	53.4	49.2	47.9	43.1	32.4	20.9
11/09/2016	00:15:00	53.3	52.5	59.1	54.6	53.4	49.3	47.9	42.9	32.5	20.5
11/09/2016	00:30:00	54.6	52.8	59.2	54.6	53.6	49.8	48.2	43.3	32.7	20.8
11/09/2016	00:45:00	53.7	52.6	59.3	54.6	53.5	49.4	47.9	42.9	32.5	20.5
11/09/2016	01:00:00	53.7	52.6	59.1	54.7	53.4	49.5	47.9	42.8	32.3	20.3
11/09/2016	01:15:00	53.0	52.5	59.1	54.7	53.5	49.0	47.8	42.9	31.9	20.0
11/09/2016	01:30:00	52.9	52.4	59.1	54.8	53.5	48.7	47.7	43.0	31.8	20.0
11/09/2016	01:45:00	52.8	52.4	58.9	54.7	53.5	48.6	47.7	43.0	31.6	19.8
11/09/2016	02:00:00	52.9	52.3	58.9	54.7	53.5	48.6	47.7	43.1	31.6	19.8
11/09/2016	02:15:00	52.9	52.4	58.9	54.8	53.6	48.6	47.8	43.2	31.7	19.8
11/09/2016	02:30:00	52.7	52.3	58.8	54.6	53.5	48.6	47.7	43.1	31.7	19.8
11/09/2016	02:45:00	52.7	52.3	58.7	54.5	53.3	48.6	47.7	43.0	31.6	19.7
11/09/2016	03:00:00	52.7	52.3	58.9	54.7	53.5	48.6	47.7	42.9	31.5	19.7
11/09/2016	03:15:00	53.0	52.3	58.9	54.7	53.4	48.6	47.7	43.1	31.5	19.7
11/09/2016	03:30:00	53.2	52.3	58.8	54.7	53.5	48.5	47.7	43.0	31.5	19.7
11/09/2016	03:45:00	52.6	52.2	58.7	54.5	53.3	48.5	47.6	42.9	31.6	19.8
11/09/2016	04:00:00	52.6	52.2	58.7	54.6	53.4	48.5	47.5	42.9	31.6	19.7
11/09/2016	04:15:00	54.2	52.2	58.8	54.5	53.3	48.7	47.6	42.9	31.7	19.8
11/09/2016	04:30:00	57.7	54.4	59.9	56.0	54.6	50.3	50.0	46.4	38.8	28.2
11/09/2016	04:45:00	54.6	54.0	59.0	55.3	53.7	49.5	49.5	46.2	38.7	28.2
11/09/2016	05:00:00	54.3	54.0	58.8	55.3	53.7	49.5	49.5	46.2	38.7	28.2
11/09/2016	05:15:00	54.4	54.0	58.8	55.3	53.7	49.5	49.5	46.2	38.7	28.2
11/09/2016	05:30:00	54.3	54.0	58.8	55.5	53.8	49.5	49.5	46.2	38.7	28.2
11/09/2016	05:45:00	54.3	54.0	58.8	55.5	53.8	49.5	49.5	46.2	38.7	28.2
11/09/2016	06:00:00	54.4	54.1	59.0	55.6	54.0	49.6	49.5	46.2	38.7	28.2
11/09/2016	06:15:00	54.4	54.1	59.1	55.4	53.9	49.7	49.5	46.2	38.7	28.2
11/09/2016	06:30:00	54.5	54.1	59.1	55.5	54.0	49.6	49.5	46.3	38.7	28.2
11/09/2016	06:45:00	54.6	54.1	59.2	55.8	54.1	49.6	49.5	46.2	38.7	28.2
11/09/2016	07:00:00	54.4	54.1	59.0	55.7	54.0	49.5	49.5	46.1	38.7	28.2
11/09/2016	07:15:00	54.4	54.1	59.3	55.7	54.0	49.6	49.5	46.0	38.8	28.2
11/09/2016	07:30:00	54.3	54.0	59.2	55.5	53.8	49.7	49.5	45.8	38.8	28.2
11/09/2016	07:45:00	54.7	54.1	59.3	55.5	53.8	49.8	49.6	45.8	38.7	28.1
11/09/2016	08:00:00	54.9	54.1	59.5	55.6	53.9	49.7	49.7	45.8	38.7	28.1
11/09/2016	08:15:00	54.6	54.0	59.4	55.6	53.9	49.5	49.7	45.8	38.7	28.1
11/09/2016	08:30:00	54.9	54.0	59.2	55.6	53.8	49.5	49.6	45.8	38.7	28.1
11/09/2016	08:45:00	54.3	53.9	59.2	55.5	53.8	49.5	49.4	45.7	38.6	28.0
11/09/2016	09:00:00	54.3	53.9	59.2	55.4	53.7	49.5	49.4	45.8	38.6	28.1
11/09/2016	09:15:00	54.3	54.0	59.2	55.5	53.9	49.6	49.4	45.8	38.6	28.1
11/09/2016	09:30:00	56.1	53.9	59.5	55.5	53.8	49.6	49.3	45.7	38.6	28.0
11/09/2016	09:45:00	54.3	53.8	59.0	55.6	53.9	49.5	49.2	45.6	38.6	28.0

11/09/2016	10:00:00	54.5	53.9	59.0	55.8	54.0	49.5	49.2	45.7	38.6	28.0
11/09/2016	10:15:00	54.8	53.8	59.3	55.6	53.9	49.4	49.3	45.7	38.6	28.0
11/09/2016	10:30:00	57.8	53.9	59.2	55.9	54.0	49.5	49.2	45.7	38.5	27.9
11/09/2016	10:45:00	55.3	53.9	59.0	56.0	54.3	49.4	49.2	45.7	38.5	27.9
11/09/2016	11:00:00	54.3	53.6	58.9	55.1	53.5	49.2	49.1	45.5	38.3	27.7
11/09/2016	11:15:00	55.3	53.8	59.1	55.7	54.0	49.4	49.2	45.6	38.3	27.5
11/09/2016	11:30:00	54.7	53.8	59.1	56.0	54.3	49.3	49.0	45.5	38.2	27.4
11/09/2016	11:45:00	54.4	53.6	58.7	55.2	53.5	49.3	49.1	45.5	38.2	27.3
11/09/2016	12:00:00	54.6	53.6	59.0	55.6	53.8	49.3	49.0	45.4	38.1	27.3
11/09/2016	12:15:00	54.8	53.6	59.0	55.4	53.7	49.3	49.0	45.3	38.0	27.3
11/09/2016	12:30:00	54.3	53.5	58.9	54.4	52.7	49.2	49.1	45.4	38.1	27.1
11/09/2016	12:45:00	57.3	53.6	59.3	54.6	52.8	49.5	49.2	45.5	38.0	27.1
11/09/2016	13:00:00	54.3	53.5	59.1	54.4	52.7	49.3	49.1	45.4	37.8	26.9
11/09/2016	13:15:00	54.8	53.4	58.7	54.7	53.0	49.2	49.0	45.2	37.8	26.9
11/09/2016	13:30:00	54.1	53.4	58.7	54.3	52.4	49.2	49.0	45.3	37.8	27.0
11/09/2016	13:45:00	56.0	53.5	58.9	54.6	52.6	49.3	49.1	45.3	37.8	26.8
11/09/2016	14:00:00	54.5	53.3	58.8	54.4	52.3	49.1	49.0	45.2	37.7	26.8
11/09/2016	14:15:00	60.4	53.7	59.3	54.9	52.8	49.6	49.3	45.5	37.7	26.8
11/09/2016	14:30:00	59.0	54.1	60.0	55.5	53.7	50.7	49.8	45.6	37.6	26.7
11/09/2016	14:45:00	59.2	54.5	60.3	55.6	54.2	51.4	50.2	45.7	37.6	26.6
11/09/2016	15:00:00	58.6	54.3	60.0	54.7	53.6	51.3	49.9	45.5	37.5	26.5
11/09/2016	15:15:00	59.3	54.8	60.6	55.4	54.5	51.9	50.3	45.6	37.3	26.4
11/09/2016	15:30:00	59.1	54.5	60.2	55.5	54.4	51.6	50.2	45.5	37.1	26.2
11/09/2016	15:45:00	59.8	54.7	60.5	55.4	54.2	52.1	50.3	45.4	36.9	26.1
11/09/2016	16:00:00	61.0	54.9	60.6	55.6	54.6	52.0	50.5	45.8	37.2	26.1
11/09/2016	16:15:00	57.8	53.8	60.2	54.6	52.9	50.5	49.6	45.4	37.2	26.2
11/09/2016	16:30:00	58.6	54.0	60.1	54.9	53.2	50.8	49.7	45.5	37.3	26.3
11/09/2016	16:45:00	55.2	53.2	59.1	53.2	51.5	49.4	49.1	45.1	37.3	26.3
11/09/2016	17:00:00	54.0	53.2	58.7	53.0	51.4	49.2	49.1	45.3	37.4	26.5
11/09/2016	17:15:00	54.0	53.2	58.8	53.0	51.3	49.3	49.1	45.3	37.5	26.7
11/09/2016	17:30:00	54.1	53.3	58.9	53.3	51.6	49.2	49.1	45.4	37.6	26.9
11/09/2016	17:45:00	54.2	53.1	58.7	53.1	51.3	49.1	49.0	45.2	37.6	26.9
11/09/2016	18:00:00	54.2	53.3	59.1	53.5	51.7	49.3	49.1	45.4	37.5	26.7
11/09/2016	18:15:00	53.9	53.4	59.1	53.7	51.8	49.4	49.1	45.3	37.6	26.7
11/09/2016	18:30:00	53.9	53.4	59.2	53.6	51.8	49.3	49.2	45.4	37.6	26.7
11/09/2016	18:45:00	54.1	53.4	59.2	53.8	52.1	49.3	49.2	45.4	37.6	26.8
11/09/2016	19:00:00	53.9	53.3	59.1	53.7	52.0	49.2	49.1	45.3	37.7	26.9
11/09/2016	19:15:00	53.7	53.4	59.1	53.8	52.2	49.3	49.1	45.3	37.7	26.9
11/09/2016	19:30:00	53.7	53.3	59.1	53.7	52.1	49.2	49.1	45.3	37.7	27.0
11/09/2016	19:45:00	53.9	53.5	59.0	54.1	52.6	49.3	49.1	45.3	37.8	27.1
11/09/2016	20:00:00	53.8	53.5	59.0	54.0	52.5	49.2	49.2	45.3	37.9	27.1
11/09/2016	20:15:00	54.0	53.6	59.2	54.2	52.8	49.4	49.2	45.5	37.9	27.3
11/09/2016	20:30:00	54.9	53.6	59.2	54.3	52.9	49.6	49.2	45.6	38.0	27.4
11/09/2016	20:45:00	54.1	53.6	59.1	54.3	52.8	49.5	49.1	45.7	38.0	27.5
11/09/2016	21:00:00	54.1	53.7	59.3	54.4	53.1	49.6	49.1	45.7	38.0	27.5
11/09/2016	21:15:00	53.9	53.6	59.3	54.3	52.9	49.5	49.1	45.6	38.0	27.5

11/09/2016	21:30:00	54.1	53.7	59.3	54.5	53.2	49.6	49.1	45.6	38.1	27.5
11/09/2016	21:45:00	54.5	53.7	59.5	54.7	53.3	49.4	49.1	45.7	38.1	27.5
11/09/2016	22:00:00	54.0	53.7	59.4	54.6	53.3	49.4	49.1	45.7	38.2	27.6
11/09/2016	22:15:00	54.0	52.6	59.4	54.3	53.1	49.4	48.2	43.5	32.4	20.1
11/09/2016	22:30:00	52.6	51.9	59.3	53.8	52.8	48.7	47.1	42.3	31.4	19.1
11/09/2016	22:45:00	54.2	52.0	59.5	54.1	53.0	48.6	47.3	42.5	31.4	19.3
11/09/2016	23:00:00	52.4	52.0	59.1	54.1	53.0	48.4	47.2	42.6	31.6	19.7
11/09/2016	23:15:00	52.2	51.8	59.0	54.1	52.8	48.3	47.1	42.4	31.2	19.1
11/09/2016	23:30:00	52.3	51.9	59.0	54.1	53.0	48.4	47.1	42.4	31.3	19.7
11/09/2016	23:45:00	52.2	51.8	58.8	54.0	52.8	48.5	47.0	42.1	31.3	19.3
12/09/2016	00:00:00	52.2	51.8	59.5	53.9	52.8	48.4	47.0	42.2	31.3	19.3
12/09/2016	00:15:00	52.7	51.8	58.9	54.0	52.8	48.6	47.1	42.1	31.3	19.2
12/09/2016	00:30:00	52.1	51.7	58.9	53.9	52.8	48.4	47.0	42.0	31.2	19.2
12/09/2016	00:45:00	52.2	51.8	58.8	54.1	52.8	48.4	47.1	42.2	31.1	19.2
12/09/2016	01:00:00	52.2	51.8	58.9	54.1	52.9	48.3	47.1	42.2	31.2	19.3
12/09/2016	01:15:00	52.2	51.8	58.8	54.2	52.9	48.3	47.1	42.5	31.2	19.3
12/09/2016	01:30:00	52.2	51.9	58.7	54.2	53.0	48.3	47.1	42.5	31.1	19.4
12/09/2016	01:45:00	52.7	51.8	58.8	54.1	53.1	48.2	47.1	42.6	31.1	19.3
12/09/2016	02:00:00	52.2	51.8	58.8	54.1	53.1	48.2	47.1	42.6	31.1	19.4
12/09/2016	02:15:00	52.5	51.9	58.8	54.2	53.1	48.4	47.2	42.6	31.1	19.3
12/09/2016	02:30:00	52.7	51.9	58.8	54.3	53.1	48.4	47.1	42.6	31.2	19.4
12/09/2016	02:45:00	52.3	51.9	58.6	54.2	53.2	48.2	47.1	42.7	31.2	19.5
12/09/2016	03:00:00	52.4	51.9	58.8	54.4	53.1	48.3	47.2	42.6	31.2	19.4
12/09/2016	03:15:00	52.3	51.9	58.8	54.3	53.2	48.3	47.1	42.6	31.0	19.3
12/09/2016	03:30:00	54.6	52.0	59.2	54.5	53.4	48.4	47.3	42.6	31.1	19.6
12/09/2016	03:45:00	52.3	51.9	58.8	54.3	53.1	48.2	47.2	42.7	31.2	19.4
12/09/2016	04:00:00	52.2	51.8	58.9	54.2	53.0	48.3	47.1	42.4	31.1	19.3
12/09/2016	04:15:00	52.3	51.9	59.1	54.2	53.0	48.5	47.1	42.3	31.1	19.4
12/09/2016	04:30:00	54.0	53.7	59.2	55.0	53.4	49.3	49.2	45.7	38.5	28.0
12/09/2016	04:45:00	54.0	53.7	59.2	55.1	53.5	49.3	49.2	45.7	38.5	28.0
12/09/2016	05:00:00	54.1	53.7	59.3	55.1	53.4	49.4	49.2	45.7	38.5	28.1
12/09/2016	05:15:00	54.2	53.8	59.4	55.2	53.6	49.5	49.2	45.7	38.5	28.1
12/09/2016	05:30:00	54.1	53.8	59.5	55.2	53.6	49.5	49.2	45.7	38.5	28.1
12/09/2016	05:45:00	54.5	53.8	59.6	55.1	53.5	49.6	49.3	45.7	38.5	28.1
12/09/2016	06:00:00	54.4	54.0	59.6	55.4	53.8	49.7	49.3	45.8	38.6	28.2
12/09/2016	06:15:00	54.4	54.0	59.9	55.6	54.0	49.7	49.3	45.9	38.6	28.1
12/09/2016	06:30:00	54.5	54.0	60.1	55.5	53.8	49.8	49.4	45.7	38.5	28.1
12/09/2016	06:45:00	54.9	54.1	60.2	55.6	54.1	49.9	49.5	45.9	38.6	28.2
12/09/2016	07:00:00	54.9	54.0	60.2	55.5	53.8	49.9	49.4	45.8	38.6	28.2
12/09/2016	07:15:00	54.6	54.0	60.0	55.6	53.9	49.9	49.4	45.7	38.5	28.1
12/09/2016	07:30:00	54.6	53.9	59.9	55.5	53.8	49.7	49.3	45.5	38.5	28.1
12/09/2016	07:45:00	55.4	53.9	60.1	55.8	54.0	49.7	49.3	45.4	38.5	28.1
12/09/2016	08:00:00	56.4	53.9	60.1	55.3	53.6	49.9	49.4	45.5	38.5	28.1
12/09/2016	08:15:00	62.8	54.1	60.4	55.3	53.5	50.2	49.7	45.8	38.7	28.6
12/09/2016	08:30:00	65.0	53.9	60.2	55.5	53.6	50.0	49.3	45.5	38.5	28.5
12/09/2016	08:45:00	55.1	53.7	59.6	54.9	53.0	49.9	49.1	45.4	38.5	28.5

12/09/2016	09:00:00	63.0	53.8	59.9	54.9	53.2	50.1	49.3	45.4	38.5	28.5
12/09/2016	09:15:00	60.7	53.5	59.4	54.1	52.0	49.7	49.1	45.5	38.6	28.5
12/09/2016	09:30:00	58.1	53.7	59.5	54.4	52.3	49.7	49.3	45.7	39.0	29.9
12/09/2016	09:45:00	61.0	53.9	59.7	54.7	53.0	50.0	49.4	45.8	38.6	28.5
12/09/2016	10:00:00	55.4	53.6	59.0	54.4	52.7	49.7	49.1	45.4	38.3	28.1
12/09/2016	10:15:00	56.9	53.4	59.0	54.3	52.5	49.7	49.0	45.2	38.2	28.1
12/09/2016	10:30:00	59.3	53.6	58.9	54.3	52.7	49.8	49.1	45.3	38.4	28.6
12/09/2016	10:45:00	56.4	53.8	59.3	54.5	52.7	49.8	49.2	45.7	38.8	30.2
12/09/2016	11:00:00	67.1	53.9	59.7	54.7	53.1	50.0	49.3	45.7	38.8	29.5
12/09/2016	11:15:00	62.6	53.9	59.4	55.0	53.1	49.9	49.3	45.8	39.1	29.7
12/09/2016	11:30:00	73.1	53.7	58.9	54.5	52.8	49.7	49.3	45.5	38.7	29.3
12/09/2016	11:45:00	69.0	53.7	59.1	54.3	52.8	50.1	49.3	45.4	38.5	29.3
12/09/2016	12:00:00	54.3	53.3	58.6	54.2	52.3	49.2	48.8	45.2	38.2	28.6
12/09/2016	12:15:00	54.1	53.3	58.8	53.9	52.1	49.5	48.9	45.1	37.9	27.9
12/09/2016	12:30:00	54.4	53.3	58.7	54.3	52.5	49.4	48.9	45.1	37.9	27.9
12/09/2016	12:45:00	59.2	53.8	59.9	54.6	52.8	50.0	49.3	45.6	38.5	29.7
12/09/2016	13:00:00	66.8	53.8	59.0	54.6	52.9	50.0	49.3	45.7	38.9	31.5
12/09/2016	13:15:00	73.3	54.5	59.1	55.2	53.2	50.2	50.1	47.0	41.2	36.4

APPENDIX I: Glossary of Acoustic Terms

DECIBEL (dB) - A unit of sound pressure measurement
Sound Pressure Level in dB (*L*p) = 20 log (Measured sound pressure/Reference sound pressure = 20 µPa)

dB(A) - The A -weighted sound pressure level, the weighting network reduces low frequency sound in a similar way to the human ear.

REVERBERATION TIME (RT or *T*) – decay of sound in rooms
The time taken for a sound, once terminated, to fall through 60dB i.e. to one millionth of its original sound intensity. *T*30 – RT for first 30dB of decay. RT_{500} - Mid frequency RT.
HERTZ (Hz) - a unit of frequency measurement. The normal range of hearing is from 20Hz to about 15kHz.

ABSORPTION COEFFICIENT – degree to which a material absorbs sound.
The ratio of absorbed to incident sound energy (perfect absorber = 1)

SOUND REDUCTION INDEX *R* – quantity which describes a material's ability to reduce the sound pressure level across it (e.g. a wall or floor)

$R = L1 - L2 + 10\log (S/A)$

*L*1 - Average sound pressure level in source room (averaged from 100 Hz – 3150 Hz)
*L*2 - Average sound pressure level in receiving room (averaged from 100 Hz – 3150 Hz)
S – Wall Area (m^2)
A – Total absorption in receiving room (m^2 units)

*R*w – weighted sound reduction index

AVERAGE ROOM TO ROOM LEVEL DIFFERENCE – *D*, dB = *L*1 – *L*2, averaged 1/3 octave bands from 100Hz – 3150kHz.

*D*w – weighted value of D (usually 2 - 3dB higher)

*D*nT, w – *D*w corrected for reverberation time of receiving room

NOISE RATING CURVES (NR CURVES) – set of curves used to describe optimum background noise levels for different tasks.

*L*10/90 LEVEL (dB) - The level in dB of a time varying sound pressured level (e.g. traffic) exceeded for 10%/90% of the time of measurement.
*L*90 is usually called the BACKGROUND NOISE LEVEL.

*L*eq AVERAGE SOUND PRESSURE LEVEL – level dB of a time varying sound pressure level with equal amounts of energy above and below it, for the time of measurement.

TONAL NOISE – noise of a single frequency (or a narrow band of frequencies that can be perceived as a tone), audible above the broad band noise background. Noise which is at least 5dB above the average of the 1/3 octave band sound pressure levels immediately on either side of it.