

Report No:

Mulberry House School Noise Impact Assessment 10092015.pdf

Date:

10th September 2015

For:

Mulberry House School

Report Title:

MULBERRY HOUSE SCHOOL

**ENVIRONMENTAL NOISE IMPACT
ASSESSMENT**

By:

Gillieron Scott Acoustic Design
Office 20,
Wingate Business Exchange,
64-66 Wingate Square
Clapham SW4 0AF

t - 020 8671 2223

e - info@gsacoustics.org

w - www.gsacoustics.org

Gillieron Scott Acoustic Design Ltd shall not be responsible for any use of the report or its contents for any purpose other than that for which it was provided. Should the Client require the distribution of the report to other parties for information, the full report should be copied. No professional liability or warranty shall be extended to other parties by Gillieron Scott Acoustic Design Ltd without written agreement from Gillieron Scott Acoustic Design Ltd.

REVISION SCHEDULE



Document Revision	Date	Document Title	Details	Prepared by	Approved by
00	10 th September 2015	Mulberry House School	Issued	Ben Claridge 	Tim Scott 

TABLE OF CONTENTS

INTRODUCTION..... 4

1.0 SUMMARY 4

2.0 LOCAL AUTHORITY POLICY AND GUIDANCE 5

 2.1 Acoustic Design Criteria 5

 2.1.1 Camden Council Noise and Vibration Policy 5

 2.2 Applicable Standards..... 7

 2.2.1 Building Bulletin 93 (BB93) - Sound Insulation of the Building Envelope 7

 2.3 BS4142: Plant Noise Limits 8

3.0 NOISE SURVEY DETAILS..... 8

 3.1 Noise Survey 8

 3.2 Noise indices 8

4.0 SURVEY RESULTS 9

5.0 PLANT NOISE DESIGN CRITERIA 9

6.0 SOUND INSULATION OF THE BUILDING ENVELOPE.....10

7.0 DESIGN DEVELOPMENT AND FUTURE REQUIREMENTS.....10

 7.1 Plant Noise 10

 7.2 BB93 11

APPENDICES.....12

APPENDIX A: Overview plan and site photo13

APPENDIX B: Time series survey results14

APPENDIX C: Equipment and Procedure.....15

APPENDIX D: Survey Results - Data16

APPENDIX E: Glossary of Acoustic Terms.....25

INTRODUCTION

Proposals are being submitted to the London Borough of Camden to alter and extend some existing school accommodation at Mulberry House School, 68 Shoot Up Hill London, NW2 3XL.

Gillieron Scott Acoustic Design have been commissioned to undertake a background noise survey and noise impact assessment in accordance with BS4142 and advise on outline likely noise mitigation measures that will be required to achieve INAL's for BB93.

Details of potential proposed plant are not yet known and as a result this report sets limits 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 at the neighbouring properties of Mulberry House School.

The measurement position is shown in Appendix A.

Details of potential proposed plant are not yet known and as a result this report sets limits in accordance with the London Borough of Camden's noise policies.

The survey results show that the minimum background noise level measured over the survey period was 52 dB $L_{A90,15min}$.

GSAD's recommended noise limits for any proposed plant location have been outlined in this report so that noise from plant items does not exceed 47 dB(A) at the nearest respective noise sensitive residential windows.

Maximum external LAeq levels have also been assessed with regard to satisfying BB93 and outline recommendations have been made for later design stages.

2.0 LOCAL AUTHORITY POLICY AND GUIDANCE

2.1 Acoustic Design Criteria

Local authority planning policy and typical design standards as detailed below have been used as design guidance for the recommendations contained within this report.

2.1.1 Camden Council Noise and Vibration Policy

Noise and vibration can have a major effect on amenity and health and therefore quality of life. Camden's high density and mixed-use nature means that disturbance from noise and vibration is a particularly important issue in the borough. Camden's Core Strategy recognises the importance of this issue for Camden's residents and policy DP28 contributes to implementing a number of Core Strategy policies, including CS5 - *Managing the impact of growth and development*, CS9 - *Achieving a successful Central London*, CS11 - *Promoting sustainable and efficient travel* and CS16 - *Improving Camden's health and well-being*.

Policy DP28 - Noise and Vibration

The Council will seek to ensure that noise and vibration is controlled and managed and will not grant planning permission for:

- a. development likely to generate noise pollution; or
- b. development sensitive to noise in locations with noise pollution, unless appropriate attenuation measures are provided.

Development that exceeds Camden's Noise and Vibration Thresholds will not be permitted.

The Council will only grant permission for plant or machinery if it can be operated without cause harm to amenity and does not exceed our noise thresholds.

The Council will seek to minimise the impact on local amenity from the demolition and construction phases of development. Where these phases are likely to cause harm, conditions and planning obligations may be used to minimise the impact.

The effect of noise and vibration can be minimised by separating uses sensitive to noise from development that generates noise and by taking measures to reduce any impact. Noise sensitive development includes housing, schools and hospitals as well as offices, workshops and open spaces, while noise is generated by rail, road and air traffic, industry, entertainment (e.g. nightclubs, restaurants and bars) and other uses.

The Council will only grant planning permission for development sensitive to noise in locations that experience noise pollution, and for development likely to generate noise pollution, if appropriate attenuation measures are taken, such as double-glazing. Planning permission will not be granted for development sensitive to noise in locations that have unacceptable levels of noise.

Where uses sensitive to noise are proposed close to an existing source of noise or when development that generates noise is proposed, the Council will require an acoustic report to ensure compliance with PPG24: *Planning and noise*. A condition will be imposed to require that the plant and equipment which may be a source of noise pollution is kept working efficiently and within the required noise limits and time restrictions.

Conditions may also be imposed to ensure that attenuation measures are kept in place and effective throughout the life of the development.

In assessing applications, we will have regard to the Noise and Vibration Thresholds, set out below. These represent an interpretation of the standards in PPG24 and includes an evening period in addition to the day and night standards contained in the PPG24, which provide a greater degree of control over noise and vibration during a period when noise is often an issue in the borough.

Table A: 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 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}

Key references / evidence

- Camden’s Noise Strategy, 2002
- The London Plan (Consolidated with Alterations since 2004), 2008
- Planning Policy Guidance 24: Planning and noise

2.2 Applicable Standards

2.2.1 Building Bulletin 93 (BB93) Sound Insulation of the Building Envelope

The building envelope/glazing must reduce external noise to within the internal ambient noise levels (IANL's) taken from BB93 as shown in Table B below.

Table B: Typical IANL's from BB93

Room	Indoor Ambient Noise Level
	$L_{Aeq,30min}$
Small Group Room	35
Primary Classroom	35
Toilets	50*
Medical Rooms	40*
Offices	40*
Multi-Purpose Hall	35
Resource Area	40
Library	40
Staff Room	40*
Classrooms designed specifically for use by hearing impaired students (including speech therapy rooms) (ESR)	30

*Part E of Schedule 1 to the Building Regulations 2000 (as amended by SI 2002/2871) applies to teaching and learning spaces and is not intended to cover administration and ancillary spaces. For these areas the performance standards are for guidance only.

The indoor ambient noise level includes noise contributions from external sources outside the school premises (including, but not limited to, noise from road, rail and air traffic, industrial and commercial premises), building services (e.g. ventilation system, plant, etc). If a room is naturally ventilated, the ventilators or windows should be assumed to be open as required to provide adequate ventilation and an extra 5dB is permitted for the maximum Indoor Ambient Noise Level. If a room is mechanically ventilated, the plant should be assumed to be running at its maximum operating duty.

The indoor ambient noise level excludes noise contributions from teaching activities within the school premises, including noise from staff, students and equipment within the building or in the playground.

The sound insulation of the façade will also be designed to minimise impact from activity noise in the new building at the nearest residential properties.

An environmental noise survey has been carried out and results should be used to determine the required façade insulation.

Ventilation

Where external ambient free field noise levels at the facade expressed as the LAeq,30mins, do not exceed the IANL figures by more than 16 dB for single sided ventilated spaces and 20 dB for cross ventilated or roof ventilated spaces, the criteria for natural ventilation can usually be achieved. However, the ventilation strategy still requires appropriate design of façade openings, height differences between low and high level openings, corridor transfer vents/stacks, etc, to limit the required façade open areas appropriately.

Acoustic $D_{n,e,w}$ ratings of trickle vents or passive ventilators should match the specified sound reduction index R_w of the windows to ensure the performance is maintained.

Demonstrating compliance

Acoustic testing is recommended in BB93 to demonstrate compliance with the performance requirements. BB93 recommends that the requirement for testing is included, by the client, in the building contract.

2.3 BS4142: Plant Noise Limits

As per the limits stipulated in section 2 noise levels emanating from any proposed items of plant should be designed to be 5dBA below the lowest measured background noise level during the hours of operation at the nearest noise sensitive residential properties.

An assessment in accordance with the methodology of BS4142 should be carried out in the later design stages once all items of plant and their locations have been designed.

3.0 NOISE SURVEY DETAILS

3.1 Noise Survey

Background noise levels have been measured over an extended period on the roof of the existing school building. The measurement position is shown on the drawings in Appendices A and B.

The prevailing noise environment is dominated by traffic noise.

The equipment was set up to integrate sound levels over 15-minute intervals between 11:30, 7th August 2015 and 10:45, 11th August 2015.

The weather was generally calm and clear throughout.

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

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.

$L_{A1,T}$: The A-weighted sound pressure level exceeded for 1% of the measurement period. Indicative of the maximum 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 show the minimum background noise levels measured over the entire period of the measurements which will be used to define plant noise limits and the maximum LAeq measurements during typical school hours which will be used to define the façade insulation requirements to satisfy BB93.

Table C: Table showing noise survey results

Position	Measurement Period	Minimum $L_{A90,15min}$	$L_{Aeq,15min}$ Maximum
Position 1 - Roof	07:00 - 19:00	54	68*
	19:00 – 23:00	56	Not required
	23:00 – 07:00	52	Not required

*-3dB correction to free field based on one reflective surface

5.0 PLANT NOISE DESIGN CRITERIA

It is proposed that any plant will have the facility to operate 24 hours a day and will create a continuous, atonal noise.

Therefore, based on the local authority noise limits set out in section 2.0 and the survey results summarised in section 4.0, the cumulative noise from all new items of plant should not exceed 47 dB(A) at 1m from the nearest respective noise sensitive residential windows: 5 dB less than minimum $L_{A90,15min}$ background level.

6.0 SOUND INSULATION OF THE BUILDING ENVELOPE

The maximum ambient free field LAeq noise levels on site have been measured and when corrected to free field are 68dB LAeq, 15min during school hours.

Hence, measured external ambient noise levels are above the maximum 16 dB allowance for single sided ventilated spaces and 20dB allowance for cross ventilated or roof ventilated spaces as defined in BB93:2014 for naturally ventilated classrooms. As a result attenuated passive vents or mechanical ventilation is likely to be required to achieve the BB93 targets.

The design of attenuated natural vents depends on their size and location and would typically need to achieve 20dBA of attenuation depending on their sizes and the internal room INAL requirements.

The main road “Shoot-Up Hill” is the dominant noise source and as a result accommodation located on this facade would be worst affected. Accommodation to the side / rear facades will most likely be less onerous by around 3-6dB. It is recommended that a CADNA noise map of the site is created to accurately predict the external levels incident on each facade.

7.0 DESIGN DEVELOPMENT AND FUTURE REQUIREMENTS

7.1 Plant Noise

When specifying new items of plant the following will be assessed in detail once final plant selections have been made and locations are known:

- The distance between the proposed plant and the nearest noise sensitive windows.
- Operational hours of the plant
- Number of plant items
- Location of plant
- Proposed plant noise levels
- Calculations for the predicted noise level at the window of the nearest sensitive property
- Predictions showing that noise levels outside the nearest noise sensitive windows will satisfy the relevant criteria.
- Details of proposed mitigation measures including calculations and product datasheets where applicable

7.2 BB93

In order to specify detailed façade requirements for schools, it is necessary to determine both INAL's for each room and the likely upper limits for internal operating noise levels for halls or music classrooms. At the time of writing these have yet to be accurately determined and will depend on the intended range of uses of the spaces.

Each space should be assessed in detail in the later design stages and be designed to ensure the noise criteria in section 2 of this report are satisfied.

Future assessments should include:

- The distance between the school and the nearest noise sensitive windows.
- Operational hours of the school
- Locations of halls or music classrooms
- Proposed INAL's/uses of the school rooms
- Calculations for the predicted noise break out level at 1 metre from the window of the nearest sensitive property
- Predictions showing that noise levels outside the nearest noise sensitive windows will satisfy the relevant criteria.
- Details of proposed mitigation measures including calculations and product datasheets where applicable.

APPENDICES

APPENDIX A: Overview plan and site photo



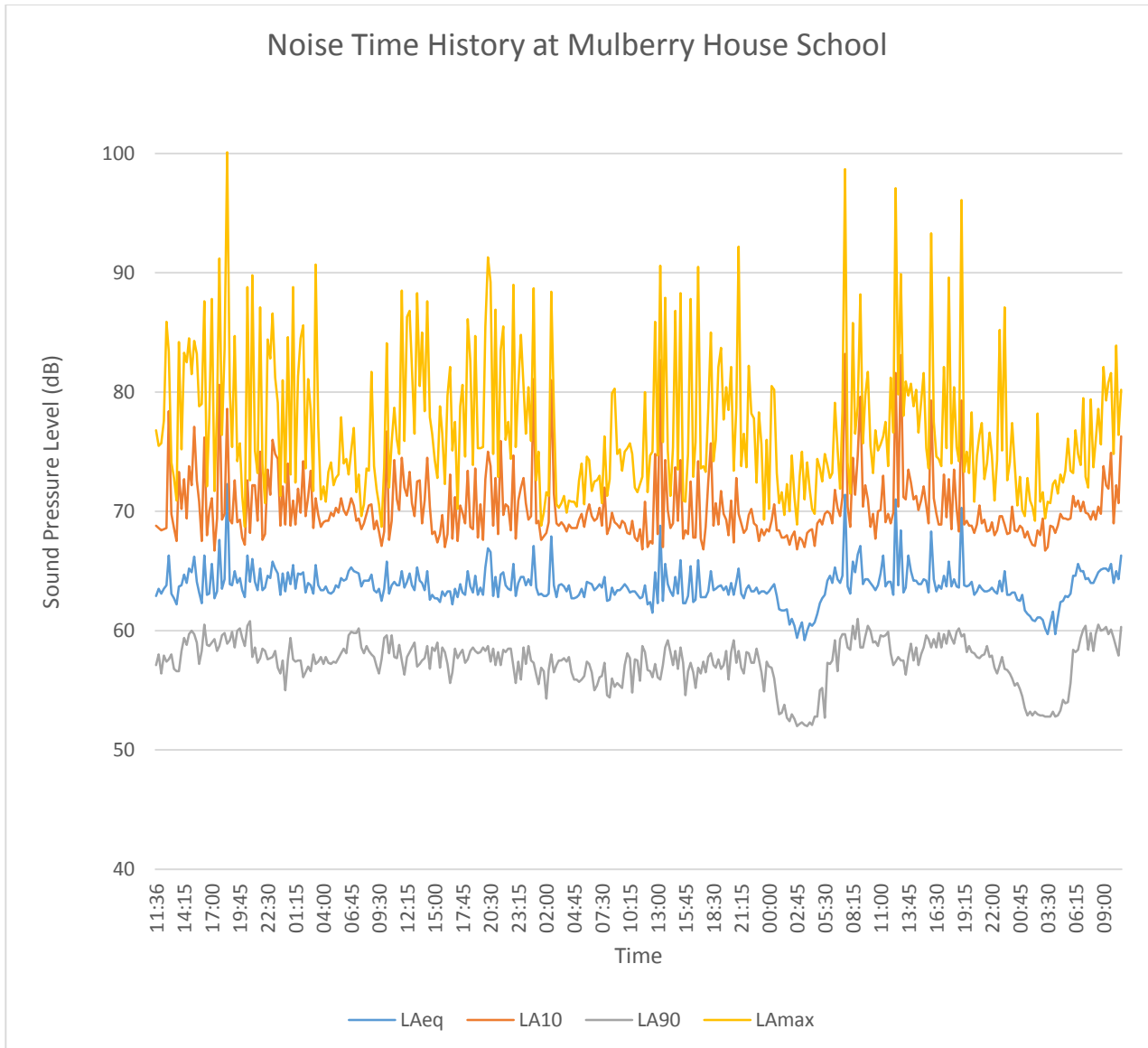
Measurement location



Closest residential receptor

Measurement location on roof

APPENDIX B: Time series survey results



APPENDIX C: Equipment and Procedure

Background noise levels have been measured over a 95 hour period on the roof of the existing garden storage. The measurement position is shown on the drawings in Appendices A and B.

The prevailing noise environment is dominated by traffic noise and speech at street level.

The equipment was set up to integrate sound levels over 15-minute intervals between 11:30, 7th August 2015 and 10:45, 11th August 2015.

The weather was generally calm and clear throughout.

Measurements were undertaken according to the procedures set out in BS4142:1997.

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
GRAS Environmental microphone
Norsonic 1251 Calibrator

The equipment was calibrated before and after the survey and no drift from calibration was found.

APPENDIX D: Survey Results - Data

Date	Time	L _{Aeq}	L _{A90}	L _{Aeq}							
				63	125	250	500	1k	2k	4k	8k
07/08/2015	11:36:00	62.9	57.1	67.5	64.1	60.6	57.4	59.6	55.4	48.0	42.0
07/08/2015	11:45:00	63.5	58.0	68.4	60.4	59.5	58.3	60.5	56.0	48.3	40.6
07/08/2015	12:00:00	63.1	56.4	66.7	60.2	58.7	57.6	59.9	56.0	49.5	45.2
07/08/2015	12:15:00	63.5	57.9	67.3	61.0	59.5	57.7	60.1	56.5	50.5	46.4
07/08/2015	12:30:00	63.8	57.4	67.0	62.6	59.8	59.3	61.0	55.6	48.1	41.7
07/08/2015	12:45:00	66.3	57.6	65.9	62.8	61.5	60.0	62.7	59.9	54.3	49.6
07/08/2015	13:00:00	63.1	58.0	66.4	61.0	60.6	57.8	59.7	55.8	49.5	45.2
07/08/2015	13:15:00	62.7	56.8	65.2	59.9	59.3	56.9	59.7	55.3	48.1	40.7
07/08/2015	13:30:00	62.2	56.6	65.5	60.6	59.3	56.9	59.0	54.6	47.6	39.6
07/08/2015	13:45:00	63.7	56.6	65.7	60.8	59.3	58.1	59.7	56.9	52.5	48.7
07/08/2015	14:00:00	63.8	58.3	80.8	64.6	61.3	59.2	60.0	55.7	50.0	47.1
07/08/2015	14:15:00	64.7	59.4	81.0	62.9	64.0	61.3	60.3	56.2	49.4	44.5
07/08/2015	14:30:00	64.0	58.8	80.2	61.9	61.6	59.4	60.2	56.0	49.9	47.2
07/08/2015	14:45:00	65.2	59.7	81.2	60.7	61.4	62.8	61.2	56.2	51.0	47.1
07/08/2015	15:00:00	64.9	60.0	81.2	62.6	62.2	61.8	60.6	56.6	50.9	48.5
07/08/2015	15:15:00	66.2	59.7	80.1	66.2	62.5	63.8	62.6	56.8	50.7	45.3
07/08/2015	15:30:00	64.1	59.0	80.4	62.5	61.0	60.8	60.3	55.4	49.0	43.1
07/08/2015	15:45:00	63.2	57.2	70.7	63.5	61.4	59.0	59.7	55.1	48.3	42.0
07/08/2015	16:00:00	62.3	58.3	77.9	62.7	60.4	57.8	58.5	54.4	47.3	39.1
07/08/2015	16:15:00	66.3	60.5	81.4	66.2	63.0	62.1	62.1	58.8	53.3	46.7
07/08/2015	16:30:00	63.0	58.8	81.2	61.6	60.2	59.4	59.1	54.5	47.6	40.7
07/08/2015	16:45:00	63.1	58.7	79.7	63.9	62.4	59.9	58.8	54.4	46.8	40.6
07/08/2015	17:00:00	65.6	59.0	76.9	64.7	64.4	61.8	61.6	58.2	49.9	42.8
07/08/2015	17:15:00	62.7	59.3	80.6	61.0	60.0	58.9	58.9	54.4	46.4	38.7
07/08/2015	17:30:00	63.3	58.3	78.2	62.9	61.2	60.8	59.0	54.8	47.4	40.8
07/08/2015	17:45:00	67.6	58.7	79.7	62.9	60.9	60.4	63.5	62.9	48.6	39.6
07/08/2015	18:00:00	63.5	59.6	81.4	63.6	60.5	60.3	59.1	55.2	48.0	41.7
07/08/2015	18:15:00	64.3	59.8	81.3	65.5	63.1	61.8	59.9	55.4	47.1	39.6
07/08/2015	18:30:00	72.3	58.9	81.1	61.0	60.4	60.0	66.8	69.1	51.8	39.8
07/08/2015	18:45:00	63.9	59.2	81.0	65.1	62.1	61.6	59.5	54.9	47.6	41.2
07/08/2015	19:00:00	63.8	59.9	81.0	62.3	60.3	60.1	60.1	55.6	48.5	39.7
07/08/2015	19:15:00	65.0	58.6	81.1	63.2	62.2	60.8	60.9	58.2	49.1	40.4
07/08/2015	19:30:00	64.0	60.0	81.1	61.9	60.8	59.8	60.4	55.7	48.3	41.5
07/08/2015	19:45:00	64.4	60.2	80.9	62.5	61.5	60.4	61.0	56.2	47.1	39.6
07/08/2015	20:00:00	63.4	59.4	81.1	61.7	60.1	59.3	59.9	55.2	46.7	39.2
07/08/2015	20:15:00	62.8	58.7	81.1	59.8	59.2	58.8	59.2	54.8	46.0	38.5
07/08/2015	20:30:00	66.3	60.4	81.2	60.2	60.5	64.4	61.7	58.0	49.0	39.5
07/08/2015	20:45:00	64.1	60.8	81.0	61.1	60.5	62.5	59.9	55.4	47.0	39.4
07/08/2015	21:00:00	66.0	57.8	81.1	61.2	59.3	58.1	63.3	59.0	49.3	38.8

07/08/2015	21:15:00	64.1	58.6	81.2	64.8	61.7	60.0	60.3	56.2	48.6	41.8
07/08/2015	21:30:00	63.4	57.3	81.1	62.6	59.5	57.3	60.1	55.9	47.5	40.0
07/08/2015	21:45:00	65.2	57.7	81.3	61.8	59.3	58.0	60.8	58.6	55.7	49.0
07/08/2015	22:00:00	63.4	58.5	81.4	59.8	59.2	58.4	60.1	55.5	46.5	39.8
07/08/2015	22:15:00	63.6	58.3	81.7	59.4	58.6	57.4	60.5	56.0	47.4	39.8
07/08/2015	22:30:00	64.6	57.6	81.8	60.8	62.2	60.6	60.7	57.0	49.5	42.1
07/08/2015	22:45:00	64.4	57.7	81.8	61.6	62.6	59.5	60.9	56.5	47.8	40.1
07/08/2015	23:00:00	65.8	57.8	82.0	69.4	68.1	61.8	61.3	56.2	46.9	38.9
07/08/2015	23:15:00	65.2	58.3	81.9	64.5	62.7	60.9	61.5	57.3	49.3	41.5
07/08/2015	23:30:00	64.8	56.9	82.0	64.0	62.6	60.8	61.3	56.2	47.0	39.5
07/08/2015	23:45:00	63.0	56.4	82.0	59.0	57.9	57.4	59.8	55.3	46.2	38.2
08/08/2015	00:00:00	64.8	57.5	82.0	62.9	63.8	60.6	61.2	56.6	47.1	38.7
08/08/2015	00:15:00	63.3	55.0	82.1	58.6	57.5	56.5	60.5	55.7	45.6	37.3
08/08/2015	00:30:00	64.9	57.6	82.3	60.5	61.4	58.5	61.8	57.5	48.2	39.9
08/08/2015	00:45:00	63.9	59.4	82.5	60.3	58.7	58.4	60.8	56.1	46.2	38.0
08/08/2015	01:00:00	65.5	57.6	83.0	58.3	57.2	56.7	61.8	59.6	53.6	43.0
08/08/2015	01:15:00	63.5	57.4	83.5	59.6	57.4	56.3	60.4	56.1	45.8	38.2
08/08/2015	01:30:00	64.8	57.5	84.0	64.1	59.8	59.0	61.7	56.8	45.9	37.2
08/08/2015	01:45:00	64.7	57.5	84.3	62.6	62.1	57.7	61.2	57.3	48.0	39.4
08/08/2015	02:00:00	64.9	56.1	84.6	59.7	56.1	55.5	62.1	58.2	45.0	35.5
08/08/2015	02:15:00	63.2	56.5	84.9	61.1	57.2	56.5	59.9	55.1	44.6	35.7
08/08/2015	02:30:00	64.0	57.0	85.0	63.5	60.7	58.2	60.6	55.7	45.0	36.0
08/08/2015	02:45:00	63.8	56.6	85.2	64.4	59.8	56.7	60.6	55.1	45.2	37.3
08/08/2015	03:00:00	63.1	58.0	85.4	62.3	56.8	55.8	59.8	55.1	44.3	35.3
08/08/2015	03:15:00	65.5	57.2	85.5	62.9	57.4	56.0	61.0	59.7	54.4	43.4
08/08/2015	03:30:00	63.8	57.4	85.5	64.8	60.1	57.1	60.4	55.4	44.3	35.7
08/08/2015	03:45:00	63.4	57.8	85.6	61.6	56.7	56.8	60.0	55.3	44.4	35.2
08/08/2015	04:00:00	63.4	57.2	85.7	62.0	56.9	56.1	60.0	55.3	44.8	36.0
08/08/2015	04:15:00	63.7	57.8	85.9	63.4	58.0	57.0	60.2	55.4	46.1	37.7
08/08/2015	04:30:00	63.2	57.3	85.9	62.0	57.0	56.3	59.6	55.0	44.1	37.7
08/08/2015	04:45:00	63.1	57.2	86.0	62.5	57.2	56.3	59.3	54.6	45.0	45.0
08/08/2015	05:00:00	63.3	57.4	86.0	62.6	57.2	56.5	59.7	55.2	45.4	39.1
08/08/2015	05:15:00	63.8	57.3	86.0	63.2	57.6	56.8	60.3	55.6	45.8	38.1
08/08/2015	05:30:00	63.6	57.7	86.0	62.5	57.4	57.2	59.8	55.7	46.0	37.6
08/08/2015	05:45:00	64.4	58.1	86.0	63.8	59.0	58.4	60.5	56.8	48.8	40.4
08/08/2015	06:00:00	64.2	58.5	85.9	62.8	58.5	59.3	60.5	56.1	46.3	38.0
08/08/2015	06:15:00	64.3	58.1	86.1	63.4	58.4	57.8	60.6	56.6	47.9	41.8
08/08/2015	06:30:00	65.0	59.6	86.2	64.8	60.3	59.5	61.1	57.0	48.5	42.3
08/08/2015	06:45:00	65.3	59.9	86.2	64.5	60.4	60.2	61.4	57.4	48.9	43.1
08/08/2015	07:00:00	65.0	59.8	86.0	64.7	60.5	59.8	61.1	57.0	48.3	40.5
08/08/2015	07:15:00	64.9	59.8	85.7	63.7	59.6	58.7	61.3	57.2	48.1	39.9
08/08/2015	07:30:00	64.8	60.2	85.2	63.2	60.1	60.1	60.9	56.9	48.3	41.3
08/08/2015	07:45:00	63.7	58.6	84.6	61.8	58.8	58.3	59.9	56.0	47.6	40.3
08/08/2015	08:00:00	64.2	58.1	83.4	61.1	59.2	58.5	61.0	56.7	48.0	41.2

08/08/2015	08:15:00	64.2	58.7	82.1	61.5	60.6	59.7	60.6	56.4	48.1	40.5
08/08/2015	08:30:00	64.2	58.3	81.6	62.0	60.0	59.8	60.7	56.7	48.5	40.1
08/08/2015	08:45:00	64.7	58.0	81.7	64.5	64.5	59.8	61.0	56.6	48.1	40.4
08/08/2015	09:00:00	63.4	57.8	81.6	62.1	59.0	57.7	60.2	55.7	47.5	41.5
08/08/2015	09:15:00	63.2	57.0	76.6	61.2	59.5	58.2	60.1	55.5	47.6	40.8
08/08/2015	09:30:00	63.5	56.4	78.9	59.7	59.7	58.3	60.4	55.9	47.4	39.9
08/08/2015	09:45:00	62.5	57.6	75.9	59.4	58.8	57.9	59.4	54.8	46.1	39.0
08/08/2015	10:00:00	63.5	59.4	80.2	62.4	59.8	58.8	60.0	55.8	48.0	41.1
08/08/2015	10:15:00	65.8	59.6	80.8	62.2	61.9	60.3	61.8	59.0	53.7	47.6
08/08/2015	10:30:00	63.1	58.1	81.0	60.8	59.6	57.8	59.5	55.3	48.0	44.5
08/08/2015	10:45:00	63.8	59.6	80.4	60.9	60.5	59.7	60.3	55.6	47.9	44.5
08/08/2015	11:00:00	64.1	57.8	80.1	65.3	63.3	60.9	59.9	55.2	47.9	44.5
08/08/2015	11:15:00	63.8	57.7	79.6	61.9	61.2	60.0	59.9	55.9	48.7	41.3
08/08/2015	11:30:00	63.8	58.8	78.0	62.3	61.1	59.4	60.5	55.7	48.2	41.5
08/08/2015	11:45:00	65.0	57.5	76.7	64.9	65.1	62.5	61.0	55.4	47.9	41.8
08/08/2015	12:00:00	63.6	56.3	75.6	64.7	62.5	58.9	60.1	55.6	47.6	40.1
08/08/2015	12:15:00	64.1	57.8	73.2	61.7	61.8	60.7	60.7	56.1	49.0	42.7
08/08/2015	12:30:00	64.8	58.2	80.7	61.8	60.4	59.1	60.4	58.4	53.8	44.2
08/08/2015	12:45:00	63.8	58.6	81.2	64.3	61.5	59.2	59.9	56.1	49.4	42.7
08/08/2015	13:00:00	63.4	59.0	79.5	62.3	60.9	59.5	59.9	55.1	47.1	39.5
08/08/2015	13:15:00	65.3	57.0	76.3	62.2	60.5	58.2	61.3	59.3	54.3	44.7
08/08/2015	13:30:00	64.2	57.2	74.1	66.9	63.2	59.8	60.5	56.0	48.4	41.6
08/08/2015	13:45:00	64.0	57.5	77.2	61.0	59.7	58.3	59.9	57.0	53.6	44.0
08/08/2015	14:00:00	63.4	57.7	77.0	61.6	60.3	58.9	60.0	55.7	48.3	41.2
08/08/2015	14:15:00	65.0	58.7	80.3	64.0	60.9	58.2	61.3	58.1	53.2	45.2
08/08/2015	14:30:00	62.6	56.8	77.6	60.9	60.4	58.6	59.1	54.4	46.3	39.4
08/08/2015	14:45:00	63.0	58.6	78.9	63.0	60.3	58.0	59.5	55.2	47.6	41.0
08/08/2015	15:00:00	62.7	58.3	78.2	61.6	60.6	58.2	59.2	54.7	47.6	41.5
08/08/2015	15:15:00	62.7	59.0	78.0	61.3	59.8	58.3	59.3	54.7	47.2	39.7
08/08/2015	15:30:00	62.4	56.9	65.3	60.0	59.0	56.4	59.4	55.1	47.4	39.3
08/08/2015	15:45:00	63.3	58.6	80.6	61.0	59.5	58.7	59.7	55.6	48.8	45.2
08/08/2015	16:00:00	62.9	58.2	81.4	60.5	59.3	59.2	59.4	54.3	46.3	37.9
08/08/2015	16:15:00	63.3	57.2	79.7	61.2	59.1	58.1	59.9	55.2	51.6	39.6
08/08/2015	16:30:00	63.3	55.6	67.1	59.7	59.0	57.4	60.9	55.4	46.2	38.7
08/08/2015	16:45:00	62.2	56.5	73.3	58.6	58.3	56.8	59.4	54.6	46.0	39.4
08/08/2015	17:00:00	63.5	58.5	81.1	64.2	61.9	58.6	60.1	55.2	47.1	40.5
08/08/2015	17:15:00	62.8	57.7	81.5	61.1	59.0	57.3	59.6	54.7	46.5	38.4
08/08/2015	17:30:00	63.9	58.1	81.4	66.6	61.7	59.6	60.0	55.3	47.3	39.7
08/08/2015	17:45:00	63.2	58.4	78.5	61.1	62.0	58.4	59.8	55.3	47.6	39.6
08/08/2015	18:00:00	63.0	57.3	80.4	61.0	59.1	57.8	59.9	55.1	46.1	39.4
08/08/2015	18:15:00	65.0	57.6	81.3	61.5	59.0	57.5	60.8	58.2	55.5	47.8
08/08/2015	18:30:00	63.7	58.3	81.2	61.7	61.1	58.9	60.2	55.8	48.3	41.0
08/08/2015	18:45:00	63.2	58.6	81.2	62.6	59.5	58.8	59.6	55.3	47.2	39.3
08/08/2015	19:00:00	64.6	58.3	81.2	62.4	60.0	59.6	61.0	56.8	51.5	45.5

08/08/2015	19:15:00	63.0	58.1	81.1	61.9	59.2	57.2	59.9	55.1	46.0	38.7
08/08/2015	19:30:00	63.6	58.2	81.0	62.6	61.7	58.7	60.2	55.3	46.7	39.0
08/08/2015	19:45:00	63.0	58.6	81.1	60.9	59.4	57.9	59.5	55.3	47.6	40.1
08/08/2015	20:00:00	65.3	58.3	81.1	60.5	59.4	58.2	61.4	58.7	55.0	45.9
08/08/2015	20:15:00	66.9	58.7	81.1	59.1	59.0	59.0	63.3	61.8	48.9	39.4
08/08/2015	20:30:00	66.6	57.4	81.2	61.2	59.6	58.4	63.6	60.4	53.0	43.9
08/08/2015	20:45:00	62.9	58.5	81.1	62.0	59.3	59.5	59.2	54.3	46.4	38.8
08/08/2015	21:00:00	64.5	57.1	81.1	59.9	58.4	57.5	61.3	57.8	50.1	40.1
08/08/2015	21:15:00	62.8	58.2	81.1	60.1	58.9	57.3	59.8	54.7	45.9	38.3
08/08/2015	21:30:00	64.7	57.1	81.2	61.4	62.2	60.8	60.2	58.0	49.9	41.7
08/08/2015	21:45:00	64.9	58.4	81.1	61.5	61.6	59.9	61.2	58.2	47.8	39.1
08/08/2015	22:00:00	63.8	58.2	81.0	59.4	58.5	57.8	60.6	56.6	49.0	40.8
08/08/2015	22:15:00	63.5	58.5	81.1	59.1	58.8	57.7	60.4	56.2	47.1	38.8
08/08/2015	22:30:00	63.4	58.5	81.1	59.0	58.9	57.5	60.4	55.7	46.5	38.5
08/08/2015	22:45:00	65.6	57.0	81.1	59.5	58.6	61.9	61.8	57.8	48.9	39.0
08/08/2015	23:00:00	62.9	55.6	81.1	58.7	57.9	56.6	59.9	55.4	46.3	37.8
08/08/2015	23:15:00	64.0	57.4	81.1	62.4	59.8	58.2	60.8	56.9	46.9	38.0
08/08/2015	23:30:00	64.5	55.9	81.1	59.1	58.2	57.5	61.3	57.9	49.9	40.4
08/08/2015	23:45:00	64.5	58.6	81.3	61.8	59.0	58.2	61.4	57.4	48.8	41.2
09/08/2015	00:00:00	63.8	57.2	81.3	60.0	59.5	58.7	60.6	56.3	47.6	39.9
09/08/2015	00:15:00	64.3	58.7	81.2	64.1	60.2	59.2	61.2	56.2	48.1	37.3
09/08/2015	00:30:00	63.8	57.5	81.2	60.0	58.4	57.7	60.9	56.4	47.5	42.6
09/08/2015	00:45:00	67.1	57.3	81.3	60.3	60.0	57.3	62.9	61.5	57.2	49.0
09/08/2015	01:00:00	63.6	56.3	81.4	58.3	57.6	56.7	61.0	56.0	45.2	36.3
09/08/2015	01:15:00	63.0	55.5	81.5	58.8	57.0	56.3	60.2	55.5	45.5	37.4
09/08/2015	01:30:00	63.1	56.9	81.6	57.4	57.0	56.0	60.5	55.2	44.7	36.7
09/08/2015	01:45:00	62.9	56.6	81.8	57.0	56.4	55.9	60.2	55.2	44.6	35.5
09/08/2015	02:00:00	62.9	54.3	82.2	57.8	57.0	55.8	60.2	55.0	43.5	34.4
09/08/2015	02:15:00	63.1	56.7	84.8	60.6	57.0	55.7	60.1	55.0	43.8	35.3
09/08/2015	02:30:00	67.9	58.0	85.0	59.9	59.6	62.3	64.3	61.4	51.4	47.5
09/08/2015	02:45:00	63.8	56.5	85.2	61.9	59.4	57.8	60.6	55.4	43.9	35.4
09/08/2015	03:00:00	62.8	57.1	85.3	59.0	55.9	55.3	59.6	54.7	43.4	34.9
09/08/2015	03:15:00	63.8	57.5	85.5	59.7	56.6	56.2	60.8	56.0	44.6	34.8
09/08/2015	03:30:00	63.9	57.5	85.7	60.0	56.7	56.5	60.9	55.9	44.8	35.7
09/08/2015	03:45:00	63.7	57.7	86.0	60.8	56.1	55.7	60.5	55.7	44.3	35.0
09/08/2015	04:00:00	63.3	57.4	86.1	60.3	55.4	55.2	60.0	55.1	43.7	34.8
09/08/2015	04:15:00	63.8	57.8	86.1	61.3	56.9	55.9	60.6	55.8	44.8	35.8
09/08/2015	04:30:00	62.7	56.5	85.5	60.2	55.7	55.1	59.4	54.5	44.0	35.0
09/08/2015	04:45:00	62.7	55.9	84.5	60.1	55.8	55.2	59.5	54.9	44.1	34.7
09/08/2015	05:00:00	62.8	55.9	84.4	60.1	55.8	55.5	59.8	54.9	44.0	35.2
09/08/2015	05:15:00	63.0	55.7	84.4	60.5	56.5	55.7	59.7	55.5	46.1	38.6
09/08/2015	05:30:00	63.5	55.9	84.5	60.9	56.8	56.0	60.3	56.1	46.5	37.5
09/08/2015	05:45:00	62.8	56.2	84.5	60.5	56.0	55.2	59.7	54.8	44.5	36.4
09/08/2015	06:00:00	64.1	57.4	84.5	61.3	57.1	56.8	60.9	56.7	47.1	37.8

09/08/2015	06:15:00	64.0	57.2	84.3	62.0	59.1	57.8	60.5	56.5	48.0	39.4
09/08/2015	06:30:00	63.9	56.5	83.8	61.7	58.1	58.3	60.6	55.8	46.2	40.2
09/08/2015	06:45:00	63.4	55.0	83.3	60.0	57.2	56.5	60.4	55.8	46.1	37.7
09/08/2015	07:00:00	63.6	55.4	83.1	59.6	56.6	56.8	60.7	56.0	46.5	37.7
09/08/2015	07:15:00	63.9	56.1	83.0	60.4	59.0	57.1	60.8	56.5	47.3	38.5
09/08/2015	07:30:00	63.6	56.2	82.6	59.7	58.0	57.3	60.6	56.1	46.9	38.8
09/08/2015	07:45:00	64.5	57.3	82.1	59.3	60.9	60.1	60.4	58.0	47.6	41.2
09/08/2015	08:00:00	62.5	54.6	81.7	59.3	57.4	56.6	59.3	54.7	45.4	36.9
09/08/2015	08:15:00	62.6	54.4	81.5	59.8	58.5	56.6	59.4	54.8	45.6	38.7
09/08/2015	08:30:00	63.6	56.0	81.5	61.0	61.5	57.6	60.3	55.9	46.7	37.9
09/08/2015	08:45:00	63.0	55.3	79.1	58.8	57.7	56.9	60.2	55.6	46.5	39.9
09/08/2015	09:00:00	63.4	55.6	80.7	58.1	58.3	57.1	60.7	55.7	45.4	36.4
09/08/2015	09:15:00	63.4	55.4	80.4	59.0	58.1	56.9	60.6	56.0	46.7	37.7
09/08/2015	09:30:00	63.6	55.2	81.4	59.8	58.5	57.0	60.8	55.8	46.3	37.7
09/08/2015	09:45:00	63.9	57.1	81.4	61.2	59.5	58.7	60.8	56.1	47.2	39.9
09/08/2015	10:00:00	63.6	58.1	81.1	59.3	58.8	58.5	60.4	55.9	47.2	38.3
09/08/2015	10:15:00	63.2	57.7	81.1	63.1	59.5	58.6	59.9	54.9	45.9	37.9
09/08/2015	10:30:00	63.3	54.8	81.0	59.4	58.6	57.6	60.1	55.7	47.8	38.8
09/08/2015	10:45:00	63.3	57.6	81.0	59.5	58.7	57.3	60.4	55.5	46.6	37.7
09/08/2015	11:00:00	63.0	57.5	81.0	59.2	58.6	57.1	60.1	55.1	46.2	40.7
09/08/2015	11:15:00	62.7	55.8	80.9	59.3	58.3	56.9	59.7	54.6	45.5	37.0
09/08/2015	11:30:00	62.8	58.7	80.7	59.9	59.0	57.2	59.7	54.9	46.3	38.1
09/08/2015	11:45:00	63.8	58.2	80.1	60.9	60.0	59.1	60.4	56.3	48.3	39.6
09/08/2015	12:00:00	62.2	56.7	79.6	60.9	58.8	56.7	59.2	54.1	45.6	36.8
09/08/2015	12:15:00	62.4	56.6	76.0	59.9	59.5	57.5	59.5	54.2	45.3	37.1
09/08/2015	12:30:00	61.5	56.1	72.8	61.2	58.9	56.2	58.5	53.8	45.2	37.4
09/08/2015	12:45:00	64.9	57.2	66.4	59.0	58.3	56.4	62.2	58.6	49.9	40.9
09/08/2015	13:00:00	62.3	56.1	66.2	59.5	59.3	56.6	59.6	54.5	45.8	38.8
09/08/2015	13:15:00	68.8	55.9	66.5	60.3	60.4	57.6	65.1	64.5	48.5	37.1
09/08/2015	13:30:00	62.5	57.1	76.9	59.2	58.8	56.9	59.6	54.6	46.4	38.4
09/08/2015	13:45:00	65.6	58.6	80.2	62.3	59.5	59.6	62.1	58.7	54.1	43.3
09/08/2015	14:00:00	63.9	59.2	80.9	62.5	60.3	60.7	60.3	55.7	46.9	37.4
09/08/2015	14:15:00	63.3	58.2	81.2	63.0	60.4	58.0	60.1	54.9	45.8	37.4
09/08/2015	14:30:00	62.9	57.1	81.4	61.2	60.8	57.5	59.6	54.5	45.2	37.9
09/08/2015	14:45:00	64.5	58.3	79.7	61.2	62.2	61.0	60.9	55.6	46.5	37.5
09/08/2015	15:00:00	63.1	56.8	78.8	62.0	59.8	57.2	60.2	55.0	45.3	37.0
09/08/2015	15:15:00	65.9	58.6	78.8	60.3	60.6	58.5	62.6	59.8	52.7	40.0
09/08/2015	15:30:00	62.3	57.3	71.4	59.6	58.4	56.7	59.7	54.4	45.7	36.7
09/08/2015	15:45:00	62.3	54.6	70.8	59.8	59.4	57.0	59.6	54.3	45.4	36.4
09/08/2015	16:00:00	62.9	56.6	76.3	60.5	60.4	57.7	60.0	54.8	45.5	35.9
09/08/2015	16:15:00	65.4	57.3	78.3	60.9	59.2	57.9	62.0	58.9	53.4	43.0
09/08/2015	16:30:00	62.4	56.5	76.1	59.8	58.7	57.0	59.6	54.5	45.7	37.1
09/08/2015	16:45:00	62.6	55.2	66.2	58.4	58.2	56.8	60.2	54.7	45.1	36.2
09/08/2015	17:00:00	65.9	56.9	65.7	61.7	59.6	56.6	62.7	60.3	48.5	41.1

09/08/2015	17:15:00	62.8	56.4	66.4	61.0	58.6	56.9	60.0	55.5	47.0	38.1
09/08/2015	17:30:00	62.8	57.4	75.3	59.7	58.6	57.2	60.1	54.9	45.7	39.0
09/08/2015	17:45:00	62.8	56.5	71.1	60.2	60.1	57.8	59.9	54.9	46.2	38.3
09/08/2015	18:00:00	63.3	57.8	74.4	64.7	63.0	59.5	59.7	54.8	45.9	38.7
09/08/2015	18:15:00	65.0	58.1	81.3	61.9	62.0	59.3	61.9	57.7	46.5	44.2
09/08/2015	18:30:00	63.4	57.1	80.9	62.6	60.1	57.7	60.3	55.5	47.0	39.7
09/08/2015	18:45:00	63.5	56.9	81.0	61.3	58.9	57.8	60.0	56.2	48.9	41.2
09/08/2015	19:00:00	63.7	57.6	80.4	64.0	60.5	58.6	60.7	55.3	45.6	39.6
09/08/2015	19:15:00	63.8	56.8	80.0	61.3	60.0	58.0	60.9	56.2	47.1	39.8
09/08/2015	19:30:00	63.4	57.1	80.0	61.5	60.1	57.4	60.1	56.1	47.7	39.8
09/08/2015	19:45:00	63.7	58.3	80.2	61.2	59.1	57.7	60.4	56.6	49.2	41.9
09/08/2015	20:00:00	63.0	55.9	80.2	61.2	60.7	57.6	59.7	54.8	46.3	39.0
09/08/2015	20:15:00	64.0	58.2	80.1	59.0	58.6	58.0	61.3	56.5	46.4	38.6
09/08/2015	20:30:00	63.0	59.2	80.2	59.0	59.1	58.7	59.5	55.1	47.2	40.7
09/08/2015	20:45:00	64.1	57.3	80.1	61.4	60.2	59.8	60.4	56.6	49.8	42.7
09/08/2015	21:00:00	65.2	58.3	80.1	61.0	58.3	56.8	61.1	60.0	52.5	42.8
09/08/2015	21:15:00	63.1	56.9	80.1	59.0	58.6	57.1	60.1	55.5	47.2	40.2
09/08/2015	21:30:00	62.7	56.4	80.3	60.0	58.2	56.6	59.7	55.1	46.4	39.4
09/08/2015	21:45:00	63.5	58.2	80.3	63.5	59.0	57.3	60.6	55.7	46.7	38.4
09/08/2015	22:00:00	63.8	58.1	80.3	59.5	58.4	56.5	60.6	56.7	50.2	42.6
09/08/2015	22:15:00	63.3	57.3	80.3	61.3	61.9	58.5	59.9	55.3	46.6	39.0
09/08/2015	22:30:00	63.3	57.3	80.3	61.3	61.8	58.3	59.9	55.1	47.2	39.9
09/08/2015	22:45:00	63.6	58.5	80.4	60.7	59.6	57.5	60.7	56.0	46.8	38.4
09/08/2015	23:00:00	63.1	57.6	80.5	59.6	58.4	56.8	60.2	55.4	46.5	39.3
09/08/2015	23:15:00	63.3	56.5	80.5	59.0	58.3	58.4	60.2	55.5	47.1	39.0
09/08/2015	23:30:00	63.3	54.9	80.6	58.5	58.6	58.8	60.2	55.3	45.8	38.7
09/08/2015	23:45:00	63.1	57.4	80.8	58.7	58.2	58.5	59.8	55.3	47.0	38.9
10/08/2015	00:00:00	63.3	57.0	81.0	58.0	58.1	59.2	60.2	55.1	44.7	36.3
10/08/2015	00:15:00	63.6	56.9	81.2	57.9	57.8	58.0	60.6	55.9	45.9	37.6
10/08/2015	00:30:00	63.9	56.0	81.1	61.3	59.4	57.9	60.9	56.3	47.0	38.9
10/08/2015	00:45:00	62.9	54.3	80.9	58.3	57.6	56.4	60.1	55.3	45.7	38.0
10/08/2015	01:00:00	61.8	53.0	80.9	56.6	55.8	54.6	59.1	54.3	43.9	35.6
10/08/2015	01:15:00	61.7	53.1	80.9	56.7	55.3	54.9	59.0	54.0	43.6	36.0
10/08/2015	01:30:00	61.7	53.8	80.9	56.4	55.7	56.3	58.7	53.9	43.4	34.9
10/08/2015	01:45:00	61.8	52.7	80.9	56.6	55.6	57.1	58.7	53.8	43.4	35.3
10/08/2015	02:00:00	60.5	52.4	81.0	55.4	54.6	54.0	57.4	52.5	42.1	34.2
10/08/2015	02:15:00	61.0	53.0	80.9	55.8	55.3	56.0	57.7	52.9	43.8	35.2
10/08/2015	02:30:00	60.4	52.6	81.0	55.2	53.8	54.4	57.3	52.3	41.9	33.7
10/08/2015	02:45:00	59.4	52.0	80.9	54.8	53.2	52.2	56.3	51.5	41.2	33.3
10/08/2015	03:00:00	60.2	52.2	80.9	55.4	54.4	54.2	57.0	52.1	42.9	34.7
10/08/2015	03:15:00	60.7	52.3	81.0	55.6	54.6	54.5	57.8	52.7	43.0	35.1
10/08/2015	03:30:00	59.2	52.1	81.0	55.2	52.9	53.3	55.8	50.8	41.0	33.4
10/08/2015	03:45:00	60.0	52.0	81.0	55.2	52.9	53.1	56.7	52.1	44.3	40.7
10/08/2015	04:00:00	60.6	52.3	80.9	56.7	54.6	54.3	57.6	52.6	43.3	36.3

10/08/2015	04:15:00	60.4	52.1	80.8	56.1	55.7	54.9	57.0	52.4	43.2	34.7
10/08/2015	04:30:00	60.7	52.8	80.8	56.3	54.8	54.9	57.4	53.0	43.6	35.5
10/08/2015	04:45:00	61.4	52.8	80.8	56.6	56.3	56.2	58.2	53.4	44.3	36.3
10/08/2015	05:00:00	62.3	55.0	80.8	57.4	57.1	58.3	59.0	54.1	45.3	38.0
10/08/2015	05:15:00	62.7	55.2	80.9	57.8	57.4	57.9	59.5	54.9	45.6	37.7
10/08/2015	05:30:00	63.0	52.7	80.9	57.7	57.1	56.9	59.7	55.8	48.1	40.4
10/08/2015	05:45:00	64.2	57.3	80.8	59.6	59.0	59.8	61.0	56.5	47.8	40.0
10/08/2015	06:00:00	64.6	57.2	80.7	60.0	60.0	60.6	61.3	57.0	47.9	40.6
10/08/2015	06:15:00	64.0	57.5	80.7	59.8	59.3	58.6	60.8	56.5	48.0	41.3
10/08/2015	06:30:00	65.3	59.2	80.6	61.6	60.5	60.2	61.7	58.4	51.5	44.0
10/08/2015	06:45:00	64.3	56.6	80.6	60.5	59.5	58.6	61.2	57.0	49.1	42.1
10/08/2015	07:00:00	64.0	59.3	80.6	63.5	60.6	59.1	60.2	56.6	49.3	43.1
10/08/2015	07:15:00	64.6	59.7	80.5	63.5	61.2	61.0	60.4	57.0	50.2	44.0
10/08/2015	07:30:00	71.4	59.7	80.4	65.5	62.0	62.5	70.3	59.4	51.4	44.5
10/08/2015	07:45:00	63.7	58.6	80.3	64.8	61.5	59.2	59.5	56.2	49.7	44.9
10/08/2015	08:00:00	63.1	58.4	80.0	62.2	60.9	60.4	58.5	55.0	48.8	43.1
10/08/2015	08:15:00	65.8	60.4	80.1	64.4	62.3	61.3	62.1	58.0	51.9	47.4
10/08/2015	08:30:00	64.9	59.3	80.1	65.1	62.3	61.1	60.4	57.6	51.4	46.7
10/08/2015	08:45:00	66.4	61.0	80.1	64.8	62.7	62.4	61.6	58.8	55.8	51.7
10/08/2015	09:00:00	67.1	58.6	79.9	60.1	59.7	62.4	63.8	60.2	49.5	44.6
10/08/2015	09:15:00	63.9	58.6	80.8	63.1	60.9	60.7	59.7	55.6	48.8	42.5
10/08/2015	09:30:00	64.3	59.5	81.4	63.6	63.0	60.7	59.6	56.6	50.8	45.3
10/08/2015	09:45:00	64.3	60.4	81.4	63.7	62.0	61.4	59.4	56.7	50.2	43.2
10/08/2015	10:00:00	64.0	60.0	81.4	62.6	61.7	60.5	59.6	56.1	49.2	43.3
10/08/2015	10:15:00	63.7	59.0	81.2	63.1	60.6	59.1	59.9	56.0	49.0	42.8
10/08/2015	10:30:00	63.4	59.1	80.9	61.8	60.8	59.2	59.5	55.6	48.5	41.9
10/08/2015	10:45:00	63.8	58.7	80.5	60.9	60.7	59.0	59.9	56.3	49.7	45.8
10/08/2015	11:00:00	64.8	59.6	80.3	63.9	61.6	59.8	60.4	57.2	53.6	51.5
10/08/2015	11:15:00	66.3	59.5	79.8	63.1	61.0	60.5	60.6	58.5	57.6	58.6
10/08/2015	11:30:00	63.7	59.6	79.9	61.5	60.9	59.3	59.9	56.0	49.9	44.8
10/08/2015	11:45:00	64.1	59.9	79.3	61.1	60.6	59.8	60.5	56.3	49.7	43.8
10/08/2015	12:00:00	64.1	58.1	74.0	61.0	59.2	57.9	60.0	55.6	49.9	56.5
10/08/2015	12:15:00	63.0	57.1	67.4	62.7	59.2	57.5	59.7	55.6	49.0	47.4
10/08/2015	12:30:00	71.0	57.4	66.0	60.7	59.4	60.4	70.1	59.0	50.2	44.6
10/08/2015	12:45:00	63.8	57.8	66.8	61.1	60.3	58.8	59.8	57.0	51.1	46.0
10/08/2015	13:00:00	68.4	57.5	65.3	59.7	59.7	59.9	65.8	62.4	50.0	42.9
10/08/2015	13:15:00	63.2	57.5	66.3	60.2	58.6	57.1	59.9	56.5	49.4	42.0
10/08/2015	13:30:00	63.6	56.3	65.8	59.8	60.3	59.6	60.3	55.7	48.8	42.3
10/08/2015	13:45:00	66.3	57.8	66.9	62.0	61.8	62.2	61.1	58.3	56.3	57.3
10/08/2015	14:00:00	65.0	58.9	68.5	64.9	62.1	60.7	60.9	57.8	52.1	47.5
10/08/2015	14:15:00	64.2	57.5	65.7	61.2	61.5	59.4	61.0	56.3	49.6	44.4
10/08/2015	14:30:00	64.2	58.6	65.7	61.0	61.5	59.8	60.7	56.5	51.0	46.4
10/08/2015	14:45:00	63.9	57.1	66.2	61.0	59.9	58.4	60.6	56.8	49.4	44.0
10/08/2015	15:00:00	63.9	58.0	67.3	61.4	61.1	58.9	60.6	56.5	49.0	43.3

10/08/2015	15:15:00	64.3	58.6	75.3	63.7	63.1	60.8	60.2	56.5	48.9	43.3
10/08/2015	15:30:00	64.2	59.6	79.6	62.6	61.7	60.1	60.4	56.5	49.8	44.1
10/08/2015	15:45:00	63.2	59.3	80.5	61.9	60.7	58.9	59.6	55.2	48.0	41.1
10/08/2015	16:00:00	68.3	58.6	80.7	61.9	60.7	59.4	64.2	64.0	50.0	45.9
10/08/2015	16:15:00	64.3	59.3	80.6	62.3	61.6	60.5	60.4	56.3	50.0	42.7
10/08/2015	16:30:00	63.3	58.6	80.7	62.6	61.9	59.3	59.0	55.5	48.8	42.3
10/08/2015	16:45:00	63.8	59.8	80.5	60.9	60.8	59.9	59.8	56.0	48.6	44.3
10/08/2015	17:00:00	63.5	58.6	80.7	60.7	60.5	59.1	60.0	55.5	47.8	41.4
10/08/2015	17:15:00	64.6	59.7	80.7	61.5	60.6	59.5	60.9	58.0	48.8	41.9
10/08/2015	17:30:00	63.7	58.9	80.9	64.6	60.6	60.1	59.6	55.3	48.1	40.9
10/08/2015	17:45:00	65.8	60.0	80.8	63.9	62.1	61.5	62.1	58.8	48.5	41.7
10/08/2015	18:00:00	63.7	59.4	80.7	62.6	60.6	60.8	59.5	55.4	48.2	41.9
10/08/2015	18:15:00	64.3	58.9	80.9	67.6	64.3	60.0	60.0	56.0	48.5	41.1
10/08/2015	18:30:00	63.7	59.9	80.6	61.4	61.1	60.6	59.1	56.0	49.7	42.8
10/08/2015	18:45:00	63.6	60.2	80.6	62.2	61.7	61.1	59.0	55.3	48.2	41.4
10/08/2015	19:00:00	70.3	59.5	80.8	65.0	63.1	60.6	66.3	66.0	50.7	42.3
10/08/2015	19:15:00	63.8	59.7	80.9	61.3	60.7	60.3	59.9	55.6	47.8	40.6
10/08/2015	19:30:00	63.7	58.2	81.0	60.1	59.7	59.0	60.2	56.0	48.2	41.1
10/08/2015	19:45:00	63.8	58.7	81.0	60.6	59.8	58.6	60.4	56.2	48.4	40.8
10/08/2015	20:00:00	64.1	58.2	81.0	60.8	61.3	60.6	60.3	56.0	47.8	41.4
10/08/2015	20:15:00	63.0	58.1	81.0	59.9	59.7	58.7	59.5	55.2	46.8	39.3
10/08/2015	20:30:00	63.3	57.8	81.2	60.5	59.6	58.9	59.7	55.5	47.4	39.8
10/08/2015	20:45:00	63.8	57.7	81.2	62.2	62.7	59.6	60.1	55.5	47.1	39.5
10/08/2015	21:00:00	63.5	57.9	81.2	61.5	61.1	59.3	60.0	55.2	46.5	39.5
10/08/2015	21:15:00	63.3	58.0	81.3	62.2	59.4	57.8	59.8	55.8	47.5	40.3
10/08/2015	21:30:00	63.3	58.7	81.4	60.3	58.9	57.5	60.1	55.5	46.9	39.9
10/08/2015	21:45:00	63.4	57.8	81.6	58.4	58.2	58.0	60.2	55.6	47.2	38.7
10/08/2015	22:00:00	63.6	57.9	82.0	62.6	60.1	57.9	60.4	55.7	47.1	38.5
10/08/2015	22:15:00	63.3	56.9	82.2	59.9	58.9	57.6	60.2	55.6	46.7	39.2
10/08/2015	22:30:00	63.1	56.4	82.5	60.0	58.8	57.1	59.7	55.4	47.2	39.2
10/08/2015	22:45:00	64.2	57.1	82.9	62.7	61.3	58.8	60.4	56.7	49.0	43.1
10/08/2015	23:00:00	63.3	57.8	83.4	60.0	58.0	57.1	59.8	55.7	47.1	38.8
10/08/2015	23:15:00	65.0	56.8	83.6	59.7	57.9	57.2	61.0	58.6	53.2	45.4
10/08/2015	23:30:00	63.0	56.7	83.1	59.2	58.4	57.3	59.6	55.2	46.9	40.2
10/08/2015	23:45:00	63.0	56.4	82.7	59.2	57.7	57.5	59.7	55.2	46.2	38.6
11/08/2015	00:00:00	63.2	56.0	82.3	59.8	58.1	57.6	59.5	56.0	48.6	39.5
11/08/2015	00:15:00	63.2	55.4	82.2	58.3	57.5	57.6	60.3	55.4	45.4	36.6
11/08/2015	00:30:00	62.6	55.6	82.0	58.0	57.6	58.0	59.3	54.6	44.7	35.3
11/08/2015	00:45:00	62.5	55.1	81.8	57.8	56.7	58.3	59.2	54.6	44.9	38.8
11/08/2015	01:00:00	63.0	54.5	81.7	57.8	56.8	56.0	60.2	55.4	44.8	36.2
11/08/2015	01:15:00	61.7	53.5	81.6	56.4	55.5	54.8	59.0	53.9	42.9	34.2
11/08/2015	01:30:00	61.4	52.9	81.5	56.4	55.6	54.4	58.4	53.8	43.9	34.9
11/08/2015	01:45:00	61.2	53.2	81.5	56.6	55.8	54.5	58.1	53.4	44.0	35.8
11/08/2015	02:00:00	60.9	52.9	81.5	55.4	54.1	53.5	58.1	52.9	41.5	33.3

11/08/2015	02:15:00	60.8	53.2	81.5	56.3	54.6	54.6	57.8	52.8	42.2	34.3
11/08/2015	02:30:00	61.1	53.0	81.5	60.7	57.0	55.3	57.8	53.0	43.8	36.5
11/08/2015	02:45:00	61.1	52.9	81.5	56.5	55.0	54.5	58.0	53.2	42.7	35.9
11/08/2015	03:00:00	60.9	52.9	81.5	55.7	53.9	53.7	58.0	53.2	42.8	34.1
11/08/2015	03:15:00	60.2	52.8	81.6	55.9	53.8	53.5	57.1	51.9	42.1	34.3
11/08/2015	03:30:00	59.7	52.8	81.7	55.8	53.2	52.8	56.4	51.5	41.6	33.6
11/08/2015	03:45:00	60.7	52.8	81.7	56.4	53.8	53.6	57.7	53.0	42.7	34.7
11/08/2015	04:00:00	61.6	53.2	81.7	57.4	55.4	55.3	58.6	53.7	44.2	36.7
11/08/2015	04:15:00	59.7	52.8	81.7	60.7	56.1	52.9	56.1	51.4	42.3	34.5
11/08/2015	04:30:00	61.1	52.9	81.7	56.8	55.0	54.8	58.0	53.2	43.7	35.3
11/08/2015	04:45:00	62.4	53.3	81.7	58.2	56.6	56.9	59.3	54.5	45.1	37.0
11/08/2015	05:00:00	62.5	54.2	81.7	57.6	56.4	58.2	59.3	54.5	45.1	36.7
11/08/2015	05:15:00	62.9	53.9	81.7	59.2	57.0	57.0	59.9	55.2	45.5	37.8
11/08/2015	05:30:00	62.8	54.0	81.7	58.5	57.3	57.9	59.2	55.5	47.3	40.1
11/08/2015	05:45:00	63.1	55.6	81.7	58.1	57.4	58.4	59.8	55.5	46.1	37.4
11/08/2015	06:00:00	64.6	58.4	81.6	62.6	60.7	61.2	60.9	56.8	48.2	40.5
11/08/2015	06:15:00	64.6	58.2	81.6	60.0	59.1	58.8	61.3	57.6	49.6	41.8
11/08/2015	06:30:00	65.6	58.4	81.5	61.4	60.5	60.7	62.3	58.3	49.9	41.6
11/08/2015	06:45:00	65.0	59.4	81.7	61.8	60.2	59.2	61.8	57.6	49.3	43.2
11/08/2015	07:00:00	65.0	60.1	81.6	64.2	61.7	60.5	61.1	57.8	50.3	42.9
11/08/2015	07:15:00	64.3	60.4	81.5	63.2	61.0	60.0	60.2	56.9	49.9	44.2
11/08/2015	07:30:00	64.4	58.4	81.3	63.1	61.6	60.6	60.5	56.5	48.6	42.0
11/08/2015	07:45:00	64.0	59.8	81.3	62.2	61.0	60.1	60.1	56.0	49.3	44.5
11/08/2015	08:00:00	64.0	58.3	81.3	65.6	62.3	60.7	59.5	55.7	48.8	41.8
11/08/2015	08:15:00	64.4	59.7	81.2	63.2	61.6	61.7	60.0	56.2	49.0	41.6
11/08/2015	08:30:00	64.9	60.5	81.4	63.0	61.7	62.2	60.3	56.9	50.5	43.6
11/08/2015	08:45:00	65.1	60.0	81.3	62.9	64.1	62.1	60.5	56.7	50.6	45.3
11/08/2015	09:00:00	65.2	60.1	81.2	62.7	62.2	60.7	60.8	58.5	52.0	44.4
11/08/2015	09:15:00	65.2	60.3	81.3	65.2	62.9	61.7	61.1	57.1	50.3	43.5
11/08/2015	09:30:00	65.0	59.7	80.7	62.9	61.7	61.3	61.1	57.2	49.9	43.9
11/08/2015	09:45:00	65.6	60.1	80.7	65.1	65.8	61.8	60.5	57.2	52.7	53.5
11/08/2015	10:00:00	64.0	59.4	80.9	61.1	60.7	60.2	60.1	56.1	49.0	41.2
11/08/2015	10:15:00	65.0	58.6	80.7	63.0	62.2	60.8	61.3	57.1	49.6	41.6
11/08/2015	10:30:00	64.3	57.9	80.8	61.9	61.3	60.1	60.7	56.2	48.8	43.1
11/08/2015	10:45:00	66.3	60.3	80.6	63.0	62.6	62.7	62.7	58.4	51.1	46.9

APPENDIX E: 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 = $20 \mu\text{Pa}$)

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)

$$R = L_1 - L_2 + 10 \log (S/A)$$

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.