WATERLOO ACOUSTICS

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NOISE MEASUREMENT REPORT

Site Name:	**BT Tower**
Report Type:	**Environmental Noise Assessment**
Site Address:	BT Tower 45 Maple St London W1T 4JZ
Date of Measurements:	**13th to 17th April 2017**
Client:	TUV SUD Limited The Venlaw Building 349 Bath Street Glasgow G2 4AA United Kingdom
Report Author:	**B. Costello**
Report Date: **Report Ref:**	**28th May 2017** **2089/01**

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1 Introduction

This survey was carried out on the instructions of Stephen Phimister of TUV SUD Ltd to establish the current ambient/background noise levels near the BT Tower to determine the environmental noise impact of the proposed installation of new eternally mounted roof plant on level 05.

1.1 The objectives of the survey are to:

a) Measure and record the existing ambient and background at the BT Tower (overlooking Maple Street).

b) Determine the location of the nearest noise sensitive location and assess the impact of the noise from the proposed plant installation.

c) This report will establish the existing level of ambient and background noise representative of that experienced at the nearest noise sensitive location (namely 46-48 Maple Street) and determine the specific noise from the propose plant during expected operational hours.

d) Recommendations will be included for any attenuation measures (if required) to reduce the noise emissions from the new plant to expected local authority requirements.

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2 Site Description

2.1 The BT Tower site in London is in Maple St with the site bounded by Maple St to the North, Cleveland St to the west and Howland St to the south. The external roof areas accommodate various items of plant and telecommunications equipment.

2.2 The aim of this report is to determine the impact of noise emissions the proposed plant equipment on level 05 roof. The new plant consists of 8 number new Denco Vertical Blow Hybrid combined condenser dry coolers (model DCRA75-EC) serving the 3rd floor data hall. The units are to be located on the level 05 roof area generally as indicated on the attached site plan. We understand that only six units will be operating at maximum capacity at any given time

2.3 The nearest noise sensitive locations are the properties of 46 & 48 Maple Street at approximately 40m from the centre of the proposed condenser location. The properties are shielded from a direct line of sight by the level difference in the buildings.

2.4 The main noise sources of ambient and background noise were road traffic noise and some existing plant noise from 3rd floor roof area.

2.5 The manufacturers noise data for the new plant is detailed in the appendix and summarised below for reference.

Denco DCRA75-EC (condenser)	*Octave Band frequencies*							dBA
	125	**250**	**500**	**1k**	**2k**	**4k**	**8k**	
Day: Sound Pressure Level @ 3m	62	60	64	66	63	57	51	**69**
Night: Sound Pressure Level @ 3m	57.3	55.4	51.7	46.5	42.9	39.6	37.4	**53**
Day: Airflow Rate	9.69 m^3/sec							
Night: Airflow Rate	4.85 m^3/sec							

3 Instrumentation

3.1 Cirrus Research Plc Integrating Sound Level Meter:
Type: GR 821B Serial No: C19350FE
Compliance to IEC 61672-1: 2002 Class 1, IEC 60651: 1979 Type 1,
IEC 60804: 2001 Type 1, IEC 61260: 1995 Class 1, IEC 60942:1997,
IEC 61252:1993, ANSI S1.4-1983 and ANSI S1.43-1997

3.2 Cirrus Research Plc Calibrator:
Type: GR 511E Serial No: 43553

4 Weather Conditions

4.1 As the meter was not manned throughout the survey period we cannot confirm exact weather conditions. However, the weather was relatively claim with daytime temperatures ranging from 12-16 degrees C and generally overcast with no precipitation (based on met office reports).

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5 Measurements and Measurement Procedure

5.1 Broadband noise measurements were taken were taken at roof level 05 near the boundary as far as practical from other plant equipment. The results of these readings are tabulated and utilised to establish the noise climate near Maple Street. Background noise levels were dominated by local road traffic from the surrounding streets and some existing plant noise. This is considered a reasonable representation of the noise levels this location.

5.2 Measurements were generally taken in accordance with the guide lines of BS 4142: 2014 "Methods for rating and assessing industrial and commercial sound ".

5.3 All measurements were taken between 14:00hrs on 13th April 2017 and 16:45hrs on 17th April 2017.

5.4 The results are utilised to assess the likelihood of complaint based upon the requirements of BS4142 and to determine the noise criteria for plant noise emissions based upon the expected local authority requirements. External L_{Aeq} and L_{A90} measurements were taken over minimum 15-minute measurement intervals and reported in detail in the appendix.

5.5 The meter was calibrated before and after the survey period and no deviation noted. All measurements are quoted to the nearest whole decibel and a wind shield was used during all measurements.

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6 Results

6.1 The results of the noise measurements were as follows:

Table 1: Background Noise Levels

Lowest $L_{A90,15mins}$ dB(A) Noise Levels	
Night Time (23:00 – 07:00rs)	Daytime (07:00–23:00hrs)
47 dBA	**50 dBA**

The lowest night time noise level recorded was an $L_{A90,15mins}$ of 47 dBA

Table 2: Ambient Noise Levels

Lowest $L_{Aeq,15mins}$ dB(A) Noise Levels	
Night Time (23:00 – 07:00hrs)	Daytime (07:00–23:00hrs)
49 dBA	**51 dBA**

6.2 We would normally expect the local authority to stipulate that the total plant noise emissions should not exceed a level of 10dBA below the lowest L_{A90} measured background noise at 1m from the facade of the nearest affected noise sensitive window. The local authority requirements will take precedence over any BS4142 assessment. Taking this into account the criteria for the plant noise emissions is detailed in table 3 below.

Table 3: Criteria

Limiting noise Criteria at 1m from nearest noise sensitive location when assessed to a level of 10dBA below background	
Night Time (23:00 – 07:00hrs)	Daytime (07:00–23:00hrs)
37 dBA	**40 dBA**

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7 Assessment

Assessment carried out for the proposed 24-hour operation of the plant equipment.

Comments	Assessment to sensitive Location		Comments
	Daytime	Night-Time	
Lowest Background $L_{A90, 5mins}$	**50dBA**	**47 dBA**	
			Manufacturers data
Sound **Pressure** Level at 3m	69 dBA	53 dBA	
Distance Correction to 40m	-22 dBA	-22 dBA	$20Log(d_2/d_1)$:- [SPL calc] $20Log(d_2/d_1)$-11:- [SWL calcs]
Location/ & Directivity factors	+0 dBA	+0 dBA	Manufacture's data provides for typical external environment (not freefield)
Correction for 6 units	+8 dBA	+8 dBA	20Log(6)
Further attenuation	None	None	None proposed
Screening Effects	-8 dBA	-8 dBA	Estimated minimum
Façade Corrections	+3 dBA	+3 dBA	
Specific Noise Levels @ 1m from nearest affected location	50 dBA	34 dBA	
Tonal Qualities	0 dBA	0 dBA	
Rating Level	**50 dBA**	34 dBA	Acceptance criteria as table 3 are: 40dBA Day 37dBA Night
Excess of Rating over Background	**+0 dBA**	-13 dBA	
Assessment:	**Complaints Unlikely**	***Positive Indication that Complaints unlikely***	

The results of the assessment indicate that complaints are not to be expected when assessed to BS4142, however as previously noted the local authority criteria will take precedence and it is to be expected that the limiting noise levels in table 3 will apply.

At the reduced night-time duties, the expected local authority criteria will be achieved at night.

The daytime criteria will not be achieved and further noise control measures will be necessary. In the following assessment, we have modelled the addition of a close fit acoustic screen on the roof to the north of the condensers. The screen should extend by 2m either side of the condensers and at least 750mm above the height. The screen should be as close as possible to the northern most condenser (ideally 1.5-2m from the side of the unit). We have assumed a screen construction equivalent to the Waterloo Acoustics type AP100 acoustic panel providing an R_w (weighted sound reduction index) of R_w42.

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7 Assessment (continued)

Assessment carried out with the addition of an acoustic screen for daytime operation

Comments	Assessment to sensitive Location	Comments
	Daytime	
Lowest Background $L_{A90,\ 5mins}$	**50dBA**	
		Manufacturers data
Sound **Pressure** Level at 3m	69 dBA	
Distance Correction to 40m	-22 dBA	20Log(d_2/d_1):- [SPL calc] 20Log(d_2/d_1)-11:- [SWL calcs]
Location/ & Directivity factors	+0 dBA	Manufacture's data provides for typical external environment (not freefield)
Correction for 6 units	+8 dBA	20Log(6)
Screening Effects due to new Acoustic Panel Screen	-18 dBA	AP100 panels with Rw42
Façade Corrections	+3 dBA	
Specific Noise Levels @ 1m from nearest affected location	50 dBA	
Tonal Qualities	0 dBA	
Rating Level	**40 dBA**	Acceptance criteria as table 3 are: 40dBA Day 37dBA Night
Excess of Rating over Background	**+0 dBA**	
Assessment:	**Complies with expected local authority criteria.**	

The assessment demonstrates that the expected local authority criteria can be achieved with the addition of a suitably designed high performance acoustic screen.

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8 Observations

8.1 To assess the acceptability of the proposed installation it is necessary to compare the plant noise level with the background noise at any critical location. Detailed guidance on the assessment procedure is given in BS 4142: 2014.

8.2 Should the specific noise contain any distinguishable characteristics, e.g. whine, hiss, clicks, bangs, etc, or be of cyclic nature, 5dB should be added to the specific noise prior to the assessment. In this instance, the correction factor has not been added as the tonal qualities of the proposed unit are similar or less than the existing adjacent units and other existing plant on this site and internal noise to atmosphere is of a steady state and not tonal in character.

8.3 BS4142 requires a comparison to be made between the specific noise (i.e. plant noise under consideration) when measured in L_{Aeq} mode and the background noise when measured in the L_{A90} mode. The reference time interval (T) being 1 hour during the day and 5 minutes during the night. However, BS4142 is not a suitable method of assessment when ambient and background noise levels are low (i.e. "*background noise levels below about 30dB and rating levels below about 35dB are considered very low*").

8.4 The typically expected local authority planning condition in relation to plant noise emissions is noted below where the noise criteria (as noted in table 3) is a level 10dB less than background: -

"Where noise emitted from the proposed plant and machinery will not contain tones or will not be intermittent, the 'A' weighted sound pressure level from the plant and machinery (including non-emergency auxiliary plant and generators) hereby permitted, when operating at its noisiest, shall not at any time exceed a value of 10 dB below the minimum external background noise, at a point 1 metre outside any window of any residential and other noise sensitive property, unless and until a fixed maximum noise level is approved by the City Council. The background level should be expressed in terms of the lowest LA90, 15 mins during the proposed hours of operation. The plant-specific noise level should be expressed as LAeqTm, and shall be representative of the plant operating at its maximum."

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9 Recommendations

9.1 In the first instance it is recommended that the combined plant noise emissions should not exceed a level of 40BA (day) and 37dBA (night) when measured at 1m from the nearest affected noise sensitive window as detailed in table 3. This represents a level 10dB below the lowest recorded background noise during the operational period.

9.2 Whilst the night-time criteria can be achieved without the need for further attenuation (due to the reduced night duties), the daytime levels will exceed those detailed in table 3.

9.3 Further noise control measures by way of a suitably designed high performance acoustic screen to the condensers should be installed to reduce the daytime noise emissions to the recommended levels. Relocating the condensers slightly further to the south on the roof may have some marginal benefit both in terms of distance loss and additional screening effect providing more tolerance in the calculated results.

9.4 All acceptance criteria should be agreed with the local authority.

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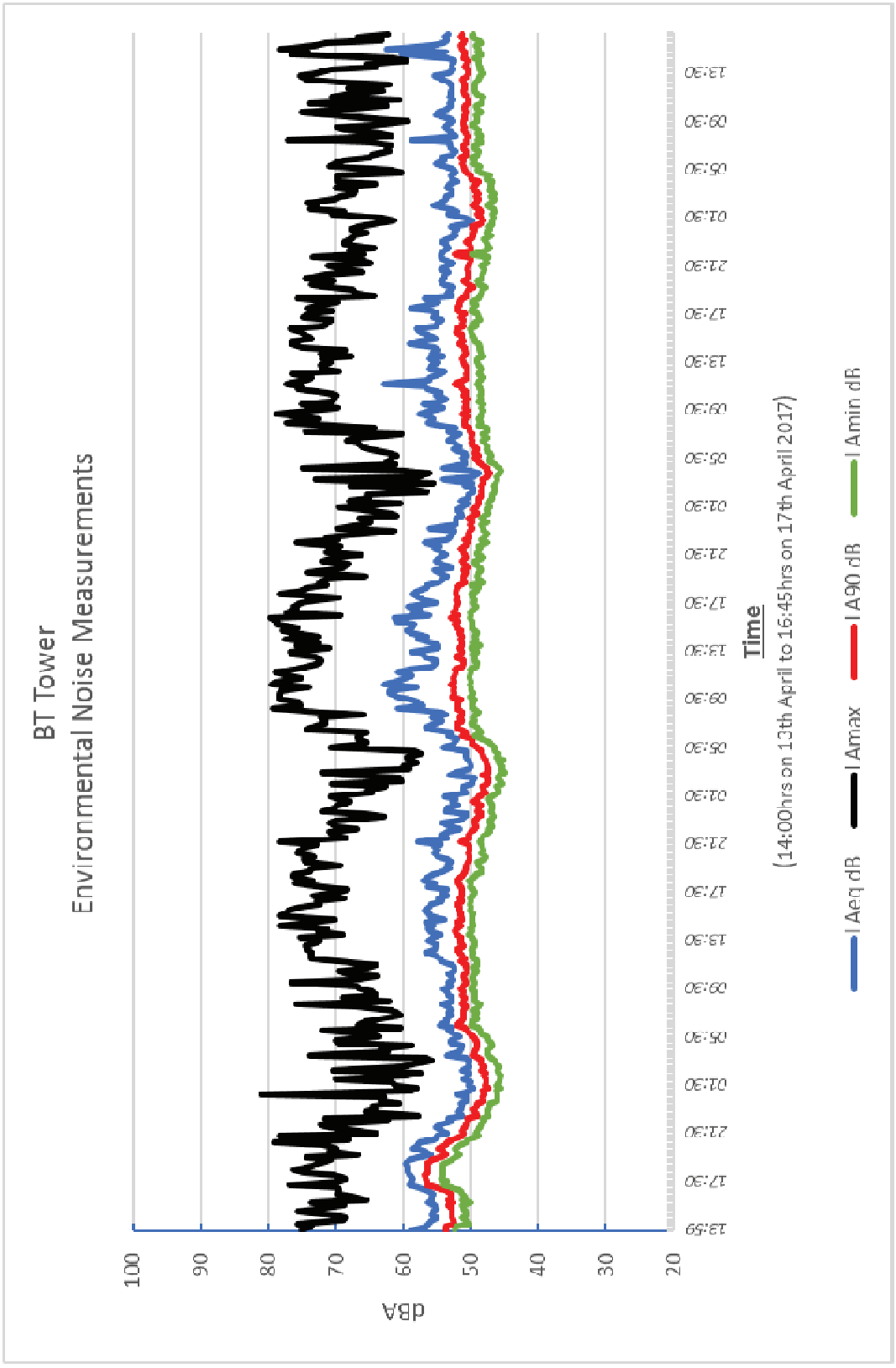
Appendix 1: Noise Measurements – Graph of Results



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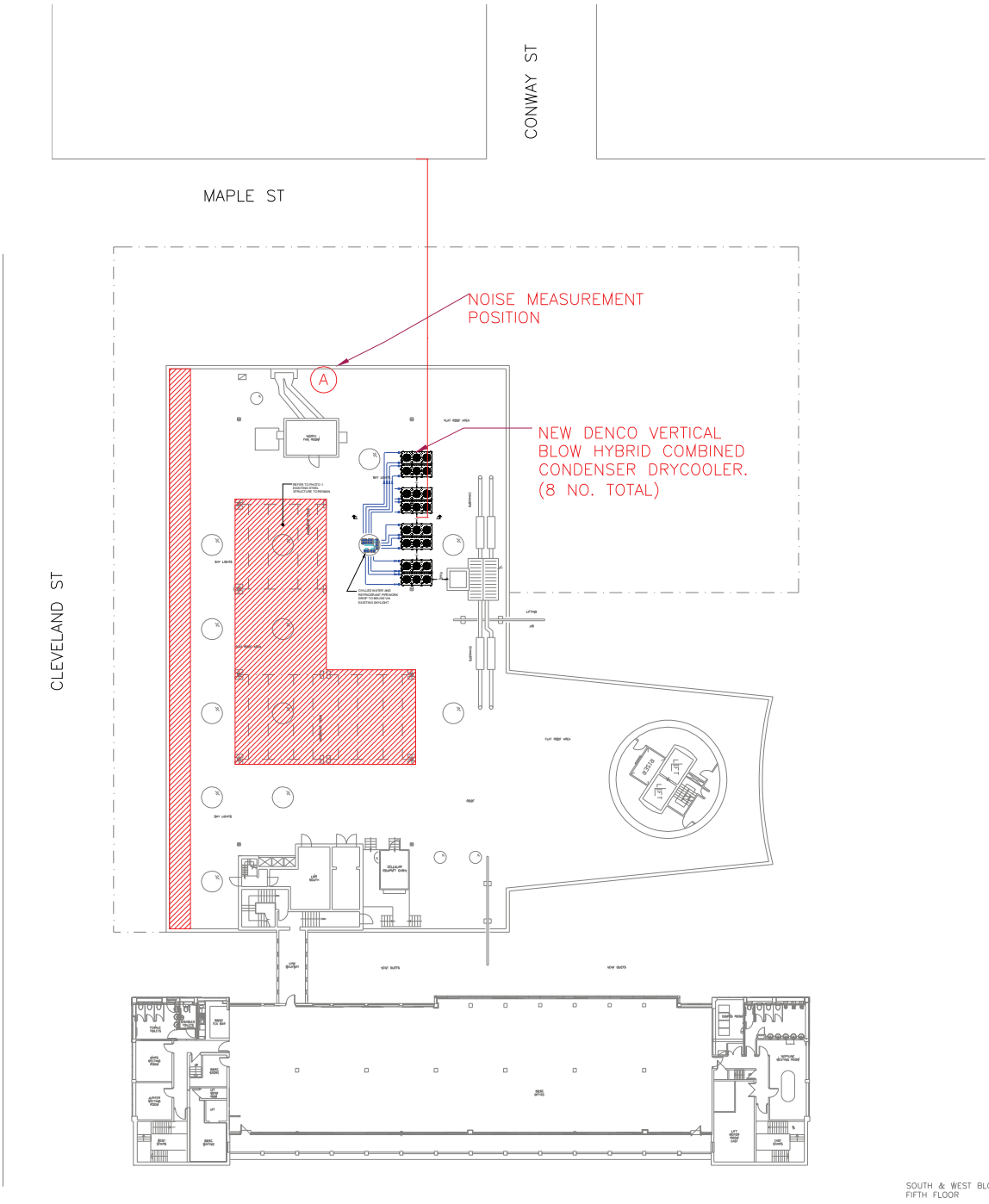
Appendix 2: Site Plan



LEVEL 05 – ROOF PLANT
BT TOWER

ENVIRONMENTAL NOISE MEASUREMENTS

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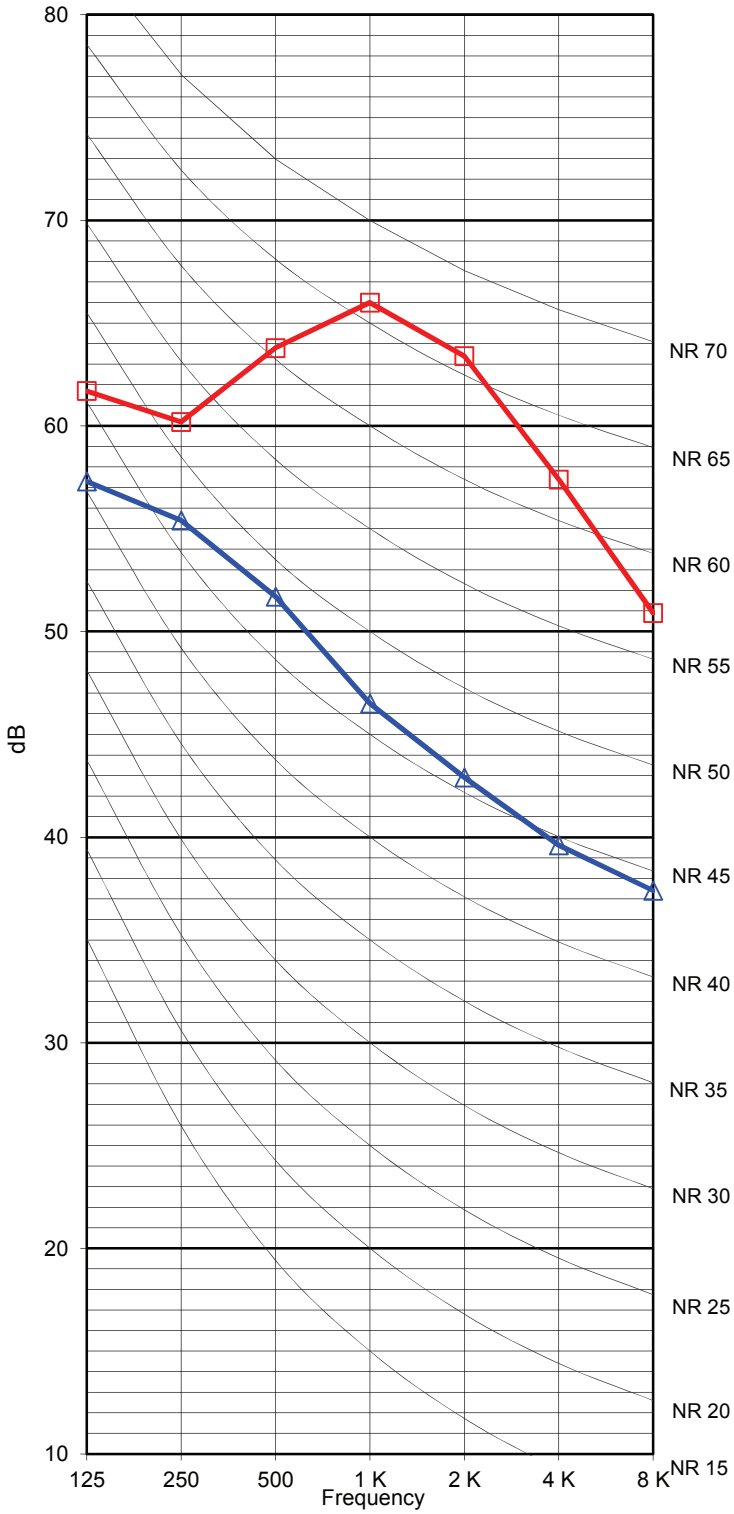
Appendix 3: Noise Measurements –(details) and Manufacturers Data

STRICTLY PRIVATE and CONFIDENTIAL	Form DQA 627 rev HX2

RESEARCH and DEVELOPMENT
UNIT NOISE LEVEL Denco® PRODUCTS

NR Rating



Type / Model	DCRA75-EC
Day Maximum Control Voltage - V	10
Night Maximum Control Voltage - V	5
Day Maximum Unit Airflow - m³/sec	9.69
Night Maximum Unit Airflow - m³/sec	4.85
Measurement Distance - m	3

Day Maximum Sound Pressure Level Readings - 3 m						
125 Hz	250 Hz	500 Hz	1 KHz	2 KHz	4KHz	8 KHz
62	60	64	66	63	57	51
Calculated NR Level						
125 Hz	250 Hz	500 Hz	1 KHz	2 KHz	4KHz	8 KHz
46	52	61	66	66	62	57
Actual NR Level				66		

Night Maximum Sound Pressure Level Readings - 3 m						
125 Hz	250 Hz	500 Hz	1 KHz	2 KHz	4KHz	8 KHz
57.3	55.4	51.7	46.5	42.9	39.6	37.4
Calculated NR Level						
125 Hz	250 Hz	500 Hz	1 KHz	2 KHz	4KHz	8 KHz
41	47	48	47	46	45	44
Actual NR Level				48		

Legend	
□	Day Maximum Sound Pressure Readings at 3m
△	Night Maximum Sound Pressure Readings at 3 m

Remarks:

Sound Pressure Levels in a typical external environment.
Readings taken on fan discharge of unit.

Test Engineer	Date
Danny Fry-Sperring	17 January 2013

Environmental Noise Measurement Report

Measurement Details

Location: BT Tower
Description: Environmental Noise Measurements
Date of Measurement: 17/04/2017 16:45

Instrumentation Details

Sound Level Meter: Cirrus Research plc CR:800B C19350FE
Acoustic Calibrator: Cirrus Research plc CR:511E
Calibration:
Recalibration Due: 30/06/2017
Level Range: 10-80 dB
Time Weighting: Fast (for Lmax and Lns)

Measurement Data

Start of Measurements: 13/04/2017 13:59
No. of Measurements: 398
Total Duration: 98:52:58
Highest Lmax: 81.2
Lmax Exceedance Count: 0, at or above 115dB

Date	Time	Run Duration (hh:mm:ss)	Leq dB	Lmax dB	L90	Lmin
13/04/2017	13:59:07	00:00:52	59.0	75.2	53.7	52.5
13/04/2017	14:00:00	00:02:57	56.6	73.6	53.7	52.2
13/04/2017	14:03:06	00:11:54	56.4	75.8	52.4	50.3
13/04/2017	14:15:00	00:14:59	55.8	69.1	52.6	50.8
13/04/2017	14:30:00	00:15:00	55.1	68.6	52.9	51.4
13/04/2017	14:45:00	00:15:00	55.8	70.4	52.9	50.8
13/04/2017	15:00:00	00:14:59	55.7	75.7	52.8	50.8
13/04/2017	15:15:00	00:14:59	55.2	72.9	52.8	51.1
13/04/2017	15:30:00	00:14:59	55.5	68.9	53.3	51.4
13/04/2017	15:45:00	00:15:00	56.4	73.6	52.7	50.1
13/04/2017	16:00:00	00:14:59	55.8	65.5	53.4	51.4
13/04/2017	16:15:00	00:15:00	55.8	67.8	52.8	51.0
13/04/2017	16:30:00	00:15:00	55.7	69.7	53.0	51.4
13/04/2017	16:45:00	00:14:59	56.8	69.5	53.7	51.8
13/04/2017	17:00:00	00:15:02	57.9	69.7	55.3	53.0
13/04/2017	17:15:00	00:15:00	59.1	77.0	56.6	54.1
13/04/2017	17:30:00	00:14:59	58.9	69.2	56.5	53.6
13/04/2017	17:45:00	00:14:59	58.6	68.7	56.7	54.5
13/04/2017	18:00:00	00:15:01	59.2	70.3	56.9	54.2
13/04/2017	18:15:00	00:15:01	59.3	74.9	56.4	54.1
13/04/2017	18:30:00	00:14:59	59.3	76.2	56.3	54.1
13/04/2017	18:45:00	00:14:59	59.3	73.5	56.4	54.2
13/04/2017	19:00:00	00:15:00	59.8	72.8	56.5	54.2
13/04/2017	19:15:00	00:14:59	59.1	70.8	55.8	52.9

Environmental Noise Measurement Report

Date	Time	Run Duration (hh:mm:ss)	Leq dB	Lmax dB	L90	Lmin
13/04/2017	19:30:00	00:15:00	57.9	74.4	54.7	52.5
13/04/2017	19:45:00	00:14:59	56.0	66.8	53.7	51.7
13/04/2017	20:00:00	00:14:59	56.9	71.1	54.2	52.2
13/04/2017	20:15:00	00:14:59	58.6	70.0	54.9	52.4
13/04/2017	20:30:00	00:14:59	57.9	72.0	53.7	51.5
13/04/2017	20:45:00	00:14:59	57.6	79.2	53.5	50.7
13/04/2017	21:00:00	00:15:00	55.5	68.0	52.9	50.6
13/04/2017	21:15:00	00:15:00	55.0	78.3	51.4	48.9
13/04/2017	21:30:00	00:14:59	53.5	64.0	51.2	49.3
13/04/2017	21:45:00	00:15:00	54.3	66.8	51.3	49.2
13/04/2017	22:00:00	00:15:00	55.3	71.0	50.9	48.8
13/04/2017	22:15:00	00:15:00	54.5	72.3	50.8	48.6
13/04/2017	22:30:00	00:15:00	52.8	62.3	50.5	48.0
13/04/2017	22:45:00	00:14:59	53.3	71.7	50.6	48.4
13/04/2017	23:00:00	00:14:59	51.4	57.8	49.2	47.4
13/04/2017	23:15:00	00:14:59	51.9	65.7	49.4	47.6
13/04/2017	23:30:00	00:15:00	51.6	64.2	49.6	47.4
13/04/2017	23:45:00	00:15:00	51.3	64.5	49.2	47.3
14/04/2017	00:00:00	00:15:00	51.6	60.6	49.2	47.3
14/04/2017	00:15:00	00:14:59	50.8	63.5	48.1	46.1
14/04/2017	00:30:00	00:15:00	50.6	62.9	48.3	46.2
14/04/2017	00:45:00	00:15:01	52.1	81.2	48.0	46.2
14/04/2017	01:00:00	00:15:00	50.1	58.7	48.3	46.4
14/04/2017	01:15:00	00:14:59	49.6	58.0	47.4	45.6
14/04/2017	01:30:00	00:15:00	50.4	61.2	48.0	46.3
14/04/2017	01:45:00	00:15:00	50.0	61.8	47.8	45.8
14/04/2017	02:00:00	00:15:01	51.2	70.2	47.9	45.8
14/04/2017	02:15:00	00:15:00	50.4	59.6	48.2	45.6
14/04/2017	02:30:00	00:15:00	50.2	57.5	47.8	45.9
14/04/2017	02:45:00	00:14:59	51.4	70.5	48.6	46.1
14/04/2017	03:00:00	00:15:01	50.3	60.3	48.0	45.7
14/04/2017	03:15:00	00:15:00	50.4	58.6	48.6	46.4
14/04/2017	03:30:00	00:15:00	50.3	55.9	48.3	46.5
14/04/2017	03:45:00	00:15:01	50.8	56.8	49.0	47.1
14/04/2017	04:00:00	00:14:59	53.5	73.9	49.7	47.4
14/04/2017	04:15:00	00:15:00	51.7	62.4	49.4	47.6
14/04/2017	04:30:00	00:15:00	51.5	63.5	49.3	47.4
14/04/2017	04:45:00	00:15:00	51.3	58.8	49.2	46.9
14/04/2017	05:00:00	00:14:59	53.1	69.5	49.2	47.1
14/04/2017	05:15:00	00:15:00	53.0	70.1	49.3	47.5
14/04/2017	05:30:00	00:14:59	51.7	63.7	49.6	47.7
14/04/2017	05:45:00	00:14:59	52.5	64.8	50.3	48.6
14/04/2017	06:00:00	00:15:02	53.3	72.0	50.6	48.7

Environmental Noise Measurement Report

Date	Time	Run Duration (hh:mm:ss)	Leq dB	Lmax dB	L90	Lmin
14/04/2017	06:15:00	00:15:00	52.8	60.5	51.0	48.9
14/04/2017	06:30:00	00:14:59	54.7	66.7	52.0	50.0
14/04/2017	06:45:00	00:14:59	53.5	65.7	51.5	49.9
14/04/2017	07:00:00	00:14:59	53.7	63.5	51.1	49.2
14/04/2017	07:15:00	00:15:03	53.1	60.4	51.2	49.4
14/04/2017	07:30:00	00:15:00	53.3	61.0	51.1	49.1
14/04/2017	07:45:00	00:15:00	53.1	61.7	51.1	49.6
14/04/2017	08:00:00	00:14:59	53.4	67.4	50.8	48.9
14/04/2017	08:15:00	00:15:00	54.3	75.9	51.3	48.7
14/04/2017	08:30:00	00:15:00	52.8	62.1	51.1	49.4
14/04/2017	08:45:00	00:15:00	52.8	69.1	51.0	49.4
14/04/2017	09:00:00	00:15:00	53.3	64.0	51.3	49.4
14/04/2017	09:15:00	00:14:59	53.6	64.8	51.1	49.4
14/04/2017	09:30:00	00:15:02	54.1	66.5	51.6	50.0
14/04/2017	09:45:00	00:15:01	53.0	67.0	51.1	49.7
14/04/2017	10:00:00	00:14:59	53.3	76.7	50.8	49.4
14/04/2017	10:15:00	00:14:59	52.7	67.8	51.0	49.7
14/04/2017	10:30:00	00:15:00	53.1	63.8	51.1	49.7
14/04/2017	10:45:00	00:14:59	53.3	68.4	51.0	49.5
14/04/2017	11:00:00	00:14:59	52.5	69.6	50.6	49.2
14/04/2017	11:15:00	00:14:59	52.4	65.3	50.8	49.6
14/04/2017	11:30:00	00:15:00	52.9	64.0	50.7	49.2
14/04/2017	11:45:00	00:14:59	54.6	70.0	51.5	49.2
14/04/2017	12:00:00	00:15:00	54.5	73.7	51.0	49.4
14/04/2017	12:15:00	00:15:01	55.2	73.6	51.4	49.8
14/04/2017	12:30:00	00:14:59	56.8	73.7	51.7	49.6
14/04/2017	12:45:00	00:14:59	55.5	74.2	52.0	50.1
14/04/2017	13:00:00	00:15:00	55.3	74.6	51.1	49.4
14/04/2017	13:15:00	00:15:00	55.2	73.3	51.5	49.5
14/04/2017	13:30:00	00:15:00	56.3	72.3	51.5	49.5
14/04/2017	13:45:00	00:15:01	55.6	75.3	51.6	49.9
14/04/2017	14:00:00	00:15:00	54.6	69.0	52.1	50.4
14/04/2017	14:15:00	00:14:59	56.2	72.7	52.4	49.9
14/04/2017	14:30:00	00:15:01	56.3	71.4	52.0	50.2
14/04/2017	14:45:00	00:14:59	55.7	78.4	51.6	49.7
14/04/2017	15:00:00	00:14:59	56.7	73.7	52.1	49.8
14/04/2017	15:15:00	00:15:00	53.9	70.2	51.4	49.8
14/04/2017	15:30:00	00:15:01	56.1	78.4	51.6	49.9
14/04/2017	15:45:00	00:14:59	56.1	77.4	51.5	49.7
14/04/2017	16:00:00	00:15:01	56.9	77.2	51.7	50.2
14/04/2017	16:15:00	00:15:01	56.1	75.3	51.8	50.1
14/04/2017	16:30:00	00:15:00	56.0	72.3	52.1	50.2
14/04/2017	16:45:00	00:15:00	54.3	72.9	51.4	50.0

Environmental Noise Measurement Report

Date	Time	Run Duration (hh:mm:ss)	Leq dB	Lmax dB	L90	Lmin
14/04/2017	17:00:00	00:14:59	54.9	68.8	51.8	50.2
14/04/2017	17:15:00	00:14:59	53.6	73.4	51.3	49.6
14/04/2017	17:30:00	00:15:02	54.3	69.6	51.4	49.5
14/04/2017	17:45:00	00:14:59	53.5	68.3	51.3	49.7
14/04/2017	18:00:00	00:14:59	56.4	72.0	51.6	50.2
14/04/2017	18:15:00	00:15:01	55.4	76.1	51.9	50.0
14/04/2017	18:30:00	00:14:59	57.1	73.4	52.1	50.4
14/04/2017	18:45:00	00:15:00	56.4	76.3	51.5	49.4
14/04/2017	19:00:00	00:14:59	55.7	76.3	51.2	49.3
14/04/2017	19:15:00	00:15:00	54.3	74.1	51.0	48.3
14/04/2017	19:30:00	00:15:00	53.2	73.5	50.7	48.6
14/04/2017	19:45:00	00:15:03	53.6	69.4	50.8	49.0
14/04/2017	20:00:00	00:14:59	53.1	74.6	50.5	49.1
14/04/2017	20:15:00	00:14:59	53.6	74.7	50.2	48.0
14/04/2017	20:30:00	00:14:59	54.8	73.3	50.2	47.9
14/04/2017	20:45:00	00:15:02	55.4	75.8	50.4	48.5
14/04/2017	21:00:00	00:14:59	54.8	75.5	50.2	48.2
14/04/2017	21:15:00	00:15:01	55.5	74.2	50.3	48.4
14/04/2017	21:30:00	00:15:01	54.6	72.8	50.4	48.5
14/04/2017	21:45:00	00:14:59	57.9	78.4	51.6	48.8
14/04/2017	22:00:00	00:15:00	53.5	68.5	50.3	48.3
14/04/2017	22:15:00	00:14:59	54.5	70.3	50.5	48.2
14/04/2017	22:30:00	00:15:00	53.4	71.1	50.0	47.2
14/04/2017	22:45:00	00:14:59	51.8	67.0	49.4	47.4
14/04/2017	23:00:00	00:15:01	53.1	70.0	49.3	46.8
14/04/2017	23:15:00	00:14:59	54.3	71.0	49.4	47.2
14/04/2017	23:30:00	00:15:00	51.7	69.9	49.4	47.3
14/04/2017	23:45:00	00:15:01	51.0	62.8	49.0	46.7
15/04/2017	00:00:00	00:15:04	50.6	65.8	48.4	46.8
15/04/2017	00:15:00	00:14:59	53.7	72.0	49.1	47.0
15/04/2017	00:30:00	00:15:00	53.5	70.3	49.0	46.9
15/04/2017	00:45:00	00:15:00	51.9	69.7	48.5	46.8
15/04/2017	01:00:00	00:14:59	52.9	67.9	49.6	47.3
15/04/2017	01:15:00	00:15:01	52.3	69.5	49.2	47.4
15/04/2017	01:30:00	00:15:00	53.9	70.9	49.0	47.0
15/04/2017	01:45:00	00:15:00	50.7	64.8	47.9	45.9
15/04/2017	02:00:00	00:14:59	51.1	65.3	48.2	45.9
15/04/2017	02:15:00	00:15:00	51.1	62.7	48.3	46.3
15/04/2017	02:30:00	00:14:59	49.8	70.6	47.6	45.4
15/04/2017	02:45:00	00:14:59	49.8	60.2	47.5	45.5
15/04/2017	03:00:00	00:15:02	49.5	60.6	47.5	46.1
15/04/2017	03:15:00	00:14:59	53.2	69.0	48.4	45.8
15/04/2017	03:30:00	00:15:01	52.3	72.0	47.4	45.1

Environmental Noise Measurement Report

Date	Time	Run Duration (hh:mm:ss)	Leq dB	Lmax dB	L90	Lmin
15/04/2017	03:45:00	00:14:59	50.3	59.1	47.5	45.6
15/04/2017	04:00:00	00:15:00	50.1	60.1	47.6	45.4
15/04/2017	04:15:00	00:15:00	50.2	58.1	47.8	45.9
15/04/2017	04:30:00	00:15:00	50.5	59.1	47.9	45.3
15/04/2017	04:45:00	00:15:00	50.7	59.5	48.2	46.4
15/04/2017	05:00:00	00:15:00	50.7	57.4	48.4	45.9
15/04/2017	05:15:00	00:15:00	50.8	58.4	48.6	46.5
15/04/2017	05:30:00	00:15:01	54.2	70.9	49.1	46.6
15/04/2017	05:45:00	00:15:01	52.8	67.3	49.6	47.0
15/04/2017	06:00:00	00:15:00	52.5	65.5	49.8	47.3
15/04/2017	06:15:00	00:14:59	52.1	66.7	49.9	48.5
15/04/2017	06:30:00	00:15:00	53.3	66.8	51.4	49.4
15/04/2017	06:45:00	00:15:01	53.0	65.4	50.7	48.6
15/04/2017	07:00:00	00:15:01	55.8	74.4	51.6	49.0
15/04/2017	07:15:00	00:15:00	56.7	73.7	52.0	49.1
15/04/2017	07:30:00	00:15:01	55.3	71.7	52.1	50.0
15/04/2017	07:45:00	00:15:01	54.3	71.7	51.4	49.5
15/04/2017	08:00:00	00:15:00	55.8	72.3	51.7	49.7
15/04/2017	08:15:00	00:15:00	53.7	65.8	51.4	49.3
15/04/2017	08:30:00	00:15:02	54.6	72.5	51.3	48.9
15/04/2017	08:45:00	00:14:59	60.8	79.5	52.0	49.7
15/04/2017	09:00:00	00:14:59	57.1	75.3	51.9	49.8
15/04/2017	09:15:00	00:14:59	57.9	75.6	51.9	49.6
15/04/2017	09:30:00	00:15:00	58.9	78.3	51.5	49.4
15/04/2017	09:45:00	00:14:59	60.8	78.3	52.8	50.2
15/04/2017	10:00:00	00:15:01	62.1	78.4	52.5	49.7
15/04/2017	10:15:00	00:15:00	62.1	78.2	52.6	50.1
15/04/2017	10:30:00	00:15:00	58.0	74.1	52.5	50.0
15/04/2017	10:45:00	00:14:59	62.9	79.6	53.1	50.2
15/04/2017	11:00:00	00:15:02	61.4	78.9	52.4	50.0
15/04/2017	11:15:00	00:15:00	59.8	75.1	52.7	50.3
15/04/2017	11:30:00	00:14:59	58.8	77.2	52.4	50.3
15/04/2017	11:45:00	00:15:00	60.9	79.1	52.2	50.0
15/04/2017	12:00:00	00:15:01	59.1	76.0	52.5	50.3
15/04/2017	12:15:00	00:15:00	55.8	74.4	51.4	49.3
15/04/2017	12:30:00	00:14:59	55.2	72.4	51.2	49.1
15/04/2017	12:45:00	00:15:00	55.3	72.2	51.2	49.5
15/04/2017	13:00:00	00:14:59	57.0	73.2	52.2	49.4
15/04/2017	13:15:00	00:15:01	57.1	76.7	51.6	49.6
15/04/2017	13:30:00	00:15:00	58.8	76.8	51.3	49.2
15/04/2017	13:45:00	00:14:59	54.9	71.1	51.8	50.0
15/04/2017	14:00:00	00:14:59	54.8	75.9	51.4	48.8
15/04/2017	14:15:00	00:14:59	55.6	72.6	51.4	49.7

Environmental Noise Measurement Report

Date	Time	Run Duration (hh:mm:ss)	Leq dB	Lmax dB	L90	Lmin
15/04/2017	14:30:00	00:15:01	57.8	77.5	51.6	49.3
15/04/2017	14:45:00	00:15:01	56.6	72.6	51.4	49.4
15/04/2017	15:00:00	00:14:59	58.9	76.7	51.8	49.2
15/04/2017	15:15:00	00:14:59	59.6	77.9	51.6	49.5
15/04/2017	15:30:00	00:14:59	58.8	75.8	52.0	49.8
15/04/2017	15:45:00	00:15:01	58.4	78.6	52.5	49.8
15/04/2017	16:00:00	00:15:00	61.1	78.6	51.9	49.8
15/04/2017	16:15:00	00:15:00	61.4	79.8	53.1	50.2
15/04/2017	16:30:00	00:15:00	56.1	69.4	51.9	50.0
15/04/2017	16:45:00	00:14:59	58.6	77.3	52.6	50.3
15/04/2017	17:00:00	00:14:59	57.6	75.9	52.3	49.5
15/04/2017	17:15:00	00:15:00	59.3	76.3	52.2	49.3
15/04/2017	17:30:00	00:15:01	55.3	75.2	51.9	49.7
15/04/2017	17:45:00	00:14:59	56.9	73.2	52.3	49.5
15/04/2017	18:00:00	00:14:59	57.7	69.6	52.1	49.6
15/04/2017	18:15:00	00:15:00	58.6	78.3	52.2	50.1
15/04/2017	18:30:00	00:15:01	58.1	75.6	52.3	49.3
15/04/2017	18:45:00	00:15:00	56.5	74.1	52.0	48.9
15/04/2017	19:00:00	00:14:59	56.5	71.5	51.7	50.0
15/04/2017	19:15:00	00:15:00	54.9	72.6	51.0	48.2
15/04/2017	19:30:00	00:14:59	54.2	71.2	51.2	48.9
15/04/2017	19:45:00	00:15:01	53.6	65.6	51.2	49.2
15/04/2017	20:00:00	00:14:59	54.8	74.2	50.8	48.9
15/04/2017	20:15:00	00:15:00	55.4	71.3	51.1	48.6
15/04/2017	20:30:00	00:15:02	52.9	69.1	50.5	48.7
15/04/2017	20:45:00	00:15:00	54.6	68.1	51.2	49.4
15/04/2017	21:00:00	00:14:59	55.3	72.0	51.4	49.5
15/04/2017	21:15:00	00:15:00	54.7	70.4	50.8	48.2
15/04/2017	21:30:00	00:15:00	53.7	66.2	51.0	49.1
15/04/2017	21:45:00	00:15:00	54.4	71.4	51.1	49.2
15/04/2017	22:00:00	00:14:59	55.4	71.0	51.5	48.8
15/04/2017	22:15:00	00:15:00	54.7	69.4	51.0	48.9
15/04/2017	22:30:00	00:15:00	57.0	75.9	50.5	47.7
15/04/2017	22:45:00	00:15:01	53.5	69.8	50.9	48.5
15/04/2017	23:00:00	00:14:59	53.2	71.5	50.2	48.0
15/04/2017	23:15:00	00:14:59	52.9	65.5	50.4	47.7
15/04/2017	23:30:00	00:14:59	52.4	61.3	50.2	48.1
15/04/2017	23:45:00	00:15:03	56.2	69.7	49.9	48.2
16/04/2017	00:00:00	00:14:59	52.2	66.0	50.3	48.5
16/04/2017	00:15:00	00:15:00	52.2	65.0	49.8	47.7
16/04/2017	00:30:00	00:14:59	52.2	66.6	50.5	48.5
16/04/2017	00:45:00	00:14:59	51.4	61.0	49.7	48.2
16/04/2017	01:00:00	00:14:59	51.6	62.0	49.2	47.4

Environmental Noise Measurement Report

Date	Time	Run Duration (hh:mm:ss)	Leq dB	Lmax dB	L90	Lmin
16/04/2017	01:15:00	00:14:59	52.1	66.3	49.7	47.9
16/04/2017	01:30:00	00:15:00	51.4	69.6	49.3	47.3
16/04/2017	01:45:00	00:15:01	50.5	60.5	49.0	47.4
16/04/2017	02:00:00	00:15:01	51.6	68.0	48.9	47.2
16/04/2017	02:15:00	00:15:00	50.5	65.2	48.9	46.9
16/04/2017	02:30:00	00:15:02	50.5	65.3	48.3	46.9
16/04/2017	02:45:00	00:15:00	49.7	56.6	48.5	46.6
16/04/2017	03:00:00	00:14:59	49.7	60.0	48.3	46.6
16/04/2017	03:15:00	00:14:59	50.9	67.9	48.6	46.7
16/04/2017	03:30:00	00:15:00	49.9	55.7	48.1	46.4
16/04/2017	03:45:00	00:15:01	54.1	73.1	48.4	46.2
16/04/2017	04:00:00	00:14:59	49.6	57.8	47.7	46.3
16/04/2017	04:15:00	00:14:59	49.0	56.2	47.3	45.7
16/04/2017	04:30:00	00:15:00	50.1	60.1	47.8	45.6
16/04/2017	04:45:00	00:14:59	54.1	75.0	47.7	45.7
16/04/2017	05:00:00	00:14:59	50.9	61.2	48.6	46.5
16/04/2017	05:15:00	00:15:01	50.9	62.5	48.9	47.3
16/04/2017	05:30:00	00:15:00	51.3	61.7	49.4	47.3
16/04/2017	05:45:00	00:14:59	50.8	61.0	49.0	47.1
16/04/2017	06:00:00	00:15:00	50.9	62.2	49.4	47.3
16/04/2017	06:15:00	00:15:00	52.7	65.1	49.2	47.9
16/04/2017	06:30:00	00:14:59	51.8	66.3	49.5	47.7
16/04/2017	06:45:00	00:14:59	52.5	66.7	50.0	48.0
16/04/2017	07:00:00	00:14:59	53.3	68.5	49.9	48.4
16/04/2017	07:15:00	00:15:00	52.8	66.8	50.0	47.6
16/04/2017	07:30:00	00:15:02	51.7	60.2	49.9	48.3
16/04/2017	07:45:00	00:15:00	53.3	74.6	50.3	47.7
16/04/2017	08:00:00	00:15:00	52.3	64.4	50.2	47.7
16/04/2017	08:15:00	00:15:01	54.7	70.5	50.9	48.9
16/04/2017	08:30:00	00:14:59	56.3	77.3	50.9	48.5
16/04/2017	08:45:00	00:14:59	55.6	72.5	51.0	48.9
16/04/2017	09:00:00	00:15:01	56.1	75.1	50.5	48.6
16/04/2017	09:15:00	00:15:00	57.7	78.9	51.3	48.6
16/04/2017	09:30:00	00:15:02	55.8	73.9	50.5	48.1
16/04/2017	09:45:00	00:15:00	54.2	69.7	51.0	48.6
16/04/2017	10:00:00	00:14:59	57.2	75.2	50.8	48.2
16/04/2017	10:15:00	00:14:59	54.7	70.6	51.0	49.0
16/04/2017	10:30:00	00:15:00	53.8	70.3	50.5	48.6
16/04/2017	10:45:00	00:15:00	55.3	69.9	51.2	48.8
16/04/2017	11:00:00	00:14:59	54.6	71.6	50.6	48.3
16/04/2017	11:15:00	00:14:59	56.5	75.8	51.4	48.7
16/04/2017	11:30:00	00:15:00	56.8	74.9	51.3	48.8
16/04/2017	11:45:00	00:15:00	62.8	77.4	52.4	49.2

Environmental Noise Measurement Report

Date	Time	Run Duration (hh:mm:ss)	Leq dB	Lmax dB	L90	Lmin
16/04/2017	12:00:00	00:14:59	56.1	74.5	51.1	48.8
16/04/2017	12:15:00	00:14:59	56.1	73.7	50.6	48.1
16/04/2017	12:30:00	00:14:59	54.6	76.5	50.7	48.9
16/04/2017	12:45:00	00:15:00	53.9	69.5	50.6	48.8
16/04/2017	13:00:00	00:15:00	56.2	72.0	50.6	48.5
16/04/2017	13:15:00	00:15:00	55.9	72.3	51.0	49.0
16/04/2017	13:30:00	00:15:00	54.9	70.9	51.1	49.2
16/04/2017	13:45:00	00:15:01	56.1	72.0	51.4	49.2
16/04/2017	14:00:00	00:14:59	54.1	67.7	51.1	48.1
16/04/2017	14:15:00	00:15:00	55.9	72.4	50.8	48.5
16/04/2017	14:30:00	00:15:00	54.8	68.6	50.9	48.7
16/04/2017	14:45:00	00:15:00	55.4	75.2	50.9	48.8
16/04/2017	15:00:00	00:14:59	59.2	76.7	51.7	49.0
16/04/2017	15:15:00	00:15:02	57.7	76.4	51.2	49.4
16/04/2017	15:30:00	00:15:00	55.2	73.7	51.4	49.4
16/04/2017	15:45:00	00:14:59	56.3	74.6	51.4	49.8
16/04/2017	16:00:00	00:14:59	57.5	75.1	52.2	50.0
16/04/2017	16:15:00	00:14:59	58.0	76.9	52.0	50.2
16/04/2017	16:30:00	00:15:01	55.1	71.8	51.1	49.3
16/04/2017	16:45:00	00:14:59	55.0	71.4	51.4	49.6
16/04/2017	17:00:00	00:15:01	54.3	70.7	51.1	48.8
16/04/2017	17:15:00	00:15:00	55.6	74.9	51.5	49.0
16/04/2017	17:30:00	00:15:01	55.0	73.8	51.0	49.1
16/04/2017	17:45:00	00:15:00	55.9	70.5	51.9	50.1
16/04/2017	18:00:00	00:14:59	58.9	74.3	52.1	49.6
16/04/2017	18:15:00	00:15:01	56.2	72.4	51.8	49.3
16/04/2017	18:30:00	00:15:00	54.8	69.7	51.7	49.9
16/04/2017	18:45:00	00:14:59	56.9	75.8	51.3	48.9
16/04/2017	19:00:00	00:15:00	52.8	64.4	50.6	48.8
16/04/2017	19:15:00	00:15:00	53.5	67.0	50.7	48.6
16/04/2017	19:30:00	00:14:59	53.0	67.6	50.5	48.4
16/04/2017	19:45:00	00:15:00	52.7	71.0	49.6	47.9
16/04/2017	20:00:00	00:15:03	54.2	73.7	50.4	48.9
16/04/2017	20:15:00	00:15:01	54.5	70.3	51.2	49.2
16/04/2017	20:30:00	00:15:02	54.0	74.6	50.4	48.3
16/04/2017	20:45:00	00:14:59	53.9	71.4	50.5	48.4
16/04/2017	21:00:00	00:15:01	53.3	66.1	50.5	48.1
16/04/2017	21:15:00	00:14:59	54.6	68.6	50.6	48.0
16/04/2017	21:30:00	00:14:59	53.6	71.2	50.5	48.5
16/04/2017	21:45:00	00:15:00	52.7	64.9	50.3	47.6
16/04/2017	22:00:00	00:15:00	54.1	66.2	50.1	48.0
16/04/2017	22:15:00	00:15:01	54.6	73.4	50.4	47.5
16/04/2017	22:30:00	00:15:01	54.5	65.9	52.4	49.8

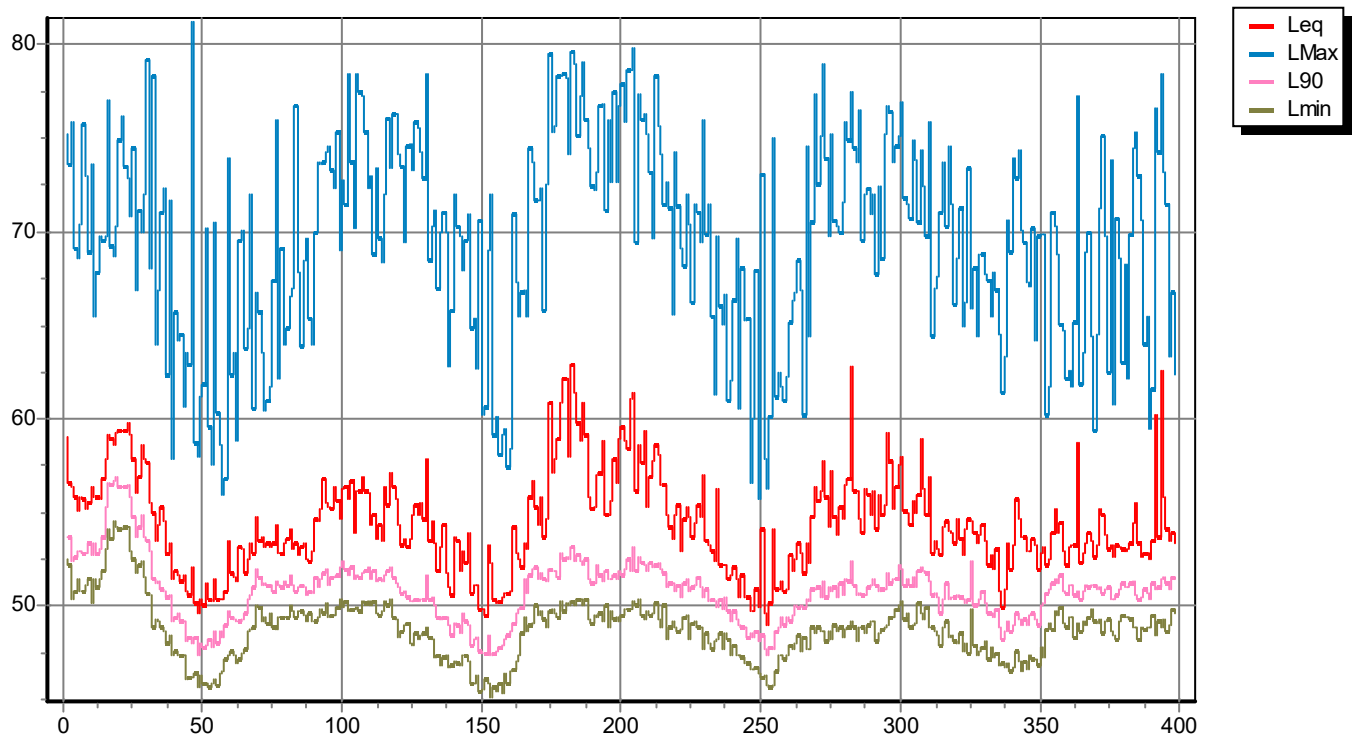
Environmental Noise Measurement Report

Date	Time	Run Duration (hh:mm:ss)	Leq dB	Lmax dB	L90	Lmin
16/04/2017	22:45:00	00:15:00	53.9	68.0	50.0	47.9
16/04/2017	23:00:00	00:15:01	53.4	64.4	50.0	47.3
16/04/2017	23:15:00	00:15:01	53.8	68.8	50.3	47.6
16/04/2017	23:30:00	00:14:59	54.3	68.8	50.8	47.8
16/04/2017	23:45:00	00:14:59	53.5	67.7	50.1	48.1
17/04/2017	00:00:00	00:15:02	52.2	67.4	49.6	47.1
17/04/2017	00:15:00	00:14:59	52.7	65.4	49.6	47.8
17/04/2017	00:30:00	00:14:59	52.0	67.8	49.4	47.2
17/04/2017	00:45:00	00:15:00	53.0	66.8	49.8	47.5
17/04/2017	01:00:00	00:15:00	50.8	64.5	48.8	46.8
17/04/2017	01:15:00	00:15:00	49.9	61.4	48.2	46.9
17/04/2017	01:30:00	00:14:59	50.9	63.3	48.6	46.7
17/04/2017	01:45:00	00:14:59	53.3	70.6	49.2	46.9
17/04/2017	02:00:00	00:15:02	52.0	68.9	48.6	46.5
17/04/2017	02:15:00	00:15:00	53.2	73.9	49.0	46.7
17/04/2017	02:30:00	00:14:59	55.7	72.8	49.6	47.6
17/04/2017	02:45:00	00:15:00	54.6	74.3	49.3	47.0
17/04/2017	03:00:00	00:14:59	53.7	70.1	49.0	46.5
17/04/2017	03:15:00	00:15:02	53.7	69.4	49.3	47.0
17/04/2017	03:30:00	00:14:59	52.9	67.3	49.0	46.6
17/04/2017	03:45:00	00:15:00	52.9	67.1	49.5	47.3
17/04/2017	04:00:00	00:14:59	53.6	70.2	49.6	47.1
17/04/2017	04:15:00	00:15:01	53.2	64.2	49.3	47.1
17/04/2017	04:30:00	00:14:59	52.0	69.7	49.0	46.8
17/04/2017	04:45:00	00:14:59	52.8	69.8	50.0	47.8
17/04/2017	05:00:00	00:14:59	53.1	69.8	50.1	47.2
17/04/2017	05:15:00	00:14:59	52.2	60.2	50.7	48.7
17/04/2017	05:30:00	00:15:01	52.5	61.7	50.9	49.1
17/04/2017	05:45:00	00:15:00	53.9	71.0	51.2	48.7
17/04/2017	06:00:00	00:15:00	55.2	70.3	51.4	49.7
17/04/2017	06:15:00	00:15:00	53.9	68.8	51.2	49.5
17/04/2017	06:30:00	00:14:59	54.4	65.0	51.6	49.9
17/04/2017	06:45:00	00:14:59	52.9	64.7	50.8	49.1
17/04/2017	07:00:00	00:14:59	52.2	62.1	50.7	48.9
17/04/2017	07:15:00	00:15:00	53.1	62.6	51.1	49.4
17/04/2017	07:30:00	00:15:01	53.2	61.7	51.1	49.4
17/04/2017	07:45:00	00:15:01	53.2	65.1	50.6	48.3
17/04/2017	08:00:00	00:14:59	58.7	77.2	50.8	49.1
17/04/2017	08:15:00	00:15:00	52.3	61.8	50.4	48.6
17/04/2017	08:30:00	00:15:00	52.8	63.5	50.8	49.2
17/04/2017	08:45:00	00:14:59	53.3	68.9	51.1	49.0
17/04/2017	09:00:00	00:15:00	53.9	70.0	51.0	49.4
17/04/2017	09:15:00	00:14:59	53.5	64.4	51.1	49.8

Environmental Noise Measurement Report

Date	Time	Run Duration (hh:mm:ss)	Leq dB	Lmax dB	L90	Lmin
17/04/2017	09:30:00	00:14:59	52.6	59.4	51.1	49.2
17/04/2017	09:45:00	00:14:59	53.2	64.5	50.9	49.1
17/04/2017	10:00:00	00:14:59	55.2	71.2	51.0	49.3
17/04/2017	10:15:00	00:15:01	54.9	75.1	50.7	48.5
17/04/2017	10:30:00	00:15:00	53.8	69.7	50.9	49.2
17/04/2017	10:45:00	00:15:02	53.0	62.5	51.0	49.3
17/04/2017	11:00:00	00:15:01	53.2	73.8	50.4	48.6
17/04/2017	11:15:00	00:15:00	52.6	60.7	50.4	48.4
17/04/2017	11:30:00	00:15:01	53.2	70.7	50.6	48.2
17/04/2017	11:45:00	00:14:59	53.1	68.6	50.9	49.2
17/04/2017	12:00:00	00:14:59	53.0	63.0	51.2	49.5
17/04/2017	12:15:00	00:15:00	52.9	68.2	51.0	49.4
17/04/2017	12:30:00	00:14:59	53.0	62.1	51.0	49.4
17/04/2017	12:45:00	00:15:01	53.3	69.8	51.2	49.3
17/04/2017	13:00:00	00:15:00	54.4	74.4	51.3	48.9
17/04/2017	13:15:00	00:15:00	55.5	75.3	50.6	48.8
17/04/2017	13:30:00	00:14:59	53.4	72.9	50.4	48.2
17/04/2017	13:45:00	00:14:59	52.6	70.6	50.5	48.8
17/04/2017	14:00:00	00:14:59	52.8	64.0	50.9	48.7
17/04/2017	14:15:00	00:15:01	52.8	65.4	50.7	48.9
17/04/2017	14:30:00	00:15:00	52.5	59.5	50.4	48.9
17/04/2017	14:45:00	00:14:59	53.5	61.6	51.2	49.5
17/04/2017	15:00:00	00:15:00	60.2	76.6	50.9	48.4
17/04/2017	15:15:00	00:15:00	53.7	74.2	51.0	49.2
17/04/2017	15:30:00	00:14:59	62.6	78.4	51.4	48.9
17/04/2017	15:45:00	00:15:00	55.8	73.2	51.5	49.3
17/04/2017	16:00:00	00:14:59	54.1	71.4	51.2	48.6
17/04/2017	16:15:00	00:15:00	53.5	63.3	50.9	49.0
17/04/2017	16:30:00	00:15:00	53.9	66.7	51.5	49.8
17/04/2017	16:45:00	00:08:01	53.4	62.4	51.4	49.6

Environmental Noise Measurement Report



Assessment made by: B Costello

Date: 04/05/2017