

CONABEARE



ACOUSTICS

ACOUSTIC REPORT

Ref No: CS 7115-2

**Royal Free Hospital
CAAP NAC Project
(East Roof)**

30th November 2011

Prepared By:

John E Redknap MBA, MIOA, MCMI

Checked By:

David Whymark - Director

Client:

**Royal Free Hampstead NHS Trust
Pond Street
Hampstead
London NW3 2QG**

Conabeare Acoustics Limited

10 Chiltern Enterprise Centre, Station Road, Theale, Berkshire. RG7 4AA
Telephone 0118 930 3650 Facsimile 0118 930 3912
sales@conabeare.co.uk



FORWARD

As part of the CAPP NAC Project, new external plant is being proposed on the roof of the site. A pre-installation acoustic survey and report is therefore required to establish compliance or otherwise with the planning requirements of the local council for this area.

Conabeare Acoustics Limited has been commissioned to undertake an Environmental Sound Survey at the proposed roof location. The results of the survey will establish the Background Sound Level to enable checks to be made on the new mechanical services plant in order that they comply with planning requirements.

SUMMARY

The lowest measured Background Sound Levels $L_{A90,15MIN}$ were as follows:

$L_{A90-15min}$	55.2dB(A) between 07:00 hours to 19:00 hours (Day Time)
$L_{A90-15min}$	57.1dB(A) between 19:00 hours to 23:00 hours (Evening)
$L_{A90-15min}$	56.7dB(A) between 23:00 hours to 07:00 hours (Night Time)

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CONABEARE ACOUSTICS

1. Author

John E Redknap MBA, MIOA, MCMI

The author has been practising in noise control engineering since 1985. He has gained a wide range of experience over this period and is employed as a Sales Engineer for **Conabeare Acoustics Ltd.**

2. Client

The survey and report has been undertaken on behalf of:

**Royal Free Hospital
Pond Street
Hampstead
London NW3 2QG**

3. Introduction

As part of the CAPP NAC Project, new external plant is being proposed on the roof of the site. A pre-installation acoustic survey and report is therefore required to establish compliance or otherwise with the planning requirements of the local council for this area. Conabeare Acoustics Limited has therefore been commissioned to undertake an Environmental Sound Survey of the area.

The Environmental Sound Survey has now been carried out to establish the existing Background Sound Levels. The results of the Environmental Sound Survey are used as a datum so that acoustic calculations can be undertaken to determine the likely impact of the proposed plant on the nearest sound sensitive locations.

4. Noise Principles

The Environmental Sound Survey has been carried out in accordance with the principles of BS7445-1 (2003) to establish the existing Background Sound Levels. The Background Sound Level measured is in terms of A-weighted sound pressure level L_{A90} with a time interval of 15 minutes.



5. The Site

The main entrance to the hospital is off Pond Street, London, NW3. The proposed new plant is to be located on a roof to the rear of the site. The proposed plant location is detailed on the attached Schofield Lothian drawing number M/010 dated July 2011. This drawing also contains our notes relating to the microphone location and residential properties. Other plant was clearly visible on the roof – some of which is also indicated on the attached drawing.

Residential properties were evident at some distance from the roof, as indicated towards the bottom of the drawing.

The general ambient noise level in the area is expected to be a combination of noise from the mechanical services plant and the local traffic.

6. Measurement Methodology

A SVAN949 (Precision) Environmental Sound Level Analyser, fitted with an Electret Microphone was set up on the edge of the proposed roof, with the tripod secured to an existing safety hand rail – see the attached location photograph.

The survey was carried out from 10:59 hours on Thursday 3rd November 2011, until 10:29 hours on Friday 4th November 2011.

The Analyser was programmed to produce the following indices:

$L_{AEQ-15min}$, $L_{A90-15min}$, $L_{A10-15min}$

Attached for your reference is a Glossary of these terms.

The analyser was checked for calibration before the survey commenced and at the end of survey with a CEL 284/2 Class 1 calibrator with no measurable deviation.

The weather during the survey period was generally dry with partly cloudy skies.

Having reviewed the results of our survey, it is our opinion that the weather experienced over the survey period has not had any detrimental effect on the recorded readings and therefore on our recommendations.



7. Planning Noise Requirements

The Planning noise requirement of this area usually states, that any proposed plant should be at least 10dBA below the Background Sound level (L_{A90}) measured at 1 metre from the nearest effected residential property. Allowance should also be made for any tonal noise emanating from the proposed units.

8. Assessment

The objective of any specification limiting sound should be to ensure that sound emissions from the proposed plant should not materially add to the existing ambient noise climate when measured 1m from the nearest effected property window.

The level at which the target should be set is normally specified by the planning authority in their planning consent conditions.

In the absence of any such specification, we would recommend setting a limit on the proposed plant sound level as follows, with the proviso that any sound produced by this plant must be quite free of any audibly evident, tonality or similar characteristics.

The lowest measured Background Sound Levels $L_{A90,15MIN}$ were as follows:

$L_{A90-15min}$	55.2dB(A) between 07:00 hours to 19:00 hours (Day Time)
$L_{A90-15min}$	57.1dB(A) between 19:00 hours to 23:00 hours (Evening)
$L_{A90-15min}$	56.7dB(A) between 23:00 hours to 07:00 hours (Night Time)

Whilst the Sound Level Analyser was positioned as remote as possible from any existing mechanical plant, the readings in our opinion, have been influenced by some of the surrounding mechanical services plant.

We have therefore investigated other survey's we have carried out at the hospital. We have found a survey undertaken at the end of August 2010, under report reference CS6884-1, on an adjacent lower roof (nom. two floors lower than the current roof). See the location photographs and also the marked drawing attached

Using data from this survey we would propose that the 24hour design target be reduced from 47dB(A) to 42dB(A). We would consider this level as a more representative figure on this particular project.

The above limits should be achieved with all plant operating normally, any plant exhibiting characteristics which are tonal or intermittent in nature should be designed to criteria 5dB(A) more stringent than those levels shown above. Allowances should also be made for the additional effect of multiple noise sources if applicable.



From the frequency analysis the plant does not exhibit any distinct tonal characteristics and so the additional 5dB(A) penalty is not required.

We have assumed for the purposes of this report that the proposed new plant may operate 24hours a day and so we would recommend that the equipment is designed to achieve a level of 42dB(A) at the nearest noise sensitive windows.

Following our site survey we have established that there is only one location to be considered as the nearest noise sensitive window. These belong to residential properties opposite the proposed plant location. The top floor residential windows are three floors lower than the roof level and estimated to be 63m from the proposed plant location – the windows are referenced as Assessment Location “A”.

The attached Calculation Sheet One is for Assessment Location A. This sheet illustrates that at 1 metre from the façade the Specific Sound Level would be 22dB(A) without the introduction of any acoustic treatment. This figure is below the proposed design target of 42dB(A) and should therefore meet the planning requirements of the local authority.

In our opinion all of the above would generally be acceptable to the local authority for this area, but all design targets should as a matter of course should be verified with the local Environmental Health or Planning Departments.

9. Sound Level Measurements

The statistical readings obtained during the survey are attached to this report and are presented in both graphical and tabular form.

10. Glossary of Terms

L_{A90}	The sound pressure level in dB(A) which is exceeded for 90% of the time and is taken to be the effective lowest background sound level for the period by such methods of sound rating as that recommended in British Standard 4142. It will also be used as a basis for selecting limiting sound levels from new plant by Local Planning Authorities when setting Planning Consent Conditions.
L_{eq}	The “equivalent continuous sound level” for the measuring period, defined as the level in dB(A) which, if held constant over the measuring period, would produce the same amount of sound energy as does the actual varying ambient sound level. It is a measure of the amount of sound energy affecting the site from sources other than new plant or operations.
L_{A10}	The sound level exceeded for 10% of the time over the sample period. Originally used as a measure of subjective reaction to traffic noise in particular, it can also be taken as an indication of the practical maximum sound level that the building envelope will have to protect against.
dB(A)	Describes measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people’s assessment of loudness. A change of 3dB(A) is the minimum perceptible under normal conditions, and a change of 10dB(A) corresponds roughly to halving or doubling the loudness of a sound.

11. Location Photograph



Nearest
Residential
Property shown
in Background

Microphone mounted
on a tripod secured to
an existing safety
hand rail

CS7115-2
30th Nov 2011

- NOTES:
1. This drawing is the property of Schofield Lothian and must not be reproduced in whole or part or used for the construction of any other building.
 2. All dimensions to centres.
 3. See schedule of materials.
 4. This note is to be used to check all dimensions of all work and to be used to check all work to be done.

EAST Roof

TENDER DRAWING

REVISIONS	No.	Date	Description

schofieldlothian
3-7 Temple Chambers
London EC4Y 0DT
Tel: (0207) 842 0920

PROJECT
ROYAL FREE HAMPSTEAD
CAAPP NAC Project

CLIENT
Royal Free Hampstead **NHS**
Trust

DATE July 2011	SCALE 1:20	PAPER SIZE A1
DR-UN BY AH	CHECKED BY BD	

DESIGNED BY
ROOF LEVEL
PROPOSED MECHANICAL
SERVICES LAYOUT (EAST)

JOB NO. RFH001	ISSUED NO. M/010
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CAMERA ROOM CONDENSING
UNITS LOCATED ON PAVING
SLABS ON ROOF (APPROX SIZE
1170H x 900W x 320D EACH)



TOILET 1200
1500

NEW
PLANT

EXISTING EXTRACT FAN
AND DUCTWORK

EXISTING CONDENSING UNITS
LOCATED ON ROOF

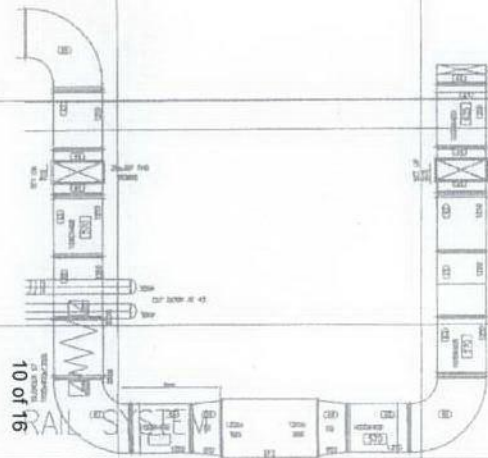


RESIDENTIAL PROPERTIES

MICROPHONE POSITION
WAS AT HANDRAIL
LOCATION - SEE PHOTO

REFRIGERATION PIPEWORK
PENETRATES THROUGH ROOF
TO PLANTROOM BELOW

EXISTING ROOF
MOUNTED COILS



CONABEARE ACOUSTICS LTD CALCULATION SHEET - ONE

CLIENT: Royal Free Hampstead NHS Trust		PROJECT: CAAPP NAC Project								
		DATE: 30th Nov 2011								
Roof Top Plant		Conabeare Acoustics ref: CS7115								
		Octave Band Centre Frequency (Hz)								
Description		63	125	250	500	1K	2K	4K	8K	dB(A)
LOCATION 'A' ASSESSMENT										
Daikin RZQ125BW1	Lp @ 1m	56	54	53	50	47	43	37	30	
Daikin RZQ125BW1	Lp @ 1m	56	54	53	50	47	43	37	30	
Combined Total		59	57	56	53	50	46	40	33	55
Additional Surface Reflections	One	3	3	3	3	3	3	3	3	
Screening via building		-6	-6	-7	-8	-9	-10	-11	-12	
Additional Distance 1 to 63m to nearest window		-31	-31	-31	-31	-31	-31	-31	-31	
Façade Correction		3	3	3	3	3	3	3	3	
Lp @1m from receivers façade		28	26	24	20	16	11	4	-4	22

24hour design target = 42

Additional screening required	No	0	0	0	0	0	0	0	0	
Lp @1m from receivers façade		28	26	24	20	16	11	4	-4	22

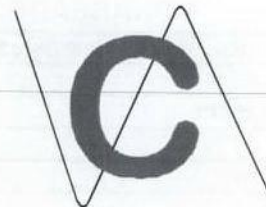
24hour design target = 42

Notes

Calculations are to the nearest top floor windows of the residential properties three floors down from the roof
 No allowance has been made for any noise/vibration transfer through floor/structure in the above calculations
 Vibration isolation will be required for the new plant

Header information for the file[1] @CAL3845

Device type	SVAN 949
Serial No.	8572
Internal software version ...	5.13
File system version	5.12
Original file name	@CAL3845
Measurement hour	10:59'14
Measurement day	03/11/11
Device function	OCTAVE 1/1
Title text:	
Input	Microphone
Mic. polarization	0 V
Mic. field correction	FREE
Mic. outdoor filter	OFF
Compensation filter	OFF
Measurement range	105 dB
Leq integration	Linear
Trig. mode	OFF
Start delay	1 s
Integration time def.	15 m
Repetition cycle	Infinity
Number of spectra	1
Octave 1/1 lines	15+3
Octave 1/1 filter	Lin
Octave 1/1 in buffer	OFF
Number of histograms	3+18
Calibration type	Measuremer
Calibration time	10:51'36
Calibration date	03/11/11
Rotation measurement	OFF
Profile: #1	
Weighting filter	A
Detector type	Fast
Buffer contents definition ..	None
Calibration factor	2.5 dB



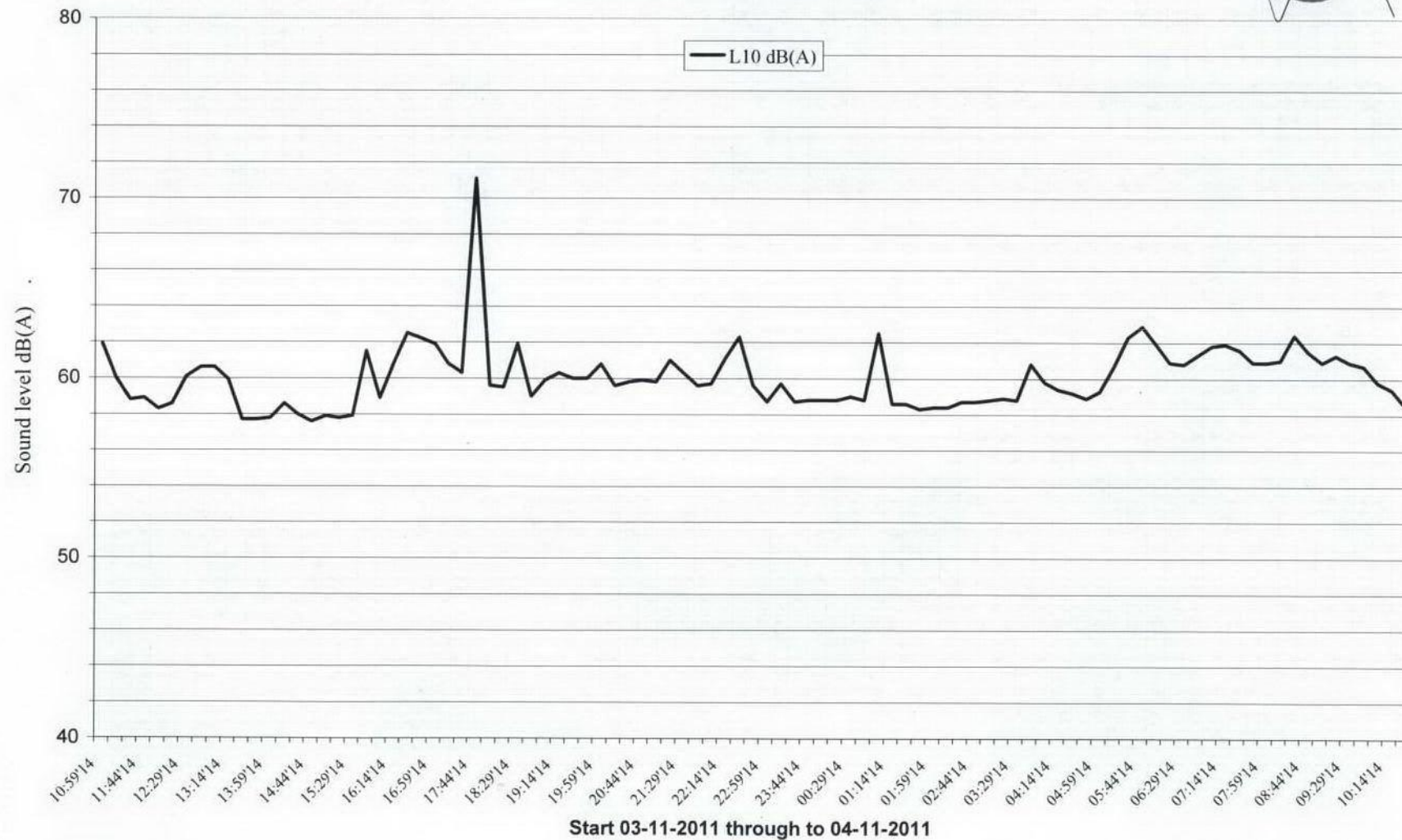
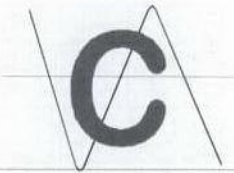
Main results:

File	Date	Start	Filter	Detect	Time	units	Leq (A)	L1 dB(A)	L10 dB(A)	L90 dB(A)
@CAL3845	03/11/11	10:59'14	A	Fast	00:15'00	dB	60.1	68.4	61.9	57.0
@CAL3846	03/11/11	11:14'14	A	Fast	00:15'00	dB	58.5	62.9	60.0	56.5
@CAL3847	03/11/11	11:29'14	A	Fast	00:15'00	dB	58.3	67.0	58.8	56.2
@CAL3848	03/11/11	11:44'14	A	Fast	00:15'00	dB	58.8	69.0	58.9	56.2
@CAL3849	03/11/11	11:59'14	A	Fast	00:15'00	dB	57.5	60.8	58.3	56.3
@CAL3850	03/11/11	12:14'14	A	Fast	00:15'00	dB	57.6	62.9	58.6	56.1
@CAL3851	03/11/11	12:29'14	A	Fast	00:15'00	dB	58.7	63.6	60.1	56.8
@CAL3852	03/11/11	12:44'14	A	Fast	00:15'00	dB	58.8	64.5	60.6	56.6
@CAL3853	03/11/11	12:59'14	A	Fast	00:15'00	dB	59.0	63.8	60.6	57.1
@CAL3854	03/11/11	13:14'14	A	Fast	00:15'00	dB	58.5	63.2	59.9	56.6
@CAL3855	03/11/11	13:29'14	A	Fast	00:15'00	dB	56.6	60.1	57.7	55.3
@CAL3856	03/11/11	13:44'14	A	Fast	00:15'00	dB	56.7	61.6	57.7	55.2
@CAL3857	03/11/11	13:59'14	A	Fast	00:15'00	dB	57.0	63.4	57.8	55.3
@CAL3858	03/11/11	14:14'14	A	Fast	00:15'00	dB	57.3	62.4	58.6	56.0
@CAL3859	03/11/11	14:29'14	A	Fast	00:15'00	dB	56.7	60.8	58.0	55.2
@CAL3860	03/11/11	14:44'14	A	Fast	00:15'00	dB	56.5	61.2	57.6	55.2
@CAL3861	03/11/11	14:59'14	A	Fast	00:15'00	dB	56.8	60.0	57.9	55.5
@CAL3862	03/11/11	15:14'14	A	Fast	00:15'00	dB	56.9	61.7	57.8	55.4
@CAL3863	03/11/11	15:29'14	A	Fast	00:15'00	dB	57.4	63.9	57.9	56.0
@CAL3864	03/11/11	15:44'14	A	Fast	00:15'00	dB	61.9	74.2	61.5	56.0
@CAL3865	03/11/11	15:59'14	A	Fast	00:15'00	dB	57.7	61.5	58.9	56.1
@CAL3866	03/11/11	16:14'14	A	Fast	00:15'00	dB	59.6	64.7	60.8	58.0
@CAL3867	03/11/11	16:29'14	A	Fast	00:15'00	dB	61.5	67.2	62.5	60.0
@CAL3868	03/11/11	16:44'14	A	Fast	00:15'00	dB	61.2	65.2	62.2	60.0
@CAL3869	03/11/11	16:59'14	A	Fast	00:15'00	dB	61.7	71.4	61.9	59.3
@CAL3870	03/11/11	17:14'14	A	Fast	00:15'00	dB	61.6	73.0	60.8	58.5
@CAL3871	03/11/11	17:29'14	A	Fast	00:15'00	dB	59.2	62.6	60.3	58.1
@CAL3872	03/11/11	17:44'14	A	Fast	00:15'00	dB	72.8	86.6	71.1	58.0

Main results:										
File	Date	Start	Filter	Detect	Time	units	Leq (A)	L1 dB(A)	L10 dB(A)	L90 dB(A)
@CAL3873	03/11/11	17:59'14	A	Fast	00:15'00	dB	58.7	61.3	59.6	57.6
@CAL3874	03/11/11	18:14'14	A	Fast	00:15'00	dB	59.5	69.4	59.5	57.3
@CAL3875	03/11/11	18:29'14	A	Fast	00:15'00	dB	62.6	75.3	61.9	57.4
@CAL3876	03/11/11	18:44'14	A	Fast	00:15'00	dB	58.3	60.4	59.0	57.3
@CAL3877	03/11/11	18:59'14	A	Fast	00:15'00	dB	59.9	69.6	59.9	57.4
@CAL3878	03/11/11	19:14'14	A	Fast	00:15'00	dB	59.2	63.5	60.3	57.8
@CAL3879	03/11/11	19:29'14	A	Fast	00:15'00	dB	59.2	65.6	60.0	57.5
@CAL3880	03/11/11	19:44'14	A	Fast	00:15'00	dB	59.0	64.1	60.0	57.6
@CAL3881	03/11/11	19:59'14	A	Fast	00:15'00	dB	60.6	71.0	60.8	57.7
@CAL3882	03/11/11	20:14'14	A	Fast	00:15'00	dB	59.4	68.3	59.6	57.7
@CAL3883	03/11/11	20:29'14	A	Fast	00:15'00	dB	59.0	64.7	59.8	57.8
@CAL3884	03/11/11	20:44'14	A	Fast	00:15'00	dB	59.3	65.8	59.9	58.0
@CAL3885	03/11/11	20:59'14	A	Fast	00:15'00	dB	60.7	71.8	59.8	57.9
@CAL3886	03/11/11	21:14'14	A	Fast	00:15'00	dB	59.7	66.7	61.0	58.0
@CAL3887	03/11/11	21:29'14	A	Fast	00:15'00	dB	60.1	69.3	60.3	57.5
@CAL3888	03/11/11	21:44'14	A	Fast	00:15'00	dB	58.6	62.6	59.6	57.4
@CAL3889	03/11/11	21:59'14	A	Fast	00:15'00	dB	59.3	67.2	59.7	57.5
@CAL3890	03/11/11	22:14'14	A	Fast	00:15'00	dB	61.7	74.1	61.1	57.8
@CAL3891	03/11/11	22:29'14	A	Fast	00:15'00	dB	62.8	75.0	62.3	57.4
@CAL3892	03/11/11	22:44'14	A	Fast	00:15'00	dB	61.5	74.0	59.6	57.2
@CAL3893	03/11/11	22:59'14	A	Fast	00:15'00	dB	57.9	58.9	58.7	57.1
@CAL3894	04/11/11	23:14'14	A	Fast	00:15'00	dB	59.1	66.8	59.7	57.1
@CAL3895	04/11/11	23:29'14	A	Fast	00:15'00	dB	57.8	58.9	58.7	57.0
@CAL3896	04/11/11	23:44'14	A	Fast	00:15'00	dB	58.0	59.7	58.8	57.2
@CAL3897	04/11/11	23:59'14	A	Fast	00:15'00	dB	58.1	59.7	58.8	57.2
@CAL3898	04/11/11	00:14'14	A	Fast	00:15'00	dB	58.0	59.2	58.8	57.1
@CAL3899	04/11/11	00:29'14	A	Fast	00:15'00	dB	58.3	59.9	59.0	57.3
@CAL3900	04/11/11	00:44'14	A	Fast	00:15'00	dB	58.1	59.7	58.8	57.2
@CAL3901	04/11/11	00:59'14	A	Fast	00:15'00	dB	60.1	67.0	62.5	57.3
@CAL3902	04/11/11	01:14'14	A	Fast	00:15'00	dB	57.8	58.9	58.6	57.0
@CAL3903	04/11/11	01:29'14	A	Fast	00:15'00	dB	57.7	58.9	58.6	57.0
@CAL3904	04/11/11	01:44'14	A	Fast	00:15'00	dB	57.5	58.9	58.3	56.8
@CAL3905	04/11/11	01:59'14	A	Fast	00:15'00	dB	57.5	58.9	58.4	56.7
@CAL3906	04/11/11	02:14'14	A	Fast	00:15'00	dB	57.6	58.9	58.4	56.8
@CAL3907	04/11/11	02:29'14	A	Fast	00:15'00	dB	57.8	59.2	58.7	57.0
@CAL3908	04/11/11	02:44'14	A	Fast	00:15'00	dB	57.8	59.1	58.7	57.1
@CAL3909	04/11/11	02:59'14	A	Fast	00:15'00	dB	58.0	59.6	58.8	57.1
@CAL3910	04/11/11	03:14'14	A	Fast	00:15'00	dB	58.2	59.8	58.9	57.2
@CAL3911	04/11/11	03:29'14	A	Fast	00:15'00	dB	58.1	59.6	58.8	57.2
@CAL3912	04/11/11	03:44'14	A	Fast	00:15'00	dB	59.5	61.8	60.8	57.7
@CAL3913	04/11/11	03:59'14	A	Fast	00:15'00	dB	58.7	61.4	59.8	57.4
@CAL3914	04/11/11	04:14'14	A	Fast	00:15'00	dB	58.5	63.1	59.4	57.3
@CAL3915	04/11/11	04:29'14	A	Fast	00:15'00	dB	58.4	60.4	59.2	57.3
@CAL3916	04/11/11	04:44'14	A	Fast	00:15'00	dB	58.3	59.8	58.9	57.3
@CAL3917	04/11/11	04:59'14	A	Fast	00:15'00	dB	58.5	59.9	59.3	57.5
@CAL3918	04/11/11	05:14'14	A	Fast	00:15'00	dB	59.5	61.8	60.7	58.3
@CAL3919	04/11/11	05:29'14	A	Fast	00:15'00	dB	61.3	63.7	62.3	60.1
@CAL3920	04/11/11	05:44'14	A	Fast	00:15'00	dB	61.8	65.0	62.9	60.3
@CAL3921	04/11/11	05:59'14	A	Fast	00:15'00	dB	60.7	63.8	61.9	59.3
@CAL3922	04/11/11	06:14'14	A	Fast	00:15'00	dB	60.2	62.1	60.9	59.2
@CAL3923	04/11/11	06:29'14	A	Fast	00:15'00	dB	60.0	61.9	60.8	59.1
@CAL3924	04/11/11	06:44'14	A	Fast	00:15'00	dB	60.4	62.5	61.3	59.3
@CAL3925	04/11/11	06:59'14	A	Fast	00:15'00	dB	61.1	66.2	61.8	60.0
@CAL3926	04/11/11	07:14'14	A	Fast	00:15'00	dB	61.1	63.3	61.9	60.1
@CAL3927	04/11/11	07:29'14	A	Fast	00:15'00	dB	60.7	62.7	61.6	60.0
@CAL3928	04/11/11	07:44'14	A	Fast	00:15'00	dB	60.2	62.6	60.9	59.2
@CAL3929	04/11/11	07:59'14	A	Fast	00:15'00	dB	60.1	61.9	60.9	59.2
@CAL3930	04/11/11	08:14'14	A	Fast	00:15'00	dB	60.3	62.5	61.0	59.2
@CAL3931	04/11/11	08:29'14	A	Fast	00:15'00	dB	61.4	69.3	62.4	59.2
@CAL3932	04/11/11	08:44'14	A	Fast	00:15'00	dB	60.6	64.6	61.5	59.2
@CAL3933	04/11/11	08:59'14	A	Fast	00:15'00	dB	60.2	62.0	60.9	59.2
@CAL3934	04/11/11	09:14'14	A	Fast	00:15'00	dB	60.3	64.2	61.3	59.1
@CAL3935	04/11/11	09:29'14	A	Fast	00:15'00	dB	60.1	63.8	60.9	59.0
@CAL3936	04/11/11	09:44'14	A	Fast	00:15'00	dB	59.6	62.4	60.7	58.3
@CAL3937	04/11/11	09:59'14	A	Fast	00:15'00	dB	58.9	63.0	59.8	57.7
@CAL3938	04/11/11	10:14'14	A	Fast	00:15'00	dB	58.3	62.1	59.4	57.0
@CAL3939	04/11/11	10:29'14	A	Fast	00:15'00	dB	57.6	60.7	58.5	56.3

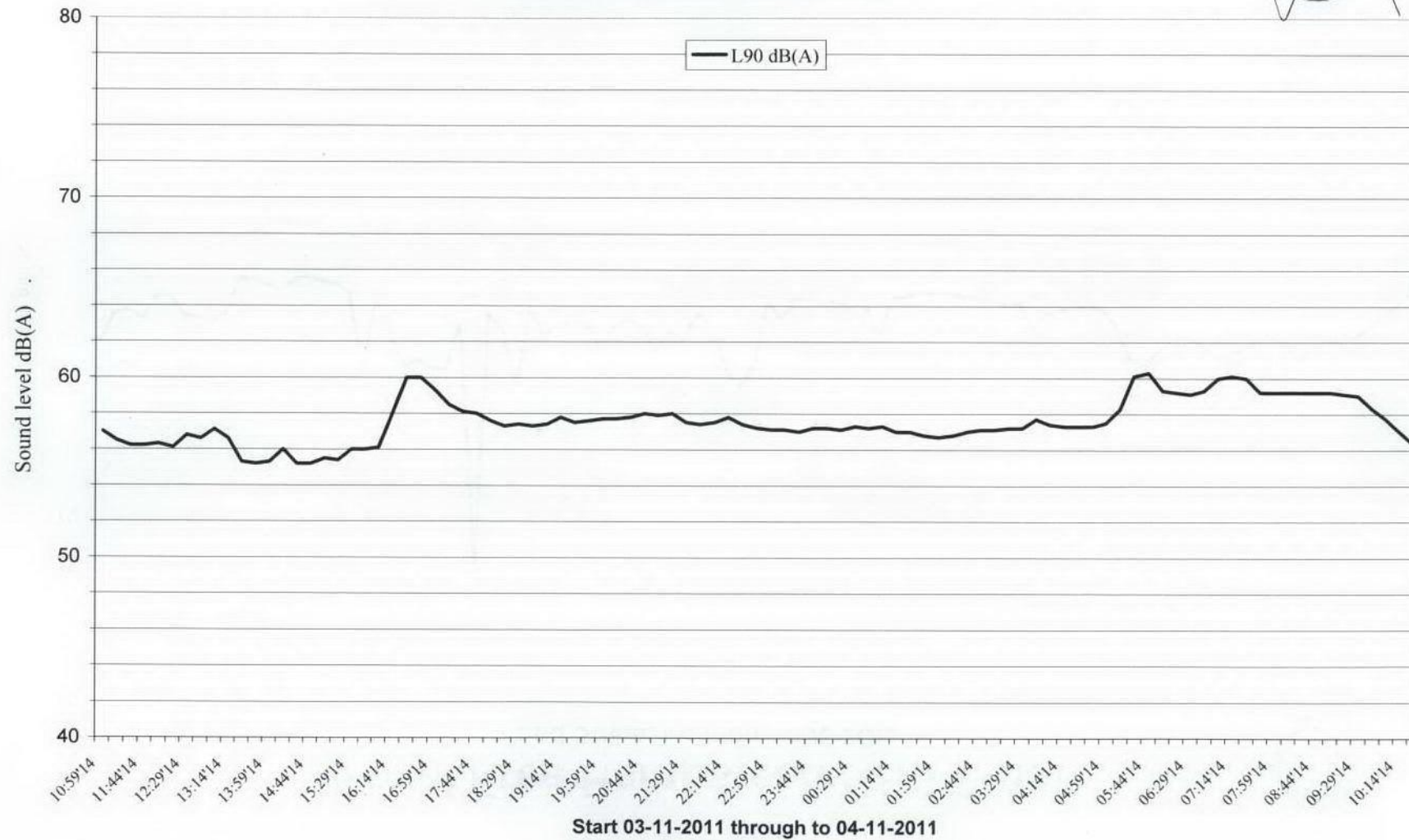
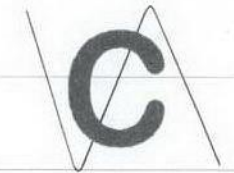
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