

Sanctuary Acoustics

Acoustic Consultancy

NOISE ASSESSMENT FOR LADBROKES PLC

A BACKGROUND NOISE ASSESSMENT CONDUCTED AS PART OF A PLANNING APPLICATION TO INSTALL AIR CONDITIONING UNITS AT THE REAR OF 304-306 OXFORD ROAD, MANCHESTER

DOCUMENT 001
REVISION 2

BY

ANTHONY FROST MSC IENG MIOA
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EXECUTIVE SUMMARY

Sanctuary Acoustics was asked by Ladbrokes Plc to assess the noise levels at the rear of their new betting shop located at 304-306 Oxford Road, Manchester. Planning approval was previously granted to Ladbrokes Plc thereby allowing the refit and renovation of the existing ground floor premises to proceed, but that initial approval did not extend to the installation of an air-conditioning system on the premises. This noise assessment which included two days of on-site noise measurements aims to assess the existing background noise levels to the rear of 304-306 Oxford Road where the proposed air-conditioning units would be installed and, if any what affect the proposed air-conditioning units would have on the existing background and ambient noise levels. The optimum sound pressure level produced by the air-conditioning units should also be compared with the measured background noise levels (L_{A90}) with further reference made to criteria in *BS 4142:1997 Method for rating industrial noise affecting mixed residential and industrial areas*. Dwellings, (flats) are located on the first and second floors of the building hence the need for an accurate noise assessment. This report classified as revision 2 is a revised report which includes a direct comparison between background noise levels and air-conditioning plant noise levels by use of octave band data. In the initial report that related to air conditioning noise, one third octave band background noise data that was measured on site was provided in Annex A, however the request for a comparison between octave band data of both background noise and plant noise was only made aware to us following an email sent to Graham Whitehead of R R Planning by Janine Renshaw-Livesey, Planner, Manchester City Council dated October 9th 2013. Within this email Janine quoted a category, NSE6; noise – external equipment insulation. "*The criteria that we ask external equipment to meet, as above, are 5dB below the existing background (L_{A90}) in each octave band at the nearest noise sensitive location.*" The noise report, revision 1, made a comparison between background noise levels and the air conditioning noise with and without acoustic shrouds in place. These shrouds however were deemed unsuitable by planning and therefore the air handling units are to be relocated internally with louvres that will be mounted in the rear extension wall. Locating the air handling units and louvres at this location, direct line of sight with the rear first floor flat will be removed.

To summarise:

1. The noise measurements were taken at the rear of 304-306 Oxford Road in the proximity of the proposed location for the air-conditioning units over a two day period, a weekend (Saturday August 10th) and a week day (Wednesday August 21st). Measurements took place during the proposed opening hours of the new Ladbrokes betting shop, 8am to 10pm and hence the operating hours of the proposed air-conditioning units.
2. The planning department have requested resolution to three points in relation to noise; *the noise output from the units, including cumulative impact of all the units operating simultaneously; any acoustic measures proposed to limit noise breakout from the units; details of the ambient noise levels during the daytime, night and weekends and how noise from the units will impact on ambient noise levels.*
3. Noise measurement parameters are detailed in the report and are based on 1-hour time intervals. The L_{Aeq}, L_{A90}, L_{Amax}, L_{Amin} and L_{A10} are detailed in the report along with octave band data between 63Hz to 4kHz with full 1/1 octave band background noise data from 8Hz to 16kHz to the rear of the report in Appendix A.

4. Six 1-hour measurements were conducted on Saturday August 10th and eight measurements were conducted on Wednesday August 21st. The results obtained for both measurement days were not dissimilar. The average background noise level (L_{A90}) at the rear of 304-306 Oxford Road was 51.5dB.
5. The proposed Ladbrokes external air conditioning units are the RZQ71DV1, RZQ100DV1 and RXS20-25G.
6. The location for the external plant will be housed internally within the ground floor extension with louvres mounted in the rear extensions external wall.
7. The octave band data for all three external units has been cross-referenced with the background noise level data measured on site with only the RXS20-25G achieving the requirement of a minimum 5dB below existing background noise levels.
8. The roof/ceiling structure will more than attenuate a sufficient amount of direct noise from the internally housed units to achieve a minimum attenuation of 5dB below background.
9. The ground floor extensions external wall will significantly attenuate any reflected noise from the internally housed units that could be reflected back off the rear alley fence in the direction of the first floor flat. Such barrier attenuation has been calculated to more than achieve the minimum reflected noise of 5dB below background.

1. INTRODUCTION

Sanctuary Acoustics was asked by Ladbrokes Plc to assess the noise levels at the rear of their new betting shop located at 304-306 Oxford Road, Manchester. Planning approval was previously granted to Ladbrokes Plc thereby allowing the refit and renovation of the existing ground floor premises to proceed, but that initial approval did not extend to the installation of an air-conditioning system on the premises. This noise assessment which included two days of on-site noise measurements aims to assess the existing background noise levels to the rear of 304-306 Oxford Road where the proposed air-conditioning units would be installed and, if any what affect the proposed air-conditioning units would have on the existing background and ambient noise levels. The optimum sound pressure level produced by the air-conditioning units should also be compared with the measured background noise levels (L_{A90}) with further reference made to criteria in *BS 4142:1997 Method for rating industrial noise affecting mixed residential and industrial areas*. Dwellings, (flats) are located on the first and second floors of the building hence the need for an accurate noise assessment. This report classified as revision 2 is a revised report which includes a direct comparison between background noise levels and air-conditioning plant noise levels by use of octave band data. In the initial report that related to air conditioning noise, one third octave band background noise data that was measured on site was provided in Annex A, however the request for a comparison between octave band data of both background noise and plant noise was only made aware to us following an email sent to Graham Whitehead of R R Planning by Janine Renshaw-Livesey, Planner, Manchester City Council dated October 9th 2013. Within this email Janine quoted a category, NSE6; noise – external equipment insulation. "*The criteria that we ask external equipment to meet, as above, are 5dB below the existing background (L_{A90}) in each octave band at the nearest noise sensitive location.*" The noise report, revision 1, made a comparison between background noise levels and the air conditioning noise with and without acoustic shrouds in place. These shrouds however were deemed unsuitable by planning and therefore the air handling units are to be relocated internally with louvres that will be mounted in the rear extension wall. Locating the air handling units and louvres at this location, direct line of sight with the rear first floor flat will be removed.

The noise assessment has been conducted in order to satisfy a planning condition relating to noise due to concerns raised by the local authority regarding the potential impingement of noise from external units, e.g. air-conditioning units onto nearby residential dwellings.

The request from the planners was thus;

1) *the noise output from the units, including cumulative impact of all the units operating simultaneously;*
2) *any acoustic measures proposed to limit noise breakout from the units,*
3) *details of the ambient noise levels during the daytime, night and weekends and how noise from the units will impact on ambient noise levels.*

In order to assess the existing noise environment, the following were investigated on both a weekday and a weekend, although it must be stated that the operational hours of the shop will be within daytime hours (8am to 10pm):

The noise survey was conducted on Saturday 10th August and Wednesday 21st August 2013.

The proposed location for the air-conditioning units is at the rear of the building, internally located at the rear of the ground floor extension. This will require remedial work to be conducted to allow louvres to be fitted to the rear wall that will enable air flow to be exchanged from the shop and the external area beyond through these wall louvres. This location will remove direct line of sight and therefore direct noise with the dwelling above.

The noise criteria used to assess the ambient noise levels within habitable rooms, e.g. Living Rooms and Bedrooms can be found in *BS 8233 Sound insulation and noise reduction for buildings – Code of practice*, *Table 5 – Indoor ambient noise levels in spaces when they are unoccupied* gives both a Good and a Reasonable Design Range to provide for reasonable resting/sleeping conditions. The Good Design Range states 30dB $L_{Aeq,T}$ for both Bedrooms and Living Rooms while the Reasonable Design Range states 35dB $L_{Aeq,T}$ for Bedrooms and 40dB $L_{Aeq,T}$ for Living Rooms.

The noise survey commenced with a 1-hour measurement at 11:00 on Saturday August 10th. This was followed by further 1-hour measurements at 12:00 to 13:00, 13:00 to 14:00, 17:00 to 18:00, 18:00 to 19:00 and 19:00 to 20:00. A second day of measurements took place on a week day, Wednesday August 21st with the commencement of 1-hour measurements beginning at 09:00 to 10:00, 10:00 to 11:00, 11:00 to 12:00, 12:00 to 13:00, 13:00 to 14:00, 17:00 to 18:00, 18:00 to 19:00 and 19:00 to 20:00.

Noise measurements are typically taken at a minimum distance of 3.5m from facades to avoid specular reflections. *BS 4142:1997 Method for rating industrial noise affecting mixed residential and industrial areas,* states in section 5.3 Measurement positions; *"To minimise the influence of reflections, make the measurements at least 3.5m from any reflecting surface other than the ground".*

However, Note 2 from this section does state; *where it is necessary to make measurements above ground floor level, choose a position which is 1 metre from the façade on the relevant floor of the building.*

The sound level meter was subsequently positioned on a tri-pod 1.5m above floor/roof level and 1m from the first floor facade.

Figure 1 depicts the measurement location on the ground floor extension roof 1m from the first floor facade.



Figure 1: Measurement location on the extension roof were the proposed air-conditioning units would be located.

Figure 2 depicts the view from the rear car park for where the proposed air-conditioning units would be located, midway between the two barred windows



Figure 2: The external proposed location for the air-conditioning units is between the two barred windows.

The noise measurements were undertaken using a Norsonics 132 Sound Level Meter (Serial Number 1322854) which was calibrated before and after the noise measurements were taken using a Cirrus CR:514 Acoustic Calibrator (Serial Number 59124). Both items of equipment have traceable calibration certificates and are designated as Type 2 instruments which are inline with IEC 60651 & 60804 and IEC respectively. The Sound Level Meter was mounted on a tri-pod 1.5m above ground level. The results of the noise measurements and their acoustic parameters are detailed in section 2, Measurements and Observations. The full 1/1 octave band data for the measurements are detailed at the end of this report in Annex A.

2. MEASUREMENTS AND OBSERVATIONS

The fourteen external noise measurements at the rear façade of 304-306 Oxford Road took place during Saturday August 10th 2013 and Wednesday August 21st 2013 with six external measurements taking place on the Saturday and eight external measurements on the Wednesday. Three 1-hour measurements were conducted between 11.00am to 2.00pm and again between the hours of 5.00pm to 8.00pm on the Saturday. Five 1-hour measurements were conducted between 9.00am to 2.00pm with a further three 1-hour measurements between the hours of 5.00pm to 8.00pm on the Wednesday.

At the rear of the site it was noted that road traffic noise from Oxford Road, particularly large vehicles such as buses were audible. Noise from extraction units at the Big Hands bar and deliveries to the Gemini Food Takeaway were also noted. With the exception of vehicles using the rear car park, people going about their daily business in the area also contributed to the ambient noise levels.

Noise derived from persons resulted from patrons using the Big Hands Roof Terrace and Beer Garden, as depicted in figure 3, Oxfam employees talking at the rear of the shop on mobile phones, pedestrians walking up Dilworth Street and students coming and going from residences on the opposite side of Dilworth Street.



Figure 3: Big Hands ground floor beer garden and first floor roof terrace.

For each of the fourteen measurements the observations and results are detailed in tabular form including descriptions of the weather conditions and pictorial location.

A glossary of the acoustic parameters/terms used can be found in Annex A.

The noise results obtained for measurement 1 at the location 1 depicted in figure 1, are detailed in table 1 for the first day of noise measurements on Saturday August 10th 2013.

Location	1. Rear of 304-306 Oxford Road
Time & Duration	11.00 – 12.00 1 Hour Measurement August 10th
Weather & Site Conditions/Observations	No perceivable winds, grey overcast sky, 16^0C Site Conditions – Primary noise source road traffic vehicles on Oxford Road with large vehicles, particularly buses audible although the building does provide barrier attenuation for other smaller road vehicles. Some birdsong noted during lulls in traffic flow. Noise derived at the rear is from air extraction from the Big Hands Bar. Pedestrians frequently walking and cycling along Oxford Road and Dilworth Street. Airplane over the site during the 12th minute provides L_{Amax}.
Measurement Parameter	**Measurement Reading**
L_{Aeq}	54.6dB(A)
L_{A10}	55.3dB(A)
L_{Amin}	47.6dB(A)
L_{Amax}	76.4dB(A)
L_{A90}	50.4dB(A)

Table 1: The results taken at Measurement Location 1 for 11am to 12pm August 10th

The observations noted during the measurement between 11am to 12pm are detailed in table 2.

Location	1. Rear of 304-306 Oxford Road
Time & Duration	11.00 – 12.00 1 Hour Measurement August 10th
Weather & Site Conditions/Observations	No perceivable winds, grey overcast sky, 16^0C Site Conditions – Primary noise source road traffic vehicles on Oxford Road with large vehicles, particularly buses audible although the building does provide barrier attenuation for other smaller road vehicles. Some birdsong noted during lulls in traffic flow. Noise derived at the rear is from air extraction from the Big Hands Bar. Pedestrians frequently walking and cycling along Oxford Road and Dilworth Street. Airplane over the site during the 12th minute provides L_{Amax}.
Minutes Passed	**Observations**
0 – 60	Regular flow of traffic on Oxford Road
2	Bang from Big Hands Bar. L_{Amax} 73.7dB(A)
12	Airplane overhead
30 – 34	Oxfam employee next door talking at the rear of their shop on a mobile phone
43	Ambulance siren. L_{Amax} 76.4dB(A)

Table 2: The observations taken at the measurement location 1 between 11am to 12pm

Table 3 details the octave bands for this measurement

Location	1. Rear of 304-306 Oxford Road						
Time & Duration	11.00 – 12.00 1 Hour Measurement August 10th						
Measurement Parameter	**Frequency (Hz) Octave Bands**						
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
L_{eq}	64.6	57.5	54.5	50.2	49.4	47.5	42.8
L_{90}	59.0	52.7	49.7	47.0	44.8	41.0	35.8

Table 3: Octave band data between 11am to 12pm

The noise results obtained for the second measurement at location 1 are detailed in table 4.

Location	1. Rear of 304-306 Oxford Road
Time & Duration	12.00 – 13.00 1 Hour Measurement August 10th
Weather & Site Conditions/Observations	Occasional light breezes, grey overcast sky, 17^0C. Some breaks in cloud develop with some sunny intervals mid-way through measurement. Site Conditions – Primary noise source road traffic vehicles on Oxford Road with large vehicles, particularly buses audible although the building does provide barrier attenuation for other smaller road vehicles. Some birdsong noted during lulls in traffic flow. Noise derived at the rear is from air extraction from the Big Hands Bar. Pedestrians frequently walking and cycling along Oxford Road and Dilworth Street. Neighbour noise during the 29th minute provides L_{Amax}.
Measurement Parameter	**Measurement Reading**
L_{Aeq}	55.1dB(A)
L_{A10}	56.0dB(A)
L_{Amin}	48.9dB(A)
L_{Amax}	80.9dB(A)
L_{A90}	51.1dB(A)

Table 4: The results taken at the measurement location 1 between 12pm to 1pm

The observations noted during the measurement between 12pm to 1pm are detailed in table 5.

Location	1. Rear of 304-306 Oxford Road
Time & Duration	12.00 – 13.00 1 Hour Measurement August 10th
Weather & Site Conditions/Observations	Occasional light breezes, grey overcast sky, 17^0C. Some breaks in cloud develop with some sunny intervals mid-way through measurement. Site Conditions – Primary noise source road traffic vehicles on Oxford Road with large vehicles, particularly buses audible although the building does provide barrier attenuation for other smaller road vehicles. Some birdsong noted during lulls in traffic flow. Noise derived at the rear is from air extraction from the Big Hands Bar. Pedestrians frequently walking and cycling along Oxford Road and Dilworth Street. Neighbour noise during the 29th minute provides L_{Amax}.
Minutes Passed	**Observations**
0 – 60	Regular flow of traffic on Oxford Road
5	Clatter from rear car park
21	Ambulance siren. L_{Amax} 72.8dB(A)
29	Neighbouring employee. L_{Amax} 80.9dB(A)
33	Background music comes on in bar

Table 5: The observations taken at the measurement location 1 between 12pm to 1pm

The octave band data for this measurement are detailed in table 6.

Location	1. Rear of 304-306 Oxford Road						
Time & Duration	12.00 – 13.00 1 Hour Measurement August 10th						
Measurement Parameter	**Frequency (Hz) Octave Bands**						
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
L_{eq}	68.2	60.4	54.7	51.0	50.0	47.5	42.7
L_{90}	62.8	56.0	50.0	47.5	45.6	41.2	36.1

Table 6: Octave band data between 12pm to 1pm

The noise results obtained for the third measurement at location 1 are detailed in table 7.

Location	1. Rear of 304-306 Oxford Road
Time & Duration	13.00 – 14.00 1 Hour Measurement August 10th
Weather & Site Conditions/Observations	Occasional light breezes, 18^{0}C. Cloud breaking with some sunny intervals. Site Conditions – Primary noise source road traffic vehicles on Oxford Road with large vehicles, particularly buses audible although the building does provide barrier attenuation for other smaller road vehicles. Some birdsong noted during lulls in traffic flow. Noise derived at the rear is from air extraction from the Big Hands Bar. Pedestrians frequently walking and cycling along Oxford Road and Dilworth Street. Helicopter overhead during the 5th minute provides L_{Amax}.
Measurement Parameter	**Measurement Reading**
L_{Aeq}	56.2dB(A)
L_{A10}	56.5dB(A)
L_{Amin}	50.5dB(A)
L_{Amax}	76.2dB(A)
L_{A90}	52.9dB(A)

Table 7: The results taken at the measurement location 1 during 1pm to 2pm

The observations noted during the measurement between 1pm to 2pm are detailed in table 8.

Location	1. Rear of 304-306 Oxford Road
Time & Duration	13.00 – 14.00 1 Hour Measurement August 10th
Weather & Site Conditions/Observations	Occasional light breezes, 18^{0}C. Cloud breaking with some sunny intervals. Site Conditions – Primary noise source road traffic vehicles on Oxford Road with large vehicles, particularly buses audible although the building does provide barrier attenuation for other smaller road vehicles. Some birdsong noted during lulls in traffic flow. Noise derived at the rear is from air extraction from the Big Hands Bar. Pedestrians frequently walking and cycling along Oxford Road and Dilworth Street. Helicopter overhead during the 5th minute provides L_{Amax}.
Minutes Passed	**Observations**
0 – 60	Regular flow of traffic on Oxford Road
9	Helicopter overhead. L_{Amax} 76.2dB(A)
6 – 13	Delivery to Gemini fast food takeaway next door. Rear shutter raised and closed. Reversing siren from delivery van when it leaves.
20	Papa Johns delivery scooter arrives on Dilworth Street to make delivery to student accommodation opposite.

Table 8: The observations taken at the measurement location 1 between 1pm to 2pm

The octave band data for this measurement are detailed in table 9.

Location	1. Rear of 304-306 Oxford Road						
Time & Duration	13.00 – 14.00 1 Hour Measurement August 10th						
Measurement Parameter	**Frequency (Hz) Octave Bands**						
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
L_{eq}	69.4	63.5	56.6	52.2	50.2	48.4	42.7
L_{90}	66.1	59.2	51.7	49.3	46.8	44.5	39.1

Table 9: Octave band data between 1pm to 2pm

The noise results obtained for measurement 4 at measurement location 1 (5pm – 6pm) are detailed in table 10.

Location	1. Rear of 304-306 Oxford Road
Time & Duration	17.00 – 18.00 1 Hour Measurement August 10th
Weather & Site Conditions/Observations	Occasional light breezes with gusts up to 3.6km/h, 19^0C. Cloud breaking with some sunny intervals. Site Conditions – Primary noise source road traffic vehicles on Oxford Road with large vehicles, particularly buses audible although the building does provide barrier attenuation for other smaller road vehicles. Some birdsong noted during lulls in traffic flow. Noise derived at the rear is from air extraction and music from the Big Hands Bar which now has customers on its roof terrace. Pedestrians frequently walking and cycling along Oxford Road and Dilworth Street. Taxi driver laughing during the 58th minute provides L_{Amax}.
Measurement Parameter	**Measurement Reading**
L_{Aeq}	54.7dB(A)
L_{A10}	55.8dB(A)
L_{Amin}	50.2dB(A)
L_{Amax}	81.3dB(A)
L_{A90}	52.2dB(A)

Table 10: The results taken at the above Location 1 between 5pm to 6pm.

The observations noted during the measurement between 5pm to 6pm are detailed in table 11.

Location	1. Rear of 304-306 Oxford Road
Time & Duration	17.00 – 18.00 1 Hour Measurement August 10th
Weather & Site Conditions/Observations	Occasional light breezes with gusts up to 3.6km/h, 19^{0}C. Cloud breaking with some sunny intervals. Site Conditions – Primary noise source road traffic vehicles on Oxford Road with large vehicles, particularly buses audible although the building does provide barrier attenuation for other smaller road vehicles. Some birdsong noted during lulls in traffic flow. Noise derived at the rear is from air extraction and music from the Big Hands Bar which now has customers on its roof terrace. Pedestrians frequently walking and cycling along Oxford Road and Dilworth Street. Taxi driver laughing during the 58th minute provides L_{Amax}.
Minutes Passed	**Observations**
0 – 60	Regular flow of traffic on Oxford Road
30	Distant reggae music audible, source unknown
40	Oxfam employee at rear of shop backdoor on mobile phone.
45	Second employee at rear of the shop for 30 seconds then back inside
53	Airplane overhead
56	Car door slam on Dilworth Street. L_{Amax} 69.8dB(A)
57	Musician and taxi driver walk passed measurement location to rear of Big Hands Bar. L_{Amax} 71.6dB(A)
58	Taxi driver laughing. L_{Amax} 81.3dB(A)

Table 11: The observations taken at the measurement location 1 between 5pm to 6pm

The octave band data for this measurement are detailed in table 12.

Location	1. Rear of 304-306 Oxford Road						
Time & Duration	17.00 – 18.00 1 Hour Measurement August 10th						
Measurement Parameter	**Frequency (Hz) Octave Bands**						
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
L_{eq}	65.7	58.0	56.6	52.0	49.3	45.4	41.4
L_{90}	61.2	54.5	51.2	49.4	46.7	42.7	38.0

Table 12: Octave band data between 5pm to 6pm

The noise results obtained for measurement 5, 6pm to 7pm at location 1 are detailed in table 13.

Location	1. Rear of 304-306 Oxford Road
Time & Duration	18.00 – 19.00 1 Hour Measurement August 10th
Weather & Site Conditions/Observations	Occasional light breezes with gusts up to 3.6km/h, 17^{0}C. Cloud breaking with some sunny intervals. Site Conditions – Primary noise source road traffic vehicles on Oxford Road with large vehicles, particularly buses audible although the building does provide barrier attenuation for other smaller road vehicles. Some birdsong noted during lulls in traffic flow. Noise derived at the rear is from air extraction and music from the Big Hands Bar which now has customers on its roof terrace. Pedestrians frequently walking and cycling along Oxford Road and Dilworth Street. Pedestrian footfall on Dilworth Street during the 1st minute provides L_{Amax}.
Measurement Parameter	**Measurement Reading**
L_{Aeq}	54.3dB(A)
L_{A10}	55.8dB(A)
L_{Amin}	50.6dB(A)
L_{Amax}	64.9dB(A)
L_{A90}	52.3dB(A)

Table 13: The results taken at Measurement Location 1 for 6pm to 7pm

The observations noted during the measurement between 6pm to 7pm are detailed in table 14.

Location	1. Rear of 304-306 Oxford Road
Time & Duration	18.00 – 19.00 1 Hour Measurement August 10th
Weather & Site Conditions/Observations	Occasional light breezes with gusts up to 3.6km/h, 17^{0}C. Cloud breaking with some sunny intervals. Site Conditions – Primary noise source road traffic vehicles on Oxford Road with large vehicles, particularly buses audible although the building does provide barrier attenuation for other smaller road vehicles. Some birdsong noted during lulls in traffic flow. Noise derived at the rear is from air extraction and music from the Big Hands Bar which now has customers on its roof terrace. Pedestrians frequently walking and cycling along Oxford Road and Dilworth Street. Pedestrian footfall on Dilworth Street during the 1st minute provides L_{Amax}.
Minutes Passed	**Observations**
0 – 60	Regular flow of traffic on Oxford Road
1	Pedestrian footfall on Dilworth Street. L_{Amax} 64.9dB(A)
5	Distant music from unknown source

Table 14: The observations taken at the measurement location 1 between 6pm to 7pm

The octave band data for this measurement are detailed in table 15.

Location	1. Rear of 304-306 Oxford Road						
Time & Duration	18.00 – 19.00 1 Hour Measurement August 10th						
Measurement Parameter	**Frequency (Hz) Octave Bands**						
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
L_{eq}	65.6	57.1	55.9	52.0	49.1	44.7	37.7
L_{90}	60.9	53.8	51.0	49.7	47.0	42.6	37.7

Table 15: Octave band data between 6pm to 7pm

The noise results obtained for measurement 6 at measurement location 1 (7pm – 8pm) are detailed in table 16.

Location	1. Rear of 304-306 Oxford Road
Time & Duration	19.00 – 20.00 1 Hour Measurement August 10th
Weather & Site Conditions/Observations	Occasional light breezes with gusts up to 3.6km/h, 16^0C. Cloud breaking with some sunny intervals. Site Conditions – Primary noise source road traffic vehicles on Oxford Road with large vehicles, particularly buses audible although the building does provide barrier attenuation for other smaller road vehicles. Some birdsong noted during lulls in traffic flow. Noise derived at the rear is from air extraction and music from the Big Hands Bar which now has customers on its roof terrace. Pedestrians frequently walking and cycling along Oxford Road and Dilworth Street. Sound check at Big Hands Bar during the 9th minute provides L_{Amax}.
Measurement Parameter	**Measurement Reading**
L_{Aeq}	59.2dB(A)
L_{A10}	63.1dB(A)
L_{Amin}	50.9dB(A)
L_{Amax}	74.3dB(A)
L_{A90}	52.8dB(A)

Table 16: The results taken at the above Location 1 between 7pm to 8pm.

The observations noted during the measurement between 7pm to 8pm are detailed in table 17.

Location	1. Rear of 304-306 Oxford Road
Time & Duration	19.00 – 20.00 1 Hour Measurement August 10th
Weather & Site Conditions/Observations	Occasional light breezes with gusts up to 3.6km/h, 16^{0}C. Cloud breaking with some sunny intervals. Site Conditions – Primary noise source road traffic vehicles on Oxford Road with large vehicles, particularly buses audible although the building does provide barrier attenuation for other smaller road vehicles. Some birdsong noted during lulls in traffic flow. Noise derived at the rear is from air extraction and music from the Big Hands Bar which now has customers on its roof terrace. Pedestrians frequently walking and cycling along Oxford Road and Dilworth Street. Sound check at Big Hands Bar during the 9th minute provides L_{Amax}.
Minutes Passed	**Observations**
0 – 60	Regular flow of traffic on Oxford Road
1	Live music from Big Hands. L_{Amax} 64.4dB(A)
2	Live music from Big Hands. L_{Amax} 71.9dB(A)
6	Live music from Big Hands. L_{Amax} 72.0dB(A)
9	Live music from Big Hands. L_{Amax} 74.3dB(A)
10	Customer from Big Hands Bar beer garden talking on mobile phone

Table 17: The observations taken at the measurement location 1 between 7pm to 8pm.

The octave band data for this measurement are detailed in table 18.

Location	1. Rear of 304-306 Oxford Road						
Time & Duration	19.00 – 20.00 1 Hour Measurement August 10th						
Measurement Parameter	**Frequency (Hz) Octave Bands**						
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
L_{eq}	67.7	59.9	57.9	54.5	55.3	52.1	43.9
L_{90}	62.1	53.8	53.3	50.1	47.2	43.3	38.3

Table 18: Octave band data between 7pm to 8pm

The results and observations for the second day of noise monitoring with the measurements taken are as follows;

The noise results obtained for measurement 1 at the location 1 are detailed in table 19.

Location	1. Rear of 304-306 Oxford Road
Time & Duration	09.00 – 10.00 1 Hour Measurement August 21st
Weather & Site Conditions/Observations	Light occasional gusts, cloudy overcast sky, 18^0C Site Conditions – Primary noise source road traffic vehicles on Oxford Road with large vehicles, particularly buses audible although the building does provide barrier attenuation for other smaller road vehicles. Some birdsong noted during lulls in traffic flow. Noise derived at the rear is from air extraction from the Big Hands Bar. Pedestrians frequently walking and cycling along Oxford Road and Dilworth Street. Rotary saw used inside the shop by a shop fitter during the 1st minute provides L_{Amax}.
Measurement Parameter	**Measurement Reading**
L_{Aeq}	53.4dB(A)
L_{A10}	54.6dB(A)
L_{Amin}	49.4dB(A)
L_{Amax}	69.0dB(A)
L_{A90}	50.5dB(A)

Table 19: The results taken at Measurement Location 1 on August 21st at 9am to 10am

The observations noted during the measurement between 9am to 10am are detailed in table 20.

Location	1. Rear of 304-306 Oxford Road
Time & Duration	09.00 – 10.00 1 Hour Measurement August 21st
Weather & Site Conditions/Observations	Light occasional gusts, cloudy overcast sky, 18^0C Site Conditions – Primary noise source road traffic vehicles on Oxford Road with large vehicles, particularly buses audible although the building does provide barrier attenuation for other smaller road vehicles. Some birdsong noted during lulls in traffic flow. Noise derived at the rear is from air extraction from the Big Hands Bar. Pedestrians frequently walking and cycling along Oxford Road and Dilworth Street. Rotary saw used inside the shop by a shop fitter during the 1st minute provides L_{Amax}.
Minutes Passed	**Observations**
0 – 60	Regular flow of traffic on Oxford Road
0 – 60	Noise from extract at Big Hands Bar
0 – 60	Rustling of trees
1	Rotary saw use in shop. L_{Amax} 69.0dB(A)

Table 20: The observations taken at the measurement location 1 between 9am to 10am on August 21st.

The octave band data for this measurement are detailed in table 21.

Location	1. Rear of 304-306 Oxford Road						
Time & Duration	09.00 – 10.00 1 Hour Measurement August 21st						
Measurement Parameter	**Frequency (Hz) Octave Bands**						
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
L_{eq}	64.1	55.7	52.6	50.0	47.4	46.5	41.6
L_{90}	60.7	53.7	50.3	47.3	44.8	40.9	36.3

Table 21: Octave band data between 9am to 10am

The noise results obtained for the second measurement at location 1 on August 21st are detailed in table 22.

Location	1. Rear of 304-306 Oxford Road
Time & Duration	10.00 – 11.00 1 Hour Measurement August 21st
Weather & Site Conditions/Observations	Light occasional gusts to 8.4km/h, cloudy overcast sky with sunny intervals, 19^0C Site Conditions – Primary noise source road traffic vehicles on Oxford Road with large vehicles, particularly buses audible although the building does provide barrier attenuation for other smaller road vehicles. Some birdsong noted during lulls in traffic flow. Noise derived at the rear is from air extraction from the Big Hands Bar. Pedestrians frequently walking and cycling along Oxford Road and Dilworth Street. Rear gate slam of Oxfam shop next door on during the 4th minute provides L_{Amax}.
Measurement Parameter	**Measurement Reading**
L_{Aeq}	54.1dB(A)
L_{A10}	54.6dB(A)
L_{Amin}	48.8dB(A)
L_{Amax}	71.8dB(A)
L_{A90}	50.1dB(A)

Table 22: The results taken at the measurement location 1 between 10am to 11am on August 21st.

The observations noted during the measurement between 10am to 11am are detailed in table 23.

Location	1. Rear of 304-306 Oxford Road
Time & Duration	10.00 – 11.00 1 Hour Measurement August 21st
Weather & Site Conditions/Observations	Light occasional gusts to 8.4km/h, cloudy overcast sky with sunny intervals, 19^0C Site Conditions – Primary noise source road traffic vehicles on Oxford Road with large vehicles, particularly buses audible although the building does provide barrier attenuation for other smaller road vehicles. Some birdsong noted during lulls in traffic flow. Noise derived at the rear is from air extraction from the Big Hands Bar. Pedestrians frequently walking and cycling along Oxford Road and Dilworth Street. Rear gate slam of Oxfam shop next door on during the 4th minute provides L_{Amax}.
Minutes Passed	**Observations**
0 – 60	Regular flow of traffic on Oxford Road
0 – 60	Noise from extract at Big Hands Bar
0 – 1	Worker singing. L_{Amax} 70.1dB(A)
4	Neighbouring unit (Oxfam) rear gate slam. L_{Amax} 71.8dB(A)

Table 23: The observations taken at the measurement location 1 between 10am to 11am on the second day of measurement, August 21st.

The octave band data for this measurement are detailed in table 24.

Location	1. Rear of 304-306 Oxford Road						
Time & Duration	10.00 – 11.00 1 Hour Measurement August 21st						
Measurement Parameter	**Frequency (Hz) Octave Bands**						
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
L_{eq}	63.0	55.1	53.8	53.5	47.6	44.3	41.3
L_{90}	59.2	53.2	50.0	47.2	44.3	40.4	35.7

Table 24: Octave band data between 10am to 11am

The noise results obtained for the third measurement at location 1 on August 21st are detailed in table 25.

Location	1. Rear of 304-306 Oxford Road
Time & Duration	11.00 – 12.00 1 Hour Measurement August 21st
Weather & Site Conditions/Observations	Light occasional gusts to 8.4km/h, cloudy overcast sky with sunny intervals, 20^0C Site Conditions – Primary noise source road traffic vehicles on Oxford Road with large vehicles, particularly buses audible although the building does provide barrier attenuation for other smaller road vehicles. Some birdsong noted during lulls in traffic flow. Noise derived at the rear is from air extraction from the Big Hands Bar. Pedestrians frequently walking and cycling along Oxford Road and Dilworth Street. Rear gate slam of Oxfam shop next door on during the 4th minute provides L_{Amax}.
Measurement Parameter	**Measurement Reading**
L_{Aeq}	56.1dB(A)
L_{A10}	55.8dB(A)
L_{Amin}	48.8dB(A)
L_{Amax}	83.9dB(A)
L_{A90}	50.2dB(A)

Table 25: The results taken at the measurement location 1 during 11am to 12pm

The observations noted during the measurement between 11am to 12pm are detailed in table 26.

Location	1. Rear of 304-306 Oxford Road
Time & Duration	11.00 – 12.00 1 Hour Measurement August 21st
Weather & Site Conditions/Observations	Light occasional gusts to 8.4km/h, cloudy overcast sky with sunny intervals, 20^0C Site Conditions – Primary noise source road traffic vehicles on Oxford Road with large vehicles, particularly buses audible although the building does provide barrier attenuation for other smaller road vehicles. Some birdsong noted during lulls in traffic flow. Noise derived at the rear is from air extraction from the Big Hands Bar. Pedestrians frequently walking and cycling along Oxford Road and Dilworth Street. Rear gate slam of Oxfam shop next door on during the 4th minute provides L_{Amax}.
Minutes Passed	**Observations**
0 – 60	Regular flow of traffic on Oxford Road
0 – 60	Noise from extract at Big Hands Bar
0 – 1	Work activity in ground floor shop refit. L_{Amax} 71.0dB(A)
2	Reversing siren in distance
4	Rear Oxfam gate slam. L_{Amax} 83.9dB(A)

Table 26: The observations taken at the measurement location 1 between 11am to 12pm on Wednesday August 21st.

The octave band data for this measurement are detailed in table 27.

Location	1. Rear of 304-306 Oxford Road						
Time & Duration	11.00 – 12.00 1 Hour Measurement August 21st						
Measurement Parameter	**Frequency (Hz) Octave Bands**						
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
L_{eq}	63.5	55.5	51.7	49.2	50.2	51.1	45.3
L_{90}	60.2	53.5	49.7	46.8	44.6	40.9	36.8

Table 27: Octave band data between 11am to 12pm

The results obtained for measurement 4 taken at measurement location 1 between 12pm to 1pm on the second day of noise monitoring on August 21st are detailed in table 28.

Location	1. Rear of 304-306 Oxford Road
Time & Duration	12.00 – 13.00 1 Hour Measurement August 21st
Weather & Site Conditions/Observations	Light occasional gusts to 8.4km/h, cloudy overcast sky with sunny intervals, 20^0C Site Conditions – Primary noise source road traffic vehicles on Oxford Road with large vehicles, particularly buses audible although the building does provide barrier attenuation for other smaller road vehicles. Some birdsong noted during lulls in traffic flow. Noise derived at the rear is from air extraction from the Big Hands Bar. Pedestrians frequently walking and cycling along Oxford Road and Dilworth Street. Child shouting during the 32nd minute provides L_{Amax}.
Measurement Parameter	**Measurement Reading**
L_{Aeq}	53.4dB(A)
L_{A10}	53.4dB(A)
L_{Amin}	48.7dB(A)
L_{Amax}	86.1dB(A)
L_{A90}	50.2dB(A)

Table 28: The results taken at the above Location 1, 12pm to 1pm on August 21st, day 2.

The observations noted between 12pm to 1pm on day 2 are detailed in table 29.

Location	1. Rear of 304-306 Oxford Road
Time & Duration	12.00 – 13.00 1 Hour Measurement August 21st
Weather & Site Conditions/Observations	Light occasional gusts to 8.4km/h, cloudy overcast sky with sunny intervals, 20^0C Site Conditions – Primary noise source road traffic vehicles on Oxford Road with large vehicles, particularly buses audible although the building does provide barrier attenuation for other smaller road vehicles. Some birdsong noted during lulls in traffic flow. Noise derived at the rear is from air extraction from the Big Hands Bar. Pedestrians frequently walking and cycling along Oxford Road and Dilworth Street. Child shouting during the 32nd minute provides L_{Amax}.
Minutes Passed	**Observations**
0 – 60	Regular flow of traffic on Oxford Road
0 – 60	Noise from extract at Big Hands Bar
1	Work activity in shop. L_{Amax} 66.2dB(A)
2 – 3	Car horns and shouts from Oxford Road.
14	Neighbour from Gemini hot food takeaway walked passed measurement location. L_{Amax} 68.1dB(A)
14	Neighbour from Gemini hot food takeaway dropped what he was carrying. L_{Amax} 72.9dB(A)
23	Distant emergency vehicle siren
29	Gemini hot food takeaway rear shutters raised. L_{Amax} 72.9dB(A)
32	Child shouting. L_{Amax} 86.1dB(A)
38 – 48	Church bells

Table 29: The observations taken between 12pm to 1pm on day 2, August 21st.

The octave band data for this measurement are detailed in table 30.

Location	1. Rear of 304-306 Oxford Road						
Time & Duration	12.00 – 13.00 1 Hour Measurement August 21st						
Measurement Parameter	**Frequency (Hz) Octave Bands**						
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
L_{eq}	64.7	55.2	52.3	49.1	49.0	45.0	41.4
L_{90}	60.6	53.2	50.0	47.1	44.8	40.6	36.1

Table 30: Octave band data between 12pm to 1pm

The noise results obtained for measurement 5, 1pm to 2pm at location 1 on August 21st are detailed in table 31.

Location	1. Rear of 304-306 Oxford Road
Time & Duration	13.00 – 14.00 1 Hour Measurement August 21st
Weather & Site Conditions/Observations	Light occasional gusts to 6.3km/h, cloudy overcast sky with sunny intervals, 20^0C Site Conditions – Primary noise source road traffic vehicles on Oxford Road with large vehicles, particularly buses audible although the building does provide barrier attenuation for other smaller road vehicles. Some birdsong noted during lulls in traffic flow. Noise derived at the rear is from air extraction from the Big Hands Bar. Pedestrians frequently walking and cycling in area. Van being loaded during the 8th minute provides L_{Amax}.
Measurement Parameter	**Measurement Reading**
L_{Aeq}	57.6dB(A)
L_{A10}	57.5dB(A)
L_{Amin}	49.0dB(A)
L_{Amax}	78.9dB(A)
L_{A90}	50.9dB(A)

Table 31: The results taken at Measurement Location 1 from 1pm to 2pm, day 2, August 21st.

The observations noted during this measurement period between 1pm to 2pm on day 2, August 21st, are detailed in table 32.

Location	1. Rear of 304-306 Oxford Road
Time & Duration	13.00 – 14.00 1 Hour Measurement August 21st
Weather & Site Conditions/Observations	Light occasional gusts to 6.3km/h, cloudy overcast sky with sunny intervals, 20^0C Site Conditions – Primary noise source road traffic vehicles on Oxford Road with large vehicles, particularly buses audible although the building does provide barrier attenuation for other smaller road vehicles. Some birdsong noted during lulls in traffic flow. Noise derived at the rear is from air extraction from the Big Hands Bar. Pedestrians frequently walking and cycling in area. Van being loaded during the 8th minute provides L_{Amax}.
Minutes Passed	**Observations**
0 – 60	Regular flow of traffic on Oxford Road
0 – 60	Noise from extract at Big Hands Bar
0 – 1	Van being loaded nearby. L_{Amax} 75.0dB(A)
5	Van being loaded nearby. L_{Amax} 75.5dB(A)
6	Van being loaded nearby. L_{Amax} 76.8dB(A)
8	Van being loaded nearby. L_{Amax} 78.9dB(A)
48	Shop fitter singing
54	Airplane overhead

Table 32: The observations taken at the measurement location 1 between 1pm to 2pm on August 21st.

The octave band data for this measurement are detailed in table 33.

Location	1. Rear of 304-306 Oxford Road						
Time & Duration	13.00 – 14.00 1 Hour Measurement August 21st						
Measurement Parameter	**Frequency (Hz) Octave Bands**						
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
L_{eq}	65.1	56.1	53.1	50.7	49.4	51.9	50.6
L_{90}	61.0	53.7	50.3	47.5	45.5	41.5	36.9

Table 33: Octave band data between 1pm to 2pm

The noise results obtained for measurement 6 at measurement location 1 (5pm – 6pm) from day 2, August 21st, are detailed in table 34.

Location	1. Rear of 304-306 Oxford Road
Time & Duration	17.00 – 18.00 1 Hour Measurement August 21st
Weather & Site Conditions/Observations	Light occasional gusts to 2.3km/h, cloudy overcast sky with sunny intervals, 20^0C Site Conditions – Primary noise source road traffic vehicles on Oxford Road with large vehicles, particularly buses audible although the building does provide barrier attenuation for other smaller road vehicles. Some birdsong noted during lulls in traffic flow. Noise derived at the rear is from air extraction and music from the Big Hands Bar. Pedestrians frequently walking and cycling in area. Oxfam employee talking on mobile phone during the 9th minute provides L_{Amax}.
Measurement Parameter	**Measurement Reading**
L_{Aeq}	55.9dB(A)
L_{A10}	56.7dB(A)
L_{Amin}	50.6dB(A)
L_{Amax}	75.3dB(A)
L_{A90}	52.7dB(A)

Table 34: The results taken at the above Location 1 from 5pm to 6pm on day 2, August 21st.

The observations noted during the measurement between 5pm to 6pm on day 2 are detailed in table 35.

Location	1. Rear of 304-306 Oxford Road
Time & Duration	17.00 – 18.00 1 Hour Measurement August 21st
Weather & Site Conditions/Observations	Light occasional gusts to 2.3km/h, cloudy overcast sky with sunny intervals, 20^0C Site Conditions – Primary noise source road traffic vehicles on Oxford Road with large vehicles, particularly buses audible although the building does provide barrier attenuation for other smaller road vehicles. Some birdsong noted during lulls in traffic flow. Noise derived at the rear is from air extraction and music from the Big Hands Bar. Pedestrians frequently walking and cycling in area. Oxfam employee talking on mobile phone during the 9th minute provides L_{Amax}.
Minutes Passed	**Observations**
0 – 60	Regular flow of traffic on Oxford Road
0 – 60	Noise from extract at Big Hands Bar
3	Oxfam employee talking on mobile phone. L_{Amax} 67.8dB(A)
4	Activity on Dilworth Street, students, L_{Amax} 68.6dB(A)
7	Oxfam employee talking on mobile phone now in rear alley. L_{Amax} 74.6dB(A)
9	Oxfam employee talking on mobile phone now in rear alley. L_{Amax} 75.3dB(A)

Table 24: The observations taken at the measurement location 1 between 5pm to 6pm on day 2, August 21st 2013.

The octave band data for this measurement are detailed in table 36.

Location	1. Rear of 304-306 Oxford Road						
Time & Duration	17.00 – 18.00 1 Hour Measurement August 21st						
Measurement Parameter	**Frequency (Hz) Octave Bands**						
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
L_{eq}	66.1	56.5	55.3	54.8	50.4	46.4	42.7
L_{90}	61.8	54.0	51.6	50.0	47.3	43.5	38.9

Table 36: Octave band data between 5pm to 6pm

The noise results obtained for measurement 7, 6pm to 7pm at location 1 are detailed in table 37.

Location	1. Rear of 304-306 Oxford Road
Time & Duration	18.00 – 19.00 1 Hour Measurement August 21st
Weather & Site Conditions/Observations	Light occasional gusts to 2.3km/h, cloudy overcast sky with sunny intervals, 20^0C Site Conditions – Primary noise source road traffic vehicles on Oxford Road with large vehicles, particularly buses audible although the building does provide barrier attenuation for other smaller road vehicles. Some birdsong noted during lulls in traffic flow. Noise derived at the rear is from air extraction and music from the Big Hands Bar. Pedestrians frequently walking and cycling in area. Emergency vehicle sire during the 13th minute provides L_{Amax}.
Measurement Parameter	**Measurement Reading**
L_{Aeq}	57.1dB(A)
L_{A10}	57.2dB(A)
L_{Amin}	51.0dB(A)
L_{Amax}	78.1dB(A)
L_{A90}	52.7dB(A)

Table 37: The results taken at Measurement Location 1 for 6pm to 7pm on day 2, August 21st.

The observations noted during the measurement between 6pm to 7pm are detailed in table 38.

Location	1. Rear of 304-306 Oxford Road
Time & Duration	18.00 – 19.00 1 Hour Measurement August 21st
Weather & Site Conditions/Observations	Light occasional gusts to 2.3km/h, cloudy overcast sky with sunny intervals, 20^0C Site Conditions – Primary noise source road traffic vehicles on Oxford Road with large vehicles, particularly buses audible although the building does provide barrier attenuation for other smaller road vehicles. Some birdsong noted during lulls in traffic flow. Noise derived at the rear is from air extraction and music from the Big Hands Bar. Pedestrians frequently walking and cycling in area. Emergency vehicle sire during the 13th minute provides L_{Amax}.
Minutes Passed	**Observations**
0 – 60	Regular flow of traffic on Oxford Road
0 – 60	Noise from extract at Big Hands Bar
0 - 5	People talking outside rear of Big Hands Bar.
13	Emergency vehicle sirens. L_{Amax} 78.1dB(A)
14	Emergency vehicle sirens

Table 38: The observations taken at the measurement location 1 between 6pm to 7pm

The octave band data for this measurement are detailed in table 39.

Location	1. Rear of 304-306 Oxford Road						
Time & Duration	18.00 – 19.00 1 Hour Measurement August 21st						
Measurement Parameter	**Frequency (Hz) Octave Bands**						
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
L_{eq}	66.5	57.7	55.3	52.8	51.9	50.5	45.8
L_{90}	61.3	54.1	51.5	49.4	47.2	43.6	38.9

Table 39: Octave band data between 6pm to 7pm

The noise results obtained for measurement 8 at measurement location 1 (7pm – 8pm) are detailed in table 40.

Location	1. Rear of 304-306 Oxford Road
Time & Duration	19.00 – 20.00 1 Hour Measurement August 21st
Weather & Site Conditions/Observations	Light occasional gusts to 2.3km/h, cloudy overcast sky, 19^0C Site Conditions – Primary noise source road traffic vehicles on Oxford Road with large vehicles, particularly buses audible although the building does provide barrier attenuation for other smaller road vehicles. Some birdsong noted during lulls in traffic flow. Noise derived at the rear is from air extraction and music from the Big Hands Bar. Pedestrians frequently walking and cycling in area. People laughing nearby during the 4th minute provide L_{Amax}.
Measurement Parameter	**Measurement Reading**
L_{Aeq}	54.3dB(A)
L_{A10}	55.7dB(A)
L_{Amin}	50.3dB(A)
L_{Amax}	72.0dB(A)
L_{A90}	51.9dB(A)

Table 40: The results taken at the above Location 1 between 7pm to 8pm.

The observations noted during the measurement between 7pm to 8pm are detailed in table 41.

Location	1. Rear of 304-306 Oxford Road
Time & Duration	19.00 – 20.00 1 Hour Measurement August 21st
Weather & Site Conditions/Observations	Light occasional gusts to 2.3km/h, cloudy overcast sky, 19^0C Site Conditions – Primary noise source road traffic vehicles on Oxford Road with large vehicles, particularly buses audible although the building does provide barrier attenuation for other smaller road vehicles. Some birdsong noted during lulls in traffic flow. Noise derived at the rear is from air extraction and music from the Big Hands Bar. Pedestrians frequently walking and cycling in area. People laughing nearby during the 4th minute provide L_{Amax}.
Minutes Passed	**Observations**
0 – 60	Regular flow of traffic on Oxford Road
0 – 60	Noise from extract at Big Hands Bar
3	Oxfam employee talking nearby. L_{Amax} 66.3dB(A)
4	People laughing nearby. L_{Amax} 72.0dB(A)

Table 41: The observations taken at the measurement location 1 between 7pm to 8pm.

The octave band data for this measurement are detailed in table 42.

Location	1. Rear of 304-306 Oxford Road						
Time & Duration	19.00 – 20.00 1 Hour Measurement August 21st						
Measurement Parameter	**Frequency (Hz) Octave Bands**						
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
L_{eq}	66.4	56.4	54.3	52.3	49.2	45.1	40.9
L_{90}	61.0	53.4	50.8	48.9	46.5	42.9	38.3

Table 42: Octave band data between 7pm to 8pm

3. CONCLUSIONS

On comparing the results obtained for the two days of measurements, the background noise level (L_{A90}) ranges from 50dB(A) to 53dB(A) which shows that over the proposed operational period of the air-conditioning units which will be based upon the Ladbrokes betting shop opening hours, the background noise levels remain fairly constant. This is due to the consistent noise sources currently evident within the vicinity.

The lowest background noise levels were obtained between 11am and 12pm on Saturday 10th August and 10am and 11am on Wednesday 21st August. 63Hz – 500Hz was lower on Saturday 10th and 1kHz – 4kHz was lower on Wednesday 21st.

Table 43 details the L_{90} measurement results for these two 1-hour measurements.

Location	1. Rear of 304-306 Oxford Road						
Time & Duration	1 Hour Measurements August 10th & 21st						
Measurement Parameter	**Frequency (Hz) Octave Bands**						
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
L_{90} August 10th	59.0	52.7	49.7	47.0	44.8	41.0	35.8
L_{90} August 21st	59.2	53.2	50.0	47.2	44.3	40.4	35.7

Table 42: Lowest measured L_{90} octave band data measured on August 10th and 21st.

The three external units are the Daikin RZQ71DV1, RZQ100DV1 and the RXS20-25G. The manufacturer's specification sheets detail the sound pressure level of the units during various functions. It is assumed that the sound pressure level readings are at 1 metre inline with other Daikin products data sheets.

By housing the normally external units internally and therefore outside of direct line of site, unhindered direct noise from source (units) to receiver will be removed. Therefore the extension roof/ceiling structure will attenuate noise from the air handling units.

Table 43 details the construction detailing. The constructions were modelled using the commercially available software known as *Insul,* which is produced by *Marshall Day Acoustics*.

Construction Detailing	Weighted Sound Reduction Index (R_W) dB	Weighted Standardised Level Difference ($D_{nT,w}$) dB
Timber joists with 12.5mm British Gypsum Fireline Board directly fixed to the underside of the joists. Timber floorboards fitted to top side of joists with suspended tile-in-grid ceiling below.[1]	36dB	38dB
The shop front elevation consists of masonry piers approximately 450mm thickwith modern alumininum recessed door entrance. The glazing specification is to be 8.4mm thick laminated glass and is provided here.	36dB	38dB
The separating walls between occupiers to be blockwork. A thickness of 140mm has been assumed here.	51dB	53dB
Existing internal structural columns and walls to be masonry. Single leaf brick masonry is assumed.	47dB	49dB
To the rear of the premises the single storey WC block and corridor is of a masonry construction approximately 250mm thick with no glazed windows. Double leaf brick is modelled here.	55dB	57dB
New internal partitions to form the comms room and disabled WC are plasterboard stud partitions with 12.7mm Gyproc Fireline plasterboard to both sides. With a 75mm 33kg/m^3 Rockwool quilt in the cavity the results are;	48dB	50dB
New internal partitions to form the comms room and disabled WC are plasterboard stud partitions with 12.7mm Gyproc Fireline plasterboard to both sides. With an empty cavity the results are;	38dB	40dB

Table 43: Calculated results for existing and proposed construction elements.

Note 1 – The plenum depth and acoustic specification of the existing and/or proposed ceiling tile is not known, therefore the acoustic model was undertaken modelling the construction given here. It can therefore be assumed that the actual performance should be improved upon the results provided here.

Table 44 details the octave band sound pressure levels from the manufacturer's data sheets for the three air handling units with the attenuation provided by the roof/ceiling structure. The graph for the roof/ceiling structure is attached as an addendum as it was with the original planning application in April 2013.

Equipment Mode	Frequency (Hz) Octave Bands						
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
RZQ100 Cooling	54	50	51	48	45	40	34
RZQ100 Heating	51	49	50	47	46	40	36
RZQ71 Cooling	51	52	48	46	44	37	35
RZQ71 Heating	51	49	50	47	46	40	37
RXS20-25G Cooling	42	42	43	40	37	31	24
RXS20-25G Heating	40	45	43	41	38	32	27
Roof/Ceiling Structure	-15	-20	-28	-36	-38	-34	-42

Table 44: Octave band data for the three external units and the roof/ceiling structure which will attenuate noise breakout.

Table 45 details the cumulative effect of all 3 external units operating simultaneously in either cooling or heating mode.

Equipment Mode	Frequency (Hz) Octave Bands						
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
RZQ100 + RZQ71 + RXS20-25G in Cooling Mode	55.9	54.4	53.2	50.5	47.9	42.1	37.7
RZQ100 + RZQ71 + RXS20-25G in Heating Mode	54.2	52.8	53.4	50.5	49.3	43.3	39.8
Background Noise Level	59.0	52.7	49.7	47.0	44.3	40.4	35.7
Level Difference: Background to Highest Produced Noise Level (**-** less than background / **+** greater than background)	-4.1	+1.7	+3.7	+3.5	+5	+2.9	+4.1

Table 45: Cumulative octave band data for the three external units

The roof/ceiling structure will separate the units from the rear of the first floor flat. However, to allow the change of air circulation sections of the rear of the ground floor extension wall will be open with louvres to allow the change of air into the rear alley/access/fire escape area.

Figure 4 depicts the rear alley.



Figure 4: The rear alleyway depicting the rear extension wall and perimeter fence

Louvres are to be mounted in the external wall to allow the change of air flow. This noise egress will not be directly imparted onto the first floor flat but instead will disperse away from the flat. However, theoretically noise could egress from the louvres, strike the rear fence as detailed in figure 4 and reflect back up in the direction of the flat but the rear ground floor extension wall will act as a barrier.

The following barrier calculation was performed to calculate the noise attenuating ability of the rear external wall.

To find the barrier attenuation we need to find the path difference. This is given as;

pd = a + b – c

Where,

a is the distance from the noise source to the top of the barrier
b is the distance from the top of the barrier to the receiver
c is the direct path

The sound source is assumed to be 1m above ground level, i.e. the noise from the louvres as it strikes the rear fence, 2.1m from the rear extension wall which is 2.65m in height. The first floor flat is 2.665m from the extension wall with the window belonging to the first floor flat 4m above ground level.

This façade was used in the calculations as this is the most noise sensitive façade in line of sight of the source.

Path difference in this case is 0.893m from which the attenuation at 1/1 octave band frequencies can be calculated.

The table below was copied over from an Excel Spreadsheet.

63	**0.893102**	-9.7966
125		-12.036
250		-14.618
500		-17.398
1000		-20.288
2000		-23.237
4000		-26.216
8000		-29.211

Table 46: Rear wall/barrier octave band data

The internally housed air-conditioning units will exude noise out in a variety of directions but their will be no noise in direct line of sight of the rear first floor flat. The only external noise from the air-conditioning units that could impact on the external flat's façade is by reflection, in particular from the rear fence.

Attenuation varies with frequency; although the height of the rear extension wall does not rise above ground floor level as it stops at the abutment between ground and first floor ceiling/floor structure, it does provide some attenuation of reflected noise back off the rear alley fence.

The ground floor extensions rear external wall will provide 9.79dB attenuation at 63Hz increasing with frequency to 29.21dB attenuation at 8kHz.

The following tables 47 thru to 52 details the difference between the lowest background levels measured over both days and the octave band data for each individual item of external plant firstly directly via the roof structure and secondly by reflection of the alley fence.

Individual Equipment with Lowest Measured Background Noise Level per Octave Band over the Two Days and the Acoustic Enclosure Octave Band Data	**Frequency (Hz) Octave Bands**						
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
RZQ100 Cooling Mode	54	50	51	48	45	40	34
RZQ100 Heating Mode	51	49	50	47	46	40	36
Background Noise Level	59.0	52.7	49.7	47.0	44.3	40.4	35.7
Difference between highest noise level (cooling or heating) and background	-5	-2.7	1.3	1	0.7	-0.4	0.3
Roof/Ceiling Structure	-15	-20	-28	-36	-38	-34	-42
Difference when considering roof/ceiling structure	-20	-22.7	-26.7	-35	-37.3	-33.4	-41.7

Table 47: Octave band data for the RZQ100 external unit with lowest background noise levels measured over both days through the separating roof/ceiling structure

Individual Equipment with Lowest Measured Background Noise Level per Octave Band over the Two Days and the Acoustic Enclosure Octave Band Data	**Frequency (Hz) Octave Bands**						
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
RZQ71 Cooling Mode	51	52	48	46	44	37	35
RZQ71 Heating Mode	51	49	50	47	46	40	37
Background Noise Level	59.0	52.7	49.7	47.0	44.3	40.4	35.7
Difference between highest noise level (cooling or heating) and background	-8	-0.7	0.3	0	1.7	-0.4	1.3
Roof/Ceiling Structure	-15	-20	-28	-36	-38	-34	-42
Difference when considering roof/ceiling structure	-23	-20.7	-27.7	-36	-36.3	-34.4	-40.7

Table 48: Octave band data for the RZQ71 external unit with lowest background noise levels measured over both days through the separating roof/ceiling structure

Individual Equipment with Lowest Measured Background Noise Level per Octave Band over the Two Days and the Acoustic Enclosure Octave Band Data	**Frequency (Hz) Octave Bands**						
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
RXS20-25G Cooling Mode	42	42	43	40	37	31	24
RXS20-25G Heating Mode	40	45	43	41	38	32	27
Background Noise Level	59.0	52.7	49.7	47.0	44.3	40.4	35.7
Difference between highest noise level (cooling or heating) and background	-17	-7.7	-6.7	-6	-6.3	-8.4	-8.7
Roof/Ceiling Structure	-15	-20	-28	-36	-38	-34	-42
Difference when considering roof/ceiling structure	-32	-27.7	-34.7	-42	-44.3	-42.4	-50.7

Table 49: Octave band data for the RXS20-25G external unit with lowest background noise levels measured over both days through the separating roof/ceiling structure

Individual Equipment with Lowest Measured Background Noise Level per Octave Band over the Two Days and the Acoustic Enclosure Octave Band Data	**Frequency (Hz) Octave Bands**						
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
RZQ100 Cooling Mode	54	50	51	48	45	40	34
RZQ100 Heating Mode	51	49	50	47	46	40	36
Background Noise Level	59.0	52.7	49.7	47.0	44.3	40.4	35.7
Difference between highest noise level (cooling or heating) and background	-5	-2.7	1.3	1	0.7	-0.4	0.3
Attenuation provided by the external wall acting as a barrier	-9.8	-12	-14.6	-17.4	-20.2	-23.2	-26.2
Difference between highest noise level produced and the background noise level with noise attenuation of the reflected noise provided by the external wall.	-14.8	-14.7	-13.3	-16.4	-19.5	-23.6	-25.9

Table 50: Octave band data for the RZQ100 external unit with lowest background noise levels measured over both days with consideration of reflected noise from the rear alley fence which will be further attenuated by the rear ground floor extension wall.

Individual Equipment with Lowest Measured Background Noise Level per Octave Band over the Two Days and the Acoustic Enclosure Octave Band Data	**Frequency (Hz) Octave Bands**						
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
RZQ71 Cooling Mode	51	52	48	46	44	37	35
RZQ71 Heating Mode	51	49	50	47	46	40	37
Background Noise Level	59.0	52.7	49.7	47.0	44.3	40.4	35.7
Difference between highest noise level (cooling or heating) and background	-8	-0.7	0.3	0	1.7	-0.4	1.3
Attenuation provided by the external wall acting as a barrier	-9.8	-12	-14.6	-17.4	-20.2	-23.2	-26.2
Difference between highest noise level produced and the background noise level with noise attenuation of the reflected noise provided by the external wall.	-17.8	-12.7	-14.3	-17.4	-18.5	-23.6	-24.9

Table 51: Octave band data for the RZQ71 external unit with lowest background noise levels measured over both days with consideration of reflected noise from the rear alley fence which will be further attenuated by the rear ground floor extension wall.

Individual Equipment with Lowest Measured Background Noise Level per Octave Band over the Two Days and the Acoustic Enclosure Octave Band Data	**Frequency (Hz) Octave Bands**						
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
RXS20-25G Cooling Mode	42	42	43	40	37	31	24
RXS20-25G Heating Mode	40	45	43	41	38	32	27
Background Noise Level	59.0	52.7	49.7	47.0	44.3	40.4	35.7
Difference between highest noise level (cooling or heating) and background	-17	-7.7	-6.7	-6	-6.3	-8.4	-8.7
Attenuation provided by the external wall acting as a barrier	-9.8	-12	-14.6	-17.4	-20.2	-23.2	-26.2
Difference between highest noise level produced and the background noise level with noise attenuation of the reflected noise provided by the external wall.	-26.8	-19.7	-21.3	-23.4	-26.5	-31.6	-34.9

Table 52: Octave band data for the RXS20-25G external unit with lowest background noise levels measured over both days with consideration of reflected noise from the rear alley fence which will be further attenuated by the rear ground floor extension wall.

The octave band results detailed in tables 47 to 52 show that all three units achieve the -5dB below existing background noise levels when housed internally as the building structure both the roof/ceiling structure and the external wall provides sufficient noise attenuation internally by direct means and externally of reflected noise.

Applicable guidance when considering the impact of industrial noise on a nearby residential development can be taken from *BS 4142: 1997 – Method for Rating industrial noise affecting mixed residential and industrial areas.*

In BS 4142, Section 8 refers to a rating level and discusses the comparison between the specific noise levels i.e. when the site is in operation or a particular piece of machinery is in use, in this case if an air conditioning unit is in operation and the background noise level, i.e. when the air conditioning unit is quiet or in-operable. Sub-section 8.1 states that; *certain acoustic features can increase the likelihood of complaint over that expected from a simple comparison between the specific noise level and the background noise level. Where present at the assessment location, such features are taken into account by adding 5 dB to the specific noise level to obtain the rating level.* Sub-section 8.2 states to the adding of 5 dB to the specific noise level if one or more features are contained in the noise which includes distinguishable, discrete continuous notes or distinct impulses or the noise is irregular enough to attract attention.

Furthermore, Section 9 *Assessment method* states *a difference of around +10dB or more indicates that complaints are likely. A difference of around +5dB is of marginal significance but if the rating level is more than 10dB below the measured level then this is a positive indication that complaints are unlikely.*

4. RECOMMENDATIONS AND FINAL CONCLUSION

The proposed location for the air-conditioning units is in the ground floor extension with air exchange being achieved through the rear extension wall which will have louvres mounted within it. The separating roof/ceiling structure of the extension roof will provide attenuation of noise created within the ground floor extension and the rear extension wall will provide barrier attenuation of reflected noise off the rear alley fence.

As the opening hours for the Ladbrokes betting shop are to be 8am to 10pm, therefore within the acknowledged daytime period 07:00 to 23:00, their will be no night-time operation of the air-conditioning units.

Additional reference is made to *BS 8233:1999 Sound insulation and noise reduction for buildings - Code of practice*. This British Standard makes reference in its table 5 which is on page 19 of the standard for the attainment of either one of two design levels. The Good design range for Living Rooms and Bedrooms is set at 30dB with the lesser but still amenable Reasonable design range of 40dB for Living Rooms and 35dB for Bedrooms. This is recommended as suitable indoor ambient noise levels when unoccupied.

5. SUMMARY.

Sanctuary Acoustics was asked by Ladbrokes Plc to assess the noise levels at the rear of their new betting shop located at 304-306 Oxford Road, Manchester. Planning approval was previously granted to Ladbrokes Plc thereby allowing the refit and renovation of the existing ground floor premises to proceed, but that initial approval did not extend to the installation of an air-conditioning system on the premises. This noise assessment which included two days of on-site noise measurements aims to assess the existing background noise levels to the rear of 304-306 Oxford Road where the proposed air-conditioning units would be installed and, if any what affect the proposed air-conditioning units would have on the existing background and ambient noise levels. The optimum sound pressure level produced by the air-conditioning units should also be compared with the measured background noise levels (L_{A90}) with further reference made to criteria in *BS 4142:1997 Method for rating industrial noise affecting mixed residential and industrial areas*. Dwellings, (flats) are located on the first and second floors of the building hence the need for an accurate noise assessment. This report classified as revision 2 is a revised report which includes a direct comparison between background noise levels and air-conditioning plant noise levels by use of octave band data. In the initial report that related to air conditioning noise, one third octave band background noise data that was measured on site was provided in Annex A, however the request for a comparison between octave band data of both background noise and plant noise was only made aware to us following an email sent to Graham Whitehead of R R Planning by Janine Renshaw-Livesey, Planner, Manchester City Council dated October 9th 2013. Within this email Janine quoted a category, NSE6; noise – external equipment insulation. "*The criteria that we ask external equipment to meet, as above, are 5dB below the existing background (L_{A90}) in each octave band at the nearest noise sensitive location.*" The noise report, revision 1, made a comparison between background noise levels and the air conditioning noise with and without acoustic shrouds in place. These shrouds however were deemed unsuitable by planning and therefore the air handling units are to be relocated internally with louvres that will be mounted in the rear extension wall. Locating the air handling units and louvres at this location, direct line of sight with the rear first floor flat will be removed.

To summarise:

1. The noise measurements were taken at the rear of 304-306 Oxford Road in the proximity of the proposed location for the air-conditioning units over a two day period, a weekend (Saturday August 10th) and a week day (Wednesday August 21st). Measurements took place during the proposed opening hours of the new Ladbrokes betting shop, 8am to 10pm and hence the operating hours of the proposed air-conditioning units.
2. The planning department have requested resolution to three points in relation to noise; *the noise output from the units, including cumulative impact of all the units operating simultaneously; any acoustic measures proposed to limit noise breakout from the units; details of the ambient noise levels during the daytime, night and weekends and how noise from the units will impact on ambient noise levels.*
3. Noise measurement parameters are detailed in the report and are based on 1-hour time intervals. The L_{Aeq}, L_{A90}, L_{Amax}, L_{Amin} and L_{A10} are detailed in the report along with octave band data between 63Hz to 4kHz with full 1/1 octave band background noise data from 8Hz to 16kHz to the rear of the report in Appendix A.

4. Six 1-hour measurements were conducted on Saturday August 10th and eight measurements were conducted on Wednesday August 21st. The results obtained for both measurement days were not dissimilar. The average background noise level (L_{A90}) at the rear of 304-306 Oxford Road was 51.5dB.
5. The proposed Ladbrokes external air conditioning units are the RZQ71DV1, RZQ100DV1 and RXS20-25G.
6. The location for the external plant will be housed internally within the ground floor extension with louvres mounted in the rear extensions external wall.
7. The octave band data for all three external units has been cross-referenced with the background noise level data measured on site with only the RXS20-25G achieving the requirement of a minimum 5dB below existing background noise levels.
8. The roof/ceiling structure will more than attenuate a sufficient amount of direct noise from the internally housed units to achieve a minimum attenuation of 5dB below background.
9. The ground floor extensions external wall will significantly attenuate any reflected noise from the internally housed units that could be reflected back off the rear alley fence in the direction of the first floor flat. Such barrier attenuation has been calculated to more than achieve the minimum reflected noise of 5dB below background.

6. ANNEX A

Location 1 - Measurement 1 – August 10th

Spectrum Time Slot:	10/08/2013 11:01:46 - 12:01:45	
Frequency [Hz]	L_{eq} [dB]	L_{90} [dB]
8	64.1	50.3
16	66.9	57.2
31.50	65.3	60.0
63	64.6	59.0
125	57.5	52.7
250	54.5	49.7
500	50.2	47.0
1000	49.4	44.8
2000	47.5	41.0
4000	42.8	35.8
8000	37.6	27.8
16000	26.2	21.3
A	54.6	50.4

Location 1 - Measurement 2 – August 10th

Spectrum Time Slot:	10/08/2013 12:01:58 - 13:01:57	
Frequency [Hz]	L_{eq} [dB]	L_{90} [dB]
8	67.3	50.4
16	65.6	55.5
31.50	64.3	60.0
63	68.2	62.8
125	60.4	56.0
250	54.7	50.0
500	51.0	47.5
1000	50.0	45.6
2000	47.5	41.2
4000	42.7	36.1
8000	35.5	28.1
16000	26.8	20.6
A	55.1	51.1

Location 1 - Measurement 3 – August 10th

Spectrum Time Slot:	10/08/2013 13:02:16 - 14:02:15	
Frequency [Hz]	L_{eq} [dB]	L_{90} [dB]
8	68.4	50.0
16	65.4	54.7
31.50	66.4	61.4
63	69.4	66.1
125	63.5	59.2
250	56.6	51.7
500	52.2	49.3
1000	50.2	46.8
2000	48.4	44.5
4000	42.7	39.1
8000	35.9	29.1
16000	25.1	19.9
A	56.2	52.9

Location 1 - Measurement 4 – August 10th

Spectrum Time Slot:	10/08/2013 17:00:34 - 18:00:33	
Frequency [Hz]	L_{eq} [dB]	L_{90} [dB]
8	63.5	50.1
16	65.8	55.6
31.50	65.5	60.5
63	65.7	61.2
125	58.0	54.5
250	56.6	51.2
500	52.0	49.4
1000	49.3	46.7
2000	45.4	42.7
4000	41.4	38.0
8000	34.6	29.5
16000	25.1	20.4
A	54.7	52.2

Location 1 - Measurement 5 – August 10th

Spectrum Time Slot:	10/08/2013 18:00:57 - 19:00:56	
Frequency [Hz]	L_{eq} [dB]	L_{90} [dB]
8	62.1	49.1
16	64.8	55.2
31.50	64.6	60.0
63	65.6	60.9
125	57.1	53.8
250	55.9	51.0
500	52.0	49.7
1000	49.1	47.0
2000	44.7	42.6
4000	40.4	37.7
8000	33.3	29.3
16000	23.5	20.1
A	54.3	52.3

Location 1 - Measurement 6 – August 10th

Spectrum Time Slot:	10/08/2013 19:01:26 - 20:01:25	
Frequency [Hz]	L_{eq} [dB]	L_{90} [dB]
8	59.6	47.8
16	64.0	54.8
31.50	65.0	60.7
63	67.7	62.1
125	59.9	53.8
250	57.9	53.3
500	54.5	50.1
1000	55.3	47.2
2000	52.1	43.3
4000	43.9	38.3
8000	35.4	29.5
16000	23.4	20.6
A	59.2	52.8

Location 1 - Measurement 1 – August 21st

Spectrum Time Slot:	21/08/2013 09:05:06 - 10:05:05	
Frequency [Hz]	L_{eq} [dB]	L_{90} [dB]
8	65.6	51.5
16	67.9	59.1
31.50	69.4	65.0
63	64.1	60.7
125	55.7	53.7
250	52.6	50.3
500	50.0	47.3
1000	47.4	44.8
2000	46.5	40.9
4000	41.6	36.3
8000	34.5	28.0
16000	24.4	20.4
A	53.4	50.5

Location 1 - Measurement 2 – August 21st

Spectrum Time Slot:	21/08/2013 10:05:47 - 11:05:46	
Frequency [Hz]	L_{eq} [dB]	L_{90} [dB]
8	62.6	50.8
16	64.7	58.7
31.50	66.1	62.7
63	63.0	59.2
125	55.1	53.2
250	53.8	50.0
500	53.5	47.2
1000	47.6	44.3
2000	44.3	40.4
4000	41.3	35.7
8000	34.3	27.5
16000	24.4	20.0
A	54.1	50.1

Location 1 - Measurement 3 – August 21st

Spectrum Time Slot:	21/08/2013 11:06:09 - 12:06:08	
Frequency [Hz]	L_{eq} [dB]	L_{90} [dB]
8	67.5	51.2
16	64.8	57.8
31.50	68.0	64.2
63	63.5	60.2
125	55.5	53.5
250	51.7	49.7
500	49.2	46.8
1000	50.2	44.6
2000	51.1	40.9
4000	45.3	36.8
8000	37.5	28.6
16000	26.9	21.0
A	56.1	50.2

Location 1 - Measurement 4 – August 21st

Spectrum Time Slot:	21/08/2013 12:06:44 - 13:06:43	
Frequency [Hz]	L_{eq} [dB]	L_{90} [dB]
8	69.7	52.6
16	68.4	59.4
31.50	69.1	64.5
63	64.7	60.6
125	55.2	53.2
250	52.3	50.0
500	49.1	47.1
1000	49.0	44.8
2000	45.0	40.6
4000	41.4	36.1
8000	35.7	27.8
16000	26.4	20.1
A	53.4	50.2

Location 1 - Measurement 5 – August 21st

Spectrum Time Slot:	21/08/2013 13:07:02 - 14:07:01	
Frequency [Hz]	L_{eq} [dB]	L_{90} [dB]
8	66.1	51.8
16	67.7	59.2
31.50	70.4	65.1
63	65.1	61.0
125	56.1	53.7
250	53.1	50.3
500	50.7	47.5
1000	49.4	45.5
2000	51.9	41.5
4000	50.6	36.9
8000	45.5	28.2
16000	34.0	20.2
A	57.6	50.9

Location 1 - Measurement 6 – August 21st

Spectrum Time Slot:	21/08/2013 17:00:10 - 18:00:09	
Frequency [Hz]	L_{eq} [dB]	L_{90} [dB]
8	63.5	51.0
16	65.4	57.4
31.50	67.1	62.9
63	66.1	61.8
125	56.5	54.0
250	55.3	51.6
500	54.8	50.0
1000	50.4	47.3
2000	46.4	43.5
4000	42.7	38.9
8000	34.9	30.8
16000	25.5	21.3
A	55.9	52.7

Location 1 - Measurement 7 – August 21st

Spectrum Time Slot:	21/08/2013 18:00:50 - 19:00:49	
Frequency [Hz]	L_{eq} [dB]	L_{90} [dB]
8	64.1	51.8
16	66.5	58.2
31.50	67.7	64.0
63	66.5	61.3
125	57.7	54.1
250	55.3	51.5
500	52.8	49.4
1000	51.9	47.2
2000	50.5	43.6
4000	45.8	38.9
8000	36.6	30.8
16000	24.9	21.1
A	57.1	52.7

Location 1 - Measurement 8 – August 21st

Spectrum Time Slot:	21/08/2013 19:01:23 - 20:01:22	
Frequency [Hz]	L_{eq} [dB]	L_{90} [dB]
8	61.9	50.6
16	65.9	58.0
31.50	67.8	63.8
63	66.4	61.0
125	56.4	53.4
250	54.3	50.8
500	52.3	48.9
1000	49.2	46.5
2000	45.1	42.9
4000	40.9	38.3
8000	32.9	30.2
16000	22.8	20.8
A	54.3	51.9

7. ANNEX B

Acoustics Glossary of Terms

$L_{Aeq,T}$ – Equivalent continuous sound pressure level. This is the A-weighted sound pressure level in decibels (dB) of a continuous, steady sound that within a specified time interval, T, has the same mean squared sound pressure as a sound that varies with time.

L_{A10} – The A-weighted mean square sound pressure level that is exceeded for 10% of the time.

L_{A90} – The A-weighted mean square sound pressure level that is exceeded for 90% of the time. Referred to as the background noise level.

L_{Amin} – The lowest A-weighted noise level recorded during a noise event.

L_{Amax} – The highest A-weighted noise level recorded during a noise event.