Azymuth Acoustics UK

Professional Acoustic Services

Approved by: Matthew Gibson
Date: 10/10/2018

Environmental Noise Report
Ref: AA0130

Proposed Residential Apartment Development

8 Brookburn Road
Chorlton-cum-Hardy
Manchester

For

Huse Living Ltd
102 Roseneath Road
Urmston
Manchester
M41 5AZ





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Document Status – Final

Reference: AA0130			**Date:** 10/10/2018
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Approved by:		Matthew Gibson	10/10/2018

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1.0 Introduction

Azymuth Acoustics UK is appointed by Huse Living Ltd to provide a Noise Impact Assessment of a proposed residential development at Brookburn Road, Chorlton-cum-Hardy, Manchester.

The development site is bounded by Brookburn Road and is located opposite the Bowling Green Hotel. The project involves the conversion of an existing building into 8 apartments and involves the construction of an additional 3rd floor of accommodation.

This report is intended to provide information relating to potential noise levels affecting the site as required by Manchester City Council to support the detailed planning application. In particular the report sets out the following details:

- The results of a baseline noise survey undertaken at the proposed development site.
- The appropriate assessment criteria and guidance relating to noise in the environment as associated with this kind of development and the level of noise control that is deemed to be appropriate in order to protect the future residents of the proposed dwellings.
- Guide noise limits for any external mechanical plant installed as part of the development.

2.0 Baseline Noise Survey

2.1 Measurement Procedures

The instrumentation used for the environmental noise survey consisted of a SvanTek 977 Type 1 precision sound level meter and 01dB calibrator. The meter was calibrated before and after the noise measurements. The sound level meter records A-weighted (fast response) noise levels as well as octave band data for all measurements recorded.

The survey was completed in two stages; the first stage being undertaken with a fixed noise monitoring position (at position 1) covering a period between 15:04hrs on Friday 21st September – 07:49hrs on Monday 24th September 2018.

Additional sampled noise measurements were made at position 1b which were undertaken on Friday 28th September 2018 between 23:00 – 23:45hrs.

The ambient noise measurements were undertaken using the sound level meter microphone at the locations shown in Figure 1 below.

The sound level meter was positioned at the following measurement locations on the site:

- Position 1a: Fixed measurement position outside 1st floor window on Brookburn Road elevation nominally 5.5m from edge of road.
- Position 1b: On-site / boundary wall location Brookburn Road (approx. 2.75m from edge of road).

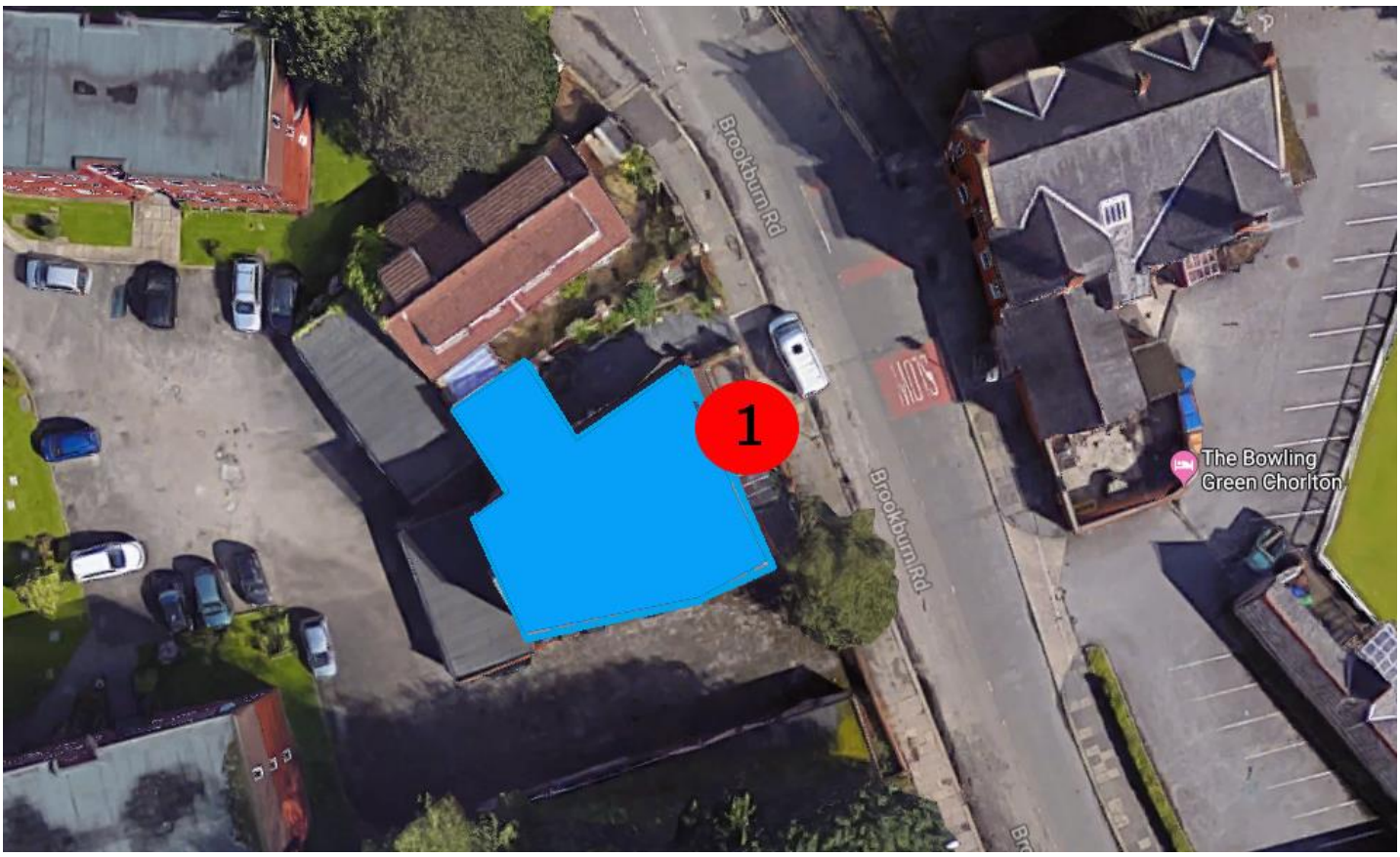

Figure 2: Site plan with noise measurement positions marked in red

2.2 Results of Noise Measurements

Full results of the noise levels recorded during the survey are included in Appendix B of this report.

The following table summarises the results of the noise measurements undertaken at the proposed site in terms of average daytime (07:00 to 23:00 hours) and night-time (23:00 to 07:00 hours) statistical noise levels.

Location	Day	Time / averaging	L_{Amax}	L_{Aeq}	L_{A10}	L_{A50}	L_{A90}
1. Brookburn Road (1st floor window)	Friday	Day	73.6	59.6	62.4	54.7	50.4
	Fri-Sat	Night	65.6	49.8	49.4	45.4	43.6
1. Brookburn Road (1st floor window)	Saturday	Day	72.9	57.9	60.2	54.2	51.1
	Sat-Sun	Night	66.8	52.1	49.5	43.7	40.5
1. Brookburn Road (1st floor window)	Sunday	Day	71.6	56.9	58.0	52.1	48.8
	Sun-Mon	Night	61.0	46.4	43.6	40.5	39.0
1. Brookburn Road (1st floor window)	Typical	Day	73.3	58.8	61.3	54.4	50.8
	Typical	Night	66.2	51.1	49.4	44.5	42.1
1b. Brookburn Road (1st floor window)	Friday (2300-2345)	Night	63.2	47.0	48.9	41.5	37.6

Table 1: Results of Azymuth Acoustics UK noise measurements, August 2018

2.3 Description of Noise Climate

The noise climate in the area is relatively quiet with the main sources of noise being road traffic movements from vehicles using Brookburn Road. The beer garden and outdoor seating area associated with the Bowling Green Hotel is also a general source of noise. However, the measurement data indicates that the levels of noise are generally relatively low.

Noise levels in the vicinity of Brookburn Road are typically in the range 55 - 60 L_{Aeq} during the day and typically 47-50 dB L_{Aeq} during the majority of the night-time periods.

Levels away from Brookburn Road are likely to be screened from the general traffic noise fairly rapidly with distance from this road with levels at 18m from this road being typically 63 - 65 dB L_{Aeq} during the daytime and at other locations that are fully screened from New North Road the daytime noise levels are in the range 47 - 49 dB L_{Aeq}.

3.0 Assessment Criteria

In order to assess the extent of any measures required in order to comply with suitable conditions relating to potential noise sources, Azymuth Acoustics has reviewed various guidance documents and standards, these include:

- ProPG: Professional Practice Guidance on Planning and Noise (New residential development)
- National Planning Policy Framework (NPPF) 2018
- British Standard 8233: 2014
- World Health Organisation Guidelines on Community Noise
- British Standard 4142: 2014

3.1 ProPG: Planning and Noise - May 2017

This Professional Practice Guidance on Planning and Noise (ProPG) has been produced to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England. The National Planning Policy Framework (NPPF) encourages improved standards of design. The CIEH, IOA and the ANC have worked together to produce this guidance which encourages better acoustic design for new residential development and aims to protect people from the harmful effects of noise.

The Professional Practice Guidance on Planning and Noise States 'The recommended approach is intended to give the developer, noise practitioner, and decision maker an early indication of the likely initial suitability of the site for new residential development from a noise perceptive and the extent of acoustic issues that would be faced'. It is important that acoustic design is reviewed at an early stage of the development process.

3.2 National Planning Policy Framework (NPPF) 2018

The NPPF provides guidance to local authorities taking into account noise in making planning decisions. Paragraph 180 of the National Planning Policy Framework (NPPF) states that planning polices and decisions should aim to:

- Avoid noise giving rise to significant adverse impacts on health and quality of life as a result of new development;
- Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions

The National Planning Policy Framework states that the planning system should 'prevent both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability'.

3.3 British Standard 8233: 2014

BS 8233 provides a code of practice for the sound insulation of a variety of building types affected by general environmental noise. It provides recommendations for control of noise in and around buildings and suggests appropriate internal ambient noise level criteria / limits for a variety of different situations including residential properties.

The following table summarises the noise limits suggested by BS 8233 applying to residential properties:

Activity	Room	Good Design Range $L_{Aeq,\,T}$ dB	
		07:00-23:00hrs	23:00-07:00hrs
Resting	Living rooms	35	-
Dining	Dining room / area	40	-
Sleeping (daytime resting)	Bedroom (at night)	35	30

Table 2: Noise Limits for Residential Properties Suggested in BS 8233

3.4 W.H.O. Guidelines on Community Noise

In 1980 the World Health Organisation proposed environmental health criteria for community noise including consideration of noise levels at which sleep disturbance may take place. These guidelines were amended by the World Health Organisation in 1999. The guidance suggests that an internal L_{Aeq} below 30dB is required to preserve the restorative process of sleep. This is equivalent to a free-field level of around 42 to 45dB L_{Aeq} or a façade level of 45 to 48dB L_{Aeq}, assuming open windows.

3.5 British Standard 4142: 2014

The test that is generally applied to assess the potential for noise from industrial and commercial installations to give rise to community response is contained in British Standard BS 4142: 2014. This standard predicts the likelihood of complaint due to noise from a new or modified source.

BS 4142 describes a method for determining the specific source and background noise levels outside residential buildings and for assessing whether the noise is likely to give rise to complaints from the occupants. The specific noise level from the commercial source is rated based on any tonal or intermittent characteristics of the sound. BS 4142 assessment methodology involves comparing the existing background level with the predicted noise from the new development. This predicted level is adjusted to allow for any tonal or impulsive characteristics and is called the Rating Level. The difference between the two levels can be used to indicate the likelihood of complaints arising, e.g. a predicted level of 10dB greater than the background level indicates a significant adverse impact; an increase of around 5dB indicates an adverse impact and where the rating level does not exceed the background sound level (BSL) this is an indication of the source having a low impact.

In the context of proposed new noise sensitive receptors in the vicinity of industrial sources, the document states that ‘where a new noise-sensitive receptor is introduced and there is extant industrial and / or commercial sound, it ought to be recognized that the industrial and / or commercial sound forms a component of the acoustic environment. In such circumstances other guidance and criteria in addition to or alternative to this standard can also inform the appropriateness of both introducing a new noise-sensitive receptor and the extent of required noise mitigation’.

3.6 Recommended Noise Assessment Criteria

Based on the guidance above it is recommended that the following criteria would be reasonable with the aim of minimising the impact of the environmental noise on the proposed new residential accommodation:

- Daytime noise levels not to exceed 35dB $L_{Aeq,\,16\,hr}$ in living rooms / bedrooms
- Daytime noise levels not to exceed 40dB $L_{Aeq,\,16\,hr}$ in dining room / kitchen
- Noise levels in bedrooms not to exceed 35dB $L_{Aeq,\,16\,hr}$ for daytime periods
- Night-time noise levels in bedrooms not to exceed 30dB $L_{Aeq,\,8\,hr}$

Table 4, Note 5 of BS 8233:2014 states: 'If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level. If applicable, any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment.'

4.0 Assessment of Noise Levels

4.1 Noise Risk Assessment (ProPG)

The risk assessment is based on survey data and incorporates a worst-case approach to potential night time adverse effects.

Adverse effect risk levels affecting the site are summarised in Table 3 below.

Façade Location	Noise Level Range (free field) dBA		Risk of Adverse Effect
	DAY	NIGHT	
Brookburn Road elevation	57-60	46-52	Low – Medium (mainly medium)
All other elevations	Estimated 55-58	Estimated 44-50	Low

Table 3: Potential adverse risk effects, various locations on Brookburn Rd site

The proposed façade facing Brookburn Road would represent the most significant risk in terms of potential adverse impact, however, at this front elevation the noise levels present a low to medium risk even after taking account of the measured noise levels from the Bowling Green Hotel beer garden over a weekend period. Incorporation of standard glazing and openable windows would likely result in satisfactory conditions for the new residents.

Other elevations of the building would present an even lower risk of adverse impact and as such standard glazing may be incorporated; in most reasonable cases natural ventilation will be acceptable.

4.2 Road Traffic and Other Ambient Noise Level Assessment

Daytime noise levels along the Brookburn Road boundary are typically 58-63 dB $L_{Aeq,\ 1hr}$ during the day and 43-50 dB $L_{Aeq,\ 1hr}$ during early night-time periods with the lowest noise levels being recorded around 02:00-05:00hrs. In relation to ProPG pre-planning guidance the measurements would indicate a low to medium risk of adverse effects during the daytime and also a high risk during the measured night-time period.

On the basis of the measured noise levels it is estimated that an overall noise reduction of 26-28 dB would be required through the façade in order to achieve satisfactory conditions inside habitable rooms near Brookburn Road.

Road traffic noise and noise levels from the Bowling Green Hotel beer garden would have a lesser impact on the side and rear elevations of the proposed apartment building. Hence the noise levels in these locations present a low risk in relation to noise as defined in ProPPG.

5.0 Recommendations for Noise Mitigation

This section sets out the recommended minimum noise mitigation measures required to ensure satisfactory acoustic conditions inside habitable rooms throughout the scheme.

5.1 Glazing Specifications

The appropriate glazing specifications for the new dwellings based on the current proposed layout are summarised in Table 4 and below.

Location (Bedrooms, Living Rooms, Dining Rooms)	Glazing Specifications	Appropriate Glazing Types
All elevations:	Airborne sound insulation min. R_W 32dB and R_W+C_{tr} 27dB	Standard good quality thermal double glazing with robust acoustic test data to prove SI performance

Table 4: Recommended glazing specifications for new apartments, New North Road site

5.2 Ventilation Specifications

The recommended ventilation strategy based on the current proposed layout are summarised in Table 5 and Figure 5 below.

Location (Bedrooms, Living Rooms, Dining Rooms)	Ventilation (minimum) Specifications	Window slot vent trickle ventilation (where applicable)
All locations and all elevations	System 3 fan assisted enhanced background ventilation Opening windows generally acceptable during hottest days of the year	*Generally avoid trickle vents, but where these are needed use Dnew 35 dB rated types*

Table 5: Recommended ventilation strategy for the Brookburn Road site

5.3 Other Elements of Building Envelope

Other elements of the building envelope should have the following minimum sound insulation performance:

- External Walls: minimum sound insulation R_W 52dB. This minimum is likely to be significantly exceeded by the existing masonry façade. Where alternative external wall types are proposed on habitable areas it will be appropriate to check compliance with the R_W 50dB target.
- Roof: minimum sound insulation R_W 40dB. This is likely to be achieved with a suitable upgrades to the thermal insulation of the existing or proposed roof / ceiling build-up.

5.4 Noise limits for externally mounted plant / atmosphere connections

It is assumed that gas central heating or electric room heaters will be used for the proposed dwellings. It is also assumed that the system 3 fan assisted ventilation will be domestic in scale and generally low noise.

However, should alternative forms of heating / ventilation be considered (eg air source heat pump and/or MVHR ventilation) then table 6 below lists noise limits for externally mounted plant at various distances. Assuming plant items could be running during both day and night-time periods, internal noise levels in next door or adjacent rooms should not exceed 30dB $L_{Aeq,\ 5min}$ (NR25) or regularly exceed 45dB L_{Amax} for any period.

Location	Period	Indicative Noise Limit $L_{Aeq,T}$
Any item located on the façade of the buildings @ 1m from any single item or group of items (cumulative) Installations should be min. 2m from any habitable room window.	All	47 dBA
Roof level, any location @ 1m from any atmosphere connection Installations should be min. 2m from any habitable room window	All	52 dBA
NB a noise limit of 42 dBA at the nearest neighbouring property applies for heat pumps covered by permitted development under the Micro-generation Certification Scheme (where applicable – eg outdoor condensers for AHPs)		

Table 6: Plant noise limits at various distances (dBA)

The noise levels set out above have been developed so as to ensure that noise from any plant or mechanical services associated with the development does not have a significant effect on ambient noise level within habitable rooms in the development and the wider environment beyond the site perimeter.

The general plant noise levels limits indicated above would be subject to review at the detailed design stage of the project, however, it would be anticipated that general domestic type of mechanical services would not exceed any of the noise limits set out above.

6.0 Conclusions

Azymuth Acoustics has undertaken a noise impact assessment of the proposed residential and retail development situated at Brookburn Road, Chorlton, Manchester.

The noise climate in the area is relatively quiet for an urban area with some contribution from occasional local road traffic using Brookburn Road as well as lower levels of sound from people using the outdoor seating area at the Bowling Green Hotel.

The residential development should be protected by noise mitigation measures including:

- Good quality double glazing to all rooms on all elevations exposed to traffic noise along Brookburn Road and noise from the Bowling Green Hotel.

- System 3 Mechanical ventilation is generally recommended to all habitable rooms in order to provide enhanced background ventilation and where trickle ventilation is deemed to be necessary these should be rated to provide an acoustic performance of Dnew 35 dB or better.

- Noise limits applicable to any externally mounted plant or atmosphere connections proposed as part of the submission (with a primary noise limit of 47 dBA @ 1m).

Appendix A – Glossary of Terms

Decibel (dB)
this is the unit used to measure sound. The human ear has an approximately logarithmic response to acoustic pressure over a very large dynamic range (typically 20 micro Pascal to 100 Pascal).

dB (A)
This is a measure of the overall noise level of sound across the audible spectrum with a frequency weighting (i.e. A-weighting) to compensate for the sensitivity of the human ear to sound of different frequencies. The A-weighting curve is implemented in sound level meters using an electronic filter that approximately corresponds to the frequency response of the ear.

Octave Band Noise Level
The human ear is sensitive to sound over a range of frequencies between approximately 20 Hz to 20 kHz. The ear is also generally more sensitive to medium and high frequencies than to low frequencies. In order to define the frequency content of a noise, the spectrum can be divided into frequency bands. The most commonly used frequency bands are octave bands, in which the mid-frequency of each band is twice that of the band below it.

L_{Aeq}
this is the equivalent steady sound level in dB (A) containing the same acoustic energy as the actual fluctuating sound level over a given time period.

Reverberation Time (RT or sometimes T_{30} or T_{60})
This is the time taken for the reverberant sound energy in an enclosure to decay one millionth of its equilibrium value, i.e. by 60 dB, after the source has been switched off, is known as the reverberation time. The reverberation time is frequency dependent and it is customary to measure its value in octave or one-third octave bands. Reverberation occurs when sound waves are repeatedly reflected from each surface of the room.

Sound Reduction Index (SRI)
Difference measured between the amount of energy flowing towards the wall in the source room and the total amount of energy flowing towards the wall in the source room and the total amount of energy entering the receiving room (usual range 100 - 3150 Hz for one third octave band values). The SRI varies with frequency and is measured in a laboratory in either octave or one-third octave bands.

SRI = L1 - L2 + 10 log (S/A)

Where: L1 = Noise level in the source room
L2 = Noise levels in the receiving room
S = Surface area of test specimen
A = Equivalent acoustic absorption area in the receiving room

Weighted Sound Reduction Index (R_w)
this is a weighted single figure descriptor of the sound insulation performance of a partition measured under laboratory conditions. The procedure used to quantify the R_w is to compare the sound reduction index (SRI) in each of the one-third octave bands from 100Hz to 3150Hz against a set of standard reference curves.
Appendix B – Graphical Results of Sound Insulation Tests

Appendix B – Full Tabulation of Noise Survey Results

Start	Position	Time	L_{Amax}	L_{Aeq}	L_{A10}	L_{A50}	L_{A90}
21/09/2018							
15:04	1a	15min	74.7	62.4	66.4	59.4	54.4
15:19	1a	15min	72.6	62.9	66.6	61.2	54.8
15:34	1a	15min	77.4	61.8	65.2	59.9	54.9
15:49	1a	15min	82	64.7	67.5	62.5	56.3
16:04	1a	15min	81	63	66.9	60.8	53.7
16:19	1a	15min	75.3	62.2	66.5	58.8	53.2
16:34	1a	15min	73	61.7	66.1	57.1	52.5
16:49	1a	15min	77.3	62	66.7	57	52.2
17:04	1a	15min	75.1	60.6	64.8	57.2	52.7
17:19	1a	15min	71.4	59.8	64.2	55.2	50.6
17:34	1a	15min	59.3	63.7	54.6	51.2	59.3
17:49	1a	15min	59.8	64.3	54.3	50.9	59.8
18:04	1a	15min	59.4	63.7	55.8	51.7	59.4
18:19	1a	15min	58.5	62.4	54.4	50.8	58.5
18:34	1a	15min	59.2	63.3	55.8	50.7	59.2
18:49	1a	15min	59.1	62.9	55.3	51	59.1
19:04	1a	15min	57.3	61.6	53.5	49.2	57.3
19:19	1a	15min	57.5	61	53.6	50.2	57.5
19:34	1a	15min	59.6	63.6	56.8	52.1	59.6
19:49	1a	15min	57.8	61.8	54	50.1	57.8
20:04	1a	15min	59.5	61.7	53.7	50	59.5
20:19	1a	15min	56.8	59.6	53.8	50.2	56.8
20:34	1a	15min	56.6	59.2	55	48.9	56.6
20:49	1a	15min	55.5	59.3	50.8	46.7	55.5
21:04	1a	15min	55.8	59.7	50.2	46	55.8
21:19	1a	15min	56	59.9	52.8	48.2	56
21:34	1a	15min	54.7	58.3	50.8	47.7	54.7
21:49	1a	15min	53.8	57.2	48.4	46.2	53.8
22:04	1a	15min	57.2	60.7	52.5	48	57.2
22:19	1a	15min	55	58.6	49.1	45.8	55
22:34	1a	15min	52.1	53.9	48.2	45.7	52.1
22:49	1a	15min	54.1	58.5	48.4	46.4	54.1
23:04	1a	15min	52.1	54.6	47.5	45.6	52.1
23:19	1a	15min	51.3	53.3	46.8	45.1	51.3
23:34	1a	15min	54	57.4	48.2	45.2	54
23:49	1a	15min	51.2	54.3	46.4	44.3	51.2
22/09/2018							
00:04	1a	15min	50.6	51.8	46.6	44.5	50.6
00:19	1a	15min	50.2	50.3	46.3	44.9	50.2
00:34	1a	15min	53.1	55.2	48.8	46.2	53.1
00:49	1a	15min	56.6	58.6	50.2	46	56.6
01:04	1a	15min	49.3	51.7	45.6	43.6	49.3
01:19	1a	15min	46.8	48.5	44.9	43.2	46.8
01:34	1a	15min	50.6	49.1	44.5	43	50.6
01:49	1a	15min	51.5	52.7	45	43.4	51.5
02:04	1a	15min	46	46.9	44.5	43.2	46

Start	Position	Time	L_{Amax}	L_{Aeq}	L_{A10}	L_{A50}	L_{A90}
02:19	1a	15min	50.7	54.8	44.4	42.6	50.7
02:34	1a	15min	69.4	48.3	47.2	43.7	42.1
02:49	1a	15min	71.8	48.9	45.7	43.5	42.1
03:04	1a	15min	68.9	47.8	46.9	44.5	43
03:19	1a	15min	63.5	45.9	46.5	44.5	42.9
03:34	1a	15min	56.8	43.9	44.9	43.2	41.6
03:49	1a	15min	61.4	43.7	44.7	43.2	42
04:04	1a	15min	58.9	43.2	44	42.4	41
04:19	1a	15min	62.8	44.8	44.2	42.3	40.8
04:34	1a	15min	57.9	43.7	44.7	42.9	41.2
04:49	1a	15min	68.3	48.4	45.4	43.3	41.5
05:04	1a	15min	57	45.1	46.5	44.5	43
05:19	1a	15min	57	45.2	46.7	44.3	42.6
05:34	1a	15min	62.5	47.3	47.9	45.8	44.2
05:49	1a	15min	54.6	45.7	47	45.5	44
06:04	1a	15min	65.7	47.8	48.2	45.5	44.1
06:19	1a	15min	69.7	50	49.7	47.2	45.6
06:34	1a	15min	58.8	48.4	50.1	47.6	46.2
06:49	1a	15min	68.1	50.5	50.6	48.5	47
07:04	1a	15min	72	52	51.5	48.1	46.8
07:19	1a	15min	70.6	53.8	56.6	49.8	48.1
07:34	1a	15min	70.5	53	54.7	49.7	48.3
07:49	1a	15min	74.4	54.4	55.7	50	48.5
08:04	1a	15min	71.4	54.5	57.6	50.3	48.1
08:19	1a	15min	71.3	53.2	55.2	50	48
08:34	1a	15min	72.3	53.5	55.5	49.4	47.7
08:49	1a	15min	70.6	57	60.7	52.7	49.6
09:04	1a	15min	82	57.2	60.4	51.8	48.9
09:19	1a	15min	72.6	57.3	61.3	52.4	48.6
09:34	1a	15min	75.7	57.5	60.9	51.8	49.2
09:49	1a	15min	72.3	58.2	62.4	54	49.3
10:04	1a	15min	70.9	56.8	61	51.9	48.8
10:19	1a	15min	81.1	62.4	65.7	53.6	47.4
10:34	1a	15min	73.2	58.7	62.8	54	48.6
10:49	1a	15min	68.9	56.1	60.7	50.5	46.9
11:04	1a	15min	73.4	57.9	62.3	53.7	47.8
11:19	1a	15min	72.6	58.4	62.8	53.8	47.8
11:34	1a	15min	69.1	57.5	61.5	54.8	47.6
11:49	1a	15min	71	58.4	62	55.6	54
12:04	1a	15min	70.5	59.1	62.6	57	54.6
12:19	1a	15min	68.8	58.4	62.1	56	53.7
12:34	1a	15min	70	58.5	61.7	56.4	54.1
12:49	1a	15min	71.9	59.2	62.7	56.1	54
13:04	1a	15min	69.8	58.8	62	56.5	53.7
13:19	1a	15min	88.9	62.5	62.7	57	54.4
13:34	1a	15min	69.2	58.4	61.6	56.4	54
13:49	1a	15min	85.5	59.1	60.8	56.3	54.3
14:04	1a	15min	76.7	59	61.9	56.9	54.4
14:19	1a	15min	69.3	57.9	61	55.8	54

Start	Position	Time	L_{Amax}	L_{Aeq}	L_{A10}	L_{A50}	L_{A90}
14:34	1a	15min	69.8	58.3	61.8	56.1	53.3
14:49	1a	15min	77.2	59	61.8	56.6	53.4
15:04	1a	15min	70	59.1	61.9	57.8	54.3
15:19	1a	15min	72.4	57.9	60.5	56.2	53.7
15:34	1a	15min	72.3	57.6	60.6	56.2	53.6
15:49	1a	15min	71.5	58	61	55.8	53.3
16:04	1a	15min	73.9	56.5	59.3	54.6	52.4
16:19	1a	15min	73.7	58.1	60.9	55.8	53.3
16:34	1a	15min	74.5	57.6	60.9	55.4	53.2
16:49	1a	15min	71.8	57.7	61.2	55.4	53.1
17:04	1a	15min	73.1	59.5	62.7	57.5	54.2
17:19	1a	15min	71.9	58.8	62	56.6	54
17:34	1a	15min	80.2	59	61.9	56.6	53.6
17:49	1a	15min	71.3	58.9	62.5	56	53.4
18:04	1a	15min	71.7	60	63.5	57.7	53.8
18:19	1a	15min	75.2	59.7	63.2	57.4	53.9
18:34	1a	15min	73	59.2	62.3	57	54
18:49	1a	15min	76.2	58.5	61.6	55.8	52.9
19:04	1a	15min	74.3	58.3	61.4	56.5	53.3
19:19	1a	15min	74.9	58.6	61.4	56.6	53.3
19:34	1a	15min	74.2	58.9	61.7	57.1	55.4
19:49	1a	15min	79.1	59.4	60.9	56.6	55.2
20:04	1a	15min	74.1	59.2	61.1	57.9	56
20:19	1a	15min	68.2	57.9	59.6	57.4	55.7
20:34	1a	15min	73.3	59.1	61.5	57.6	56.1
20:49	1a	15min	72	57.6	59.6	56.5	55
21:04	1a	15min	68.5	52.4	55.3	48.7	43.5
21:19	1a	15min	73.9	53.8	56.3	47.3	42.9
21:34	1a	15min	71.3	52.3	54.5	46.4	42.5
21:49	1a	15min	72.9	52.8	55.6	49.5	44.3
22:04	1a	15min	69.8	55.1	58.5	51.8	47.2
22:19	1a	15min	71.1	53.8	56.5	51.6	46.4
22:34	1a	15min	66.3	51.8	54.3	50.4	44.8
22:49	1a	15min	66.7	50.8	53.9	47.6	43.8
23:04	1a	15min	74.1	55.9	58.7	53.6	47.9
23:19	1a	15min	75	56.8	59.9	54	50.1
23:34	1a	15min	80.2	60.4	62	54	50.2
23:49	1a	15min	83	56.3	57.8	52.3	47.2
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00:04	1a	15min	73.3	55.1	57.6	51.4	46.5
00:19	1a	15min	83.5	56.6	58.9	53.9	48.7
00:34	1a	15min	70	54.9	58.5	49.4	43.5
00:49	1a	15min	68.1	51.8	54.4	47	43.2
01:04	1a	15min	67.6	52.8	56.4	49.4	43
01:19	1a	15min	71.2	52.4	55.4	45	42
01:34	1a	15min	70.6	53.9	55.9	51.7	43.8
01:49	1a	15min	68	51.5	52.1	48.9	40.6
02:04	1a	15min	65.1	46.4	46.1	39.7	38

Start	Position	Time	L_{Amax}	L_{Aeq}	L_{A10}	L_{A50}	L_{A90}
02:19	1a	15min	59.2	41.3	43.1	39.1	37.2
02:34	1a	15min	71.7	53.4	51	39.6	37.6
02:49	1a	15min	62.7	44.5	47.7	39.3	37.3
03:04	1a	15min	63.8	46.1	45.8	38.5	36.6
03:19	1a	15min	63.4	43.5	41.2	38.5	36.8
03:34	1a	15min	61.7	44.2	46.3	39.6	37.2
03:49	1a	15min	55.7	39.3	40.8	38.9	37.2
04:04	1a	15min	56.3	38.2	39.4	37.7	36.2
04:19	1a	15min	58.1	40.9	41.8	39.8	38.3
04:34	1a	15min	57.9	41.5	42.8	39.6	38
04:49	1a	15min	64.5	45.2	46	40.2	38.1
05:04	1a	15min	62	45.1	48.7	41.2	39.3
05:19	1a	15min	56.9	40	41.5	39.3	37.4
05:34	1a	15min	58.2	40.6	43	38.2	37
05:49	1a	15min	63	42.2	39.4	37.7	36.4
06:04	1a	15min	64.7	42.8	40.4	37.7	36.3
06:19	1a	15min	67	48.8	52.1	40.4	37.6
06:34	1a	15min	73.4	51.4	54.1	43.6	39
06:49	1a	15min	66.7	45.7	44.2	39.7	38.1
07:04	1a	15min	63.4	49.6	53.8	42.2	39.1
07:19	1a	15min	62.1	44.2	45.3	41.9	40.1
07:34	1a	15min	70.4	51	53.7	44.4	42.1
07:49	1a	15min	72	50.6	50	43.6	41.3
08:04	1a	15min	71.7	51.2	52.4	43.4	41.2
08:19	1a	15min	71.5	50.1	50.2	43.6	41.6
08:34	1a	15min	67.5	48.9	49.7	43.5	41.6
08:49	1a	15min	69.3	51.8	54	45.1	42.1
09:04	1a	15min	67.7	51.8	55.1	44.8	41.4
09:19	1a	15min	67.6	52.3	55.8	45.5	42.4
09:34	1a	15min	66.6	50.6	52.5	44.4	42.3
09:49	1a	15min	69.4	53.3	55.8	45.4	42.7
10:04	1a	15min	70.8	53.7	57.2	45.5	41.8
10:19	1a	15min	69.3	53.8	57.4	48.1	42
10:34	1a	15min	79.5	57.8	59.3	49.2	43.9
10:49	1a	15min	72.1	55	58.6	48.5	43.4
11:04	1a	15min	70.3	55.7	59.8	51.3	47
11:19	1a	15min	71.4	57.1	59.7	56.1	49.6
11:34	1a	15min	70.6	56.3	60	52.8	49
11:49	1a	15min	67	56.6	59.7	55	51.5
12:04	1a	15min	79.5	57.5	60.4	54.7	50.8
12:19	1a	15min	72.3	56.3	59.5	53.9	51.2
12:34	1a	15min	71.5	57.9	61.1	55.2	51.7
12:49	1a	15min	67.3	57.2	60.8	55	50.6
13:04	1a	15min	68.7	56.2	59.3	54.6	51.6
13:19	1a	15min	68.6	56.2	59.1	54.3	51.5
13:34	1a	15min	80.7	56.4	58.7	53.2	50.3
13:49	1a	15min	70.5	55.8	58.8	53.9	50.9
14:04	1a	15min	88.6	60.5	60	55	50.7

Start	Position	Time	L_{Amax}	L_{Aeq}	L_{A10}	L_{A50}	L_{A90}
28/09/2018							
23:00	1b	5min	67.1	48.3	51.6	39.5	37
23:05	1b	5min	64.8	45.2	47.6	39.9	37.5
23:10	1b	5min	52.5	40.9	43.7	39.4	37.3
23:15	1b	5min	61.5	48	49.9	48.3	36.9
23:20	1b	5min	62.7	45.3	46.9	39.6	37.2
23:25	1b	5min	72.3	49.7	53.5	41.9	37.5
23:30	1b	5min	64.1	46.6	49.1	38.9	37.1
23:35	1b	5min	60.7	47	48.5	44.6	40.6