Azymuth Acoustics UK

Professional Acoustic Services

Approved by: Matthew Gibson
Date: 16.06.2021

Noise Assessment Report

Ref : AA0355

Noise Assessment :

Proposed Substation

Dahlia House
Burnage Lane
Burnage
Manchester
M19 1FL

For

Rowlinson Construction Ltd
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1.0 Introduction

Azymuth Acoustics UK is appointed by Rowlinson Construction Ltd to provide a noise assessment in relation to a proposed substation associated with newly constructed Dahlia House extra care building, along Burnage Lane, Burnage. The report address the potential noise impact from the proposed substation on nearby residential receptors (including the extra care building). The nearest proposed residential receptor is understood to be 208 Burnage Lane.

A previous continuous environmental noise survey had been carried out by Echo Affiliates in September 2015, as such the noise assessment will supplement 2015 noise data. Additionally, the 2015 measured noise data will be included in Appendix C.

The Noise Impact Assessment presented here is intended to provide information to discharge planning reserved matters approval 129452/JO/2021 as follows:

Noise – external equipment insulation

a) Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location. Prior to commencement of the use hereby approved the scheme shall be submitted to and approved in writing by the City Council as local planning authority in order to secure a reduction in the level of noise emanating from the site.

b) Prior to occupation of the development a verification report shall be submitted to and approved in writing by the City Council as local planning authority to validate that the work undertaken throughout the development conforms to the recommendations and requirements in the approved acoustic report. The report shall also undertake post completion testing to confirm that the noise criteria have been met. Any instances of non-conformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the agreed noise criteria.

This noise assessment includes the following aspects:

- The results of a baseline noise survey at the site in order to assess the impact of the substation on local background sound levels.
- Criteria developed to set acceptable noise levels at sensitive receptors in nearby properties.
- Assessment of results laid out in the context of relevant guidance to inform the resulting conclusions.

2.0 Baseline Noise Survey

2.1 Measurement Procedures

The instrumentation used for the environmental noise survey consisted of a SvanTek 959 Type 1 precision sound level meter. The equipment was calibrated before and after the noise measurements. The sound level meter measured A-weighted noise levels as well as octave bands levels for all measurements recorded.

The ambient noise measurements were undertaken using the sound level meter at the location shown in Figure 1 below, which would be representative of the noise climate at the nearest proposed residences to the proposed installation. It was apparent that the substation enclosure was already on-site, however the transformer was not yet commissioned.

The survey was undertaken during the night time of Monday 7th June 2020 between 00:54 and 01:54hrs. Local road traffic noise had an influence on the measured BSL L_{A90}.

2.2 Measurement Results

The results of the noise measurements are summarised below, and the full results are set out in Appendix B. The following table summarises the results of the noise measurements undertaken in terms of averaged statistical noise levels.

Measurement Location	Time period	L_{Amax}	L_{Aeq}	L_{A1}	L_{A10}	L_{A50}	L_{A90}
1. Along Burnage Lane perimeter (near to 208 Burnage Lane)	Night-time 00:54 - 01:54hrs	67	56	61	47	33	28

Table 1a: Summary of averaged noise measurement results, Azymuth Acoustic 2021 (dBA)

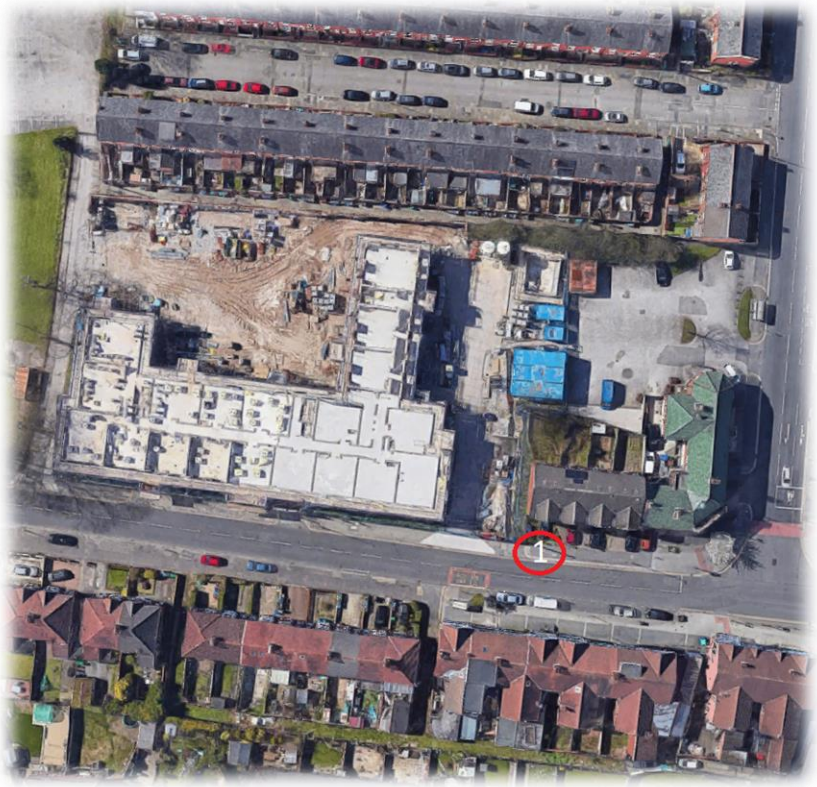

Figure 1: Noise measurement positions (marked in red), Azymuth Acoustics 2021

Measurement Location	Time period	Duration	L_{Aeq}	L_{A90}	Typical $L_{AFmax,T1}$ dB
1. Continuous Monitoring position	Night-time 07:00 - 19:00hrs	12	61	47	-
	Night-time 00:30 - 07:00hrs	6.5	52	36	72

Table 1b: Summary of averaged noise measurement results, Echo Affiliates 2015 (dBA)

2.3 Description of Noise Climate

The night time noise climate is dominated by road traffic using Burnage Lane. Road traffic on Mauldeth Road also contributes to the existing noise climate but to a lesser degree than Burnage Lane.

Noise levels within the vicinity of the site are typically 38 – 60 L_{Aeq} during the night-time, with background sound levels typically between 31 - 27 dB L_{A90} (worst-case BSL = 26dB L_{A90}).

3.0 Assessment Criteria

In order to assess the extent of the noise levels produced by the substation with suitable conditions relating to industrial and commercial sound, Azymuth Acoustics has reviewed the following guidance documents and standards:

- British Standard 8233: 2014
- World Health Organisation Guidelines on Community Noise
- British Standard 4142: 2014

3.1 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

3.2 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.

3.4 British Standard 4142: 2014

British Standard 4142: 2014 "Methods for assessing and rating industrial sound" describes methods for rating and assessing sound of an industrial and/or commercial nature. The methods described in this British Standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

a) Typically, the greater this difference, the greater the magnitude of the impact.
b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

BS 4142 notes that: *Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.*

3.5 Recommended Noise Assessment Criteria

Based on local council criteria and the guidance above it is recommended that the following criterion would be reasonable with the aim of minimising the impact of the proposed operation:

- The free field rating noise level from the new substation should by 5dB below the typical measured night time background sound level (BSL, L_{A90}) at the nearest noise sensitive locations. This would equate to an external noise level ≤21dB $L_{eq,5min}$ at the proposed receptor on receptor windows.

4.0 Assessment of Existing Substation Levels using BS4142.

4.1 Substation Transformer Noise Levels

It is understood that the substation will contain 1no. 500kVA transformer unit. Based on manufacturers noise data is understood the transformer will have a maximum permitted (worst-case) noise level of 56dBA, as such this will be incorporated into the noise assessment. During the time of survey, the substation was not connected to the extra care building, as such no emanating noise was present.

4.2 Review of Proposed Enclosure

The transformer unit is understood to be enclosed in a 3m(H)x3.7m(L)x3.2(W) GRP enclosure. The enclosure includes entrances doors to the South and a vent slot to the East elevation.

At the time of writing, details of noise reduction values associated with the enclosure construction are unknown; however, based on other manufacturer's data, most GRP buildings have a noise reduction of 24 dB(A) (i.e. R_w 26 – 27dB), as such an estimated noise reduction of R_w 26dB has been given to the substation enclosure (noise data used is shown in figure to below). Additionally, the east elevation vent slot has been incorporated into the calculation.

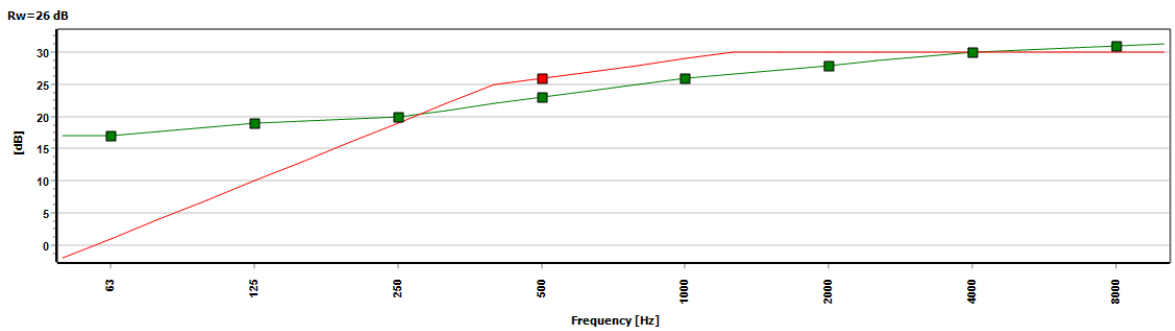

Figure 2: Estimated sound reduction 1/1 octave band noise data for GRP enclosure.

Red data line / points = R_w rating curve

Green data line / points = 1/1 octave sound reduction index values

4.3 BS4142:2014 Assessment of Noise Impact from Proposed Substation

A 3D noise model has been created in SoundPLAN 8.2 to assess the specific noise levels of the proposed Substation on the closest Noise Sensitive Receptors (NSRs). The model assumes a worst-case operation from the substation I.e. an internal noise level of 56 dBA.

This internal noise level together with the estimated noise reduction of Rw 26dB provided by the substation enclosure results in an external noise level of 23dBA @1m from the substation East elevation.

Noise is likely to be slightly tonal in nature so, within context, a penalty rating of 2 dB has been applied to the noise associated with the substation unit.

Table 3 below provides predicted noise impacts generated by SoundPLAN and compares the results with existing worst-case background sound levels in the vicinity of noise sensitive receptors.

Location / Receiver	Predicted Specific Noise Level at NSR dB(A)	Background Sound Level at Noise Sensitive Receptor dB(A)	Penalty Rating dB	Rating Level dB(A)	Rating level compared with background sound level
208 Burnage Lane	17	26	+2	19	-7
Plot 31, Dahlia House	12	26	+2	14	-12

Table 3: Assessment of noise impact on nearest noise sensitive receptors in accordance with BS4142:2014

It can be seen from table 3 above that rating noise level at the nearest residential receptor (208 Burnage Lane) is likely to be -7dB below the measured worst-case background sound level. Additionally, noise impact from the substation on apartment 31, Dahlia House is likely to be -12dB below the background sound level. As such, target criteria has generally been met.

The contour map in figure 3 below presents the calculated noise impact of worst-case operational at the nearest residential receptors at ground floor:

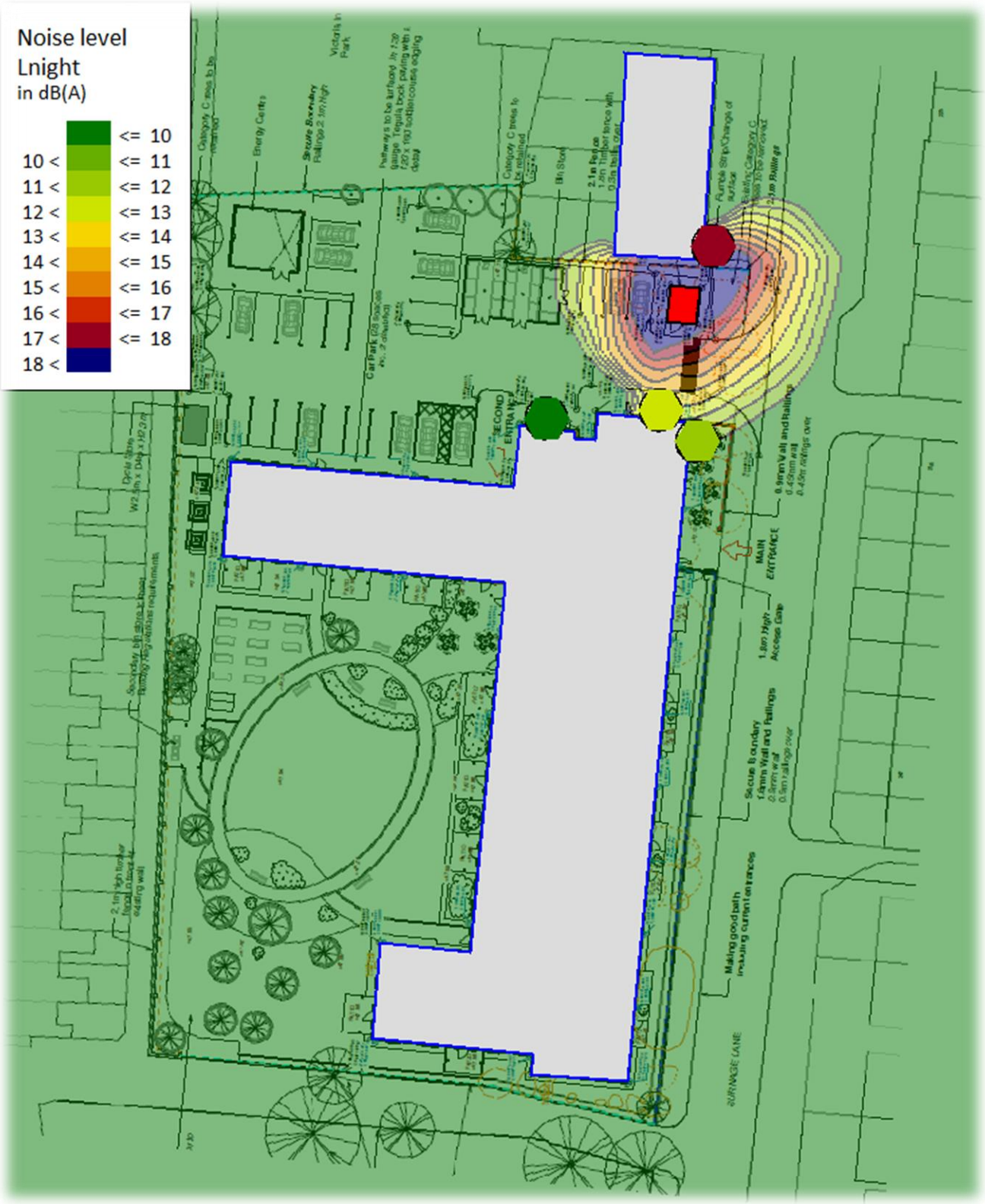

Figure 3: Predicted Noise Grid Map from proposed substation.

5.0 Conclusions

Azymuth Acoustics has undertaken an assessment of the potential noise impact of a proposed substation to associated with new extra care development along Burnage Lane, Burnage, Manchester. Night-time background sound levels in the area are generally affected by road traffic using Burnage Lane, averaging approx. 26 - 31dB L_{A90} during the survey period.

The assessment indicates that the rating noise level at the nearest residential receptor (208 Burnage Lane) is likely to be -7dB below the measured worst-case background sound level. Additionally, noise impact from the substation on apartment 31, Dahlia House is likely to be -12dB below the background sound level.

Based on this noise assessment it is unlikely that further noise mitigation will be required to protect the nearest noise sensitive receptors from noise emanating from the proposed substation, and as such the planning condition has generally been met.

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, Azymuth Acoustic

Start	Position	Time	L_{Amax}	L_{Aeq}	L_{A1}	L_{A10}	L_{A90}
00:54:32	1	00:05:00	81	61	75	61	31
00:59:32	1	00:05:00	82	61	74	60	30
01:04:32	1	00:05:00	72	53	67	49	30
01:09:32	1	00:05:00	55	38	52	38	28
01:14:32	1	00:05:00	76	56	71	53	31
01:19:32	1	00:05:00	52	39	50	43	28
01:24:32	1	00:05:00	44	30	38	32	26
01:29:32	1	00:05:00	59	37	49	36	27
01:34:32	1	00:05:00	80	60	75	54	27
01:39:32	1	00:05:00	77	54	66	49	27
01:44:32	1	00:05:00	51	38	50	42	26
01:49:32	1	00:05:00	76	54	67	49	26

Appendix C – Full Tabulation of Noise Survey Results, Echo Affiliates

Start	Position	Time	L_{Amax}	L_{Aeq}	L_{A10}	L_{A90}
18/09/2015 00:30	F1	15:00	71.7	52.3	53.2	37.3
18/09/2015 00:45	F1	15:00	74.0	52.4	51.0	36.1
18/09/2015 01:00	F1	15:00	68.5	48.0	45.6	35.4
18/09/2015 01:15	F1	15:00	70.6	49.9	47.1	34.3
18/09/2015 01:30	F1	15:00	75.0	48.9	42.9	34.8
18/09/2015 01:45	F1	15:00	69.0	46.6	44.4	34.5
18/09/2015 02:00	F1	15:00	68.2	48.7	44.7	34.2
18/09/2015 02:15	F1	15:00	68.6	48.8	43.6	33.5
18/09/2015 02:30	F1	15:00	67.2	47.3	42.9	32.4
18/09/2015 02:45	F1	15:00	69.2	48.2	43.6	31.8
18/09/2015 03:00	F1	15:00	68.1	45.8	40.6	33.6
18/09/2015 03:15	F1	15:00	73.8	49.8	41.0	33.2
18/09/2015 03:30	F1	15:00	69.8	47.3	41.0	32.8
18/09/2015 03:45	F1	15:00	47.2	36.3	38.4	33.7
18/09/2015 04:00	F1	15:00	69.3	46.1	41.1	34.6
18/09/2015 04:15	F1	15:00	66.7	42.8	41.5	34.0
18/09/2015 04:30	F1	15:00	72.4	50.6	46.7	35.2
18/09/2015 04:45	F1	15:00	69.8	45.1	41.7	36.4
18/09/2015 05:00	F1	15:00	73.0	54.0	57.3	36.6
18/09/2015 05:15	F1	15:00	72.3	52.9	52.8	37.7
18/09/2015 05:30	F1	15:00	71.9	51.1	50.3	38.1
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18/09/2015 07:30	F1	15:00	72.7	61.8	66.1	47.3
18/09/2015 07:45	F1	15:00	72.6	62.3	66.1	49.5
18/09/2015 08:00	F1	15:00	71.6	61.7	64.9	53.4
18/09/2015 08:15	F1	15:00	73.3	59.4	62.8	51.8
18/09/2015 08:30	F1	15:00	74.6	60.9	65.0	47.8
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18/09/2015 09:00	F1	15:00	71.5	60.9	64.9	49.0
18/09/2015 09:15	F1	15:00	95.5	66.2	64.7	47.7
18/09/2015 09:30	F1	15:00	79.6	60.6	64.4	46.4
18/09/2015 09:45	F1	15:00	75.4	59.7	63.8	44.4
18/09/2015 10:00	F1	15:00	91.9	64.8	64.4	45.3
18/09/2015 10:15	F1	15:00	73.6	59.4	63.6	45.5
18/09/2015 10:30	F1	15:00	74.4	59.4	63.5	45.6
18/09/2015 10:45	F1	15:00	71.8	58.2	62.8	42.0
18/09/2015 11:00	F1	15:00	72.0	59.2	63.5	44.3
18/09/2015 11:15	F1	15:00	70.5	58.7	63.0	44.1
18/.09/2015 11:30	F1	15:00	73.7	59.8	63.5	48.4

18/09/2015 11:45	F1	15:00	71.2	58.5	63.0	43.4
18/09/2015 12:00	F1	15:00	73.1	59.5	63.5	47.4
18/09/2015 12:15	F1	15:00	70.3	58.7	63.4	43.7
18/09/2015 12:30	F1	15:00	76.4	59.6	63.6	46.5
18/09/2015 12:45	F1	15:00	78.4	60.7	64.7	46.6
18/09/2015 13:00	F1	15:00	73.5	59.8	63.9	46.8
18/09/2015 13:15	F1	15:00	73.9	59.6	63.7	44.0
18/09/2015 13:30	F1	15:00	73.2	58.8	63.0	43.6
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18/09/2015 14:15	F1	15:00	71.4	60.9	64.9	47.9
18/09/2015 14:30	F1	15:00	73.0	62.4	65.7	51.5
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18/09/2015 15:15	F1	15:00	74.2	61.4	65.2	48.6
18/09/2015 15:30	F1	15:00	72.4	60.7	64.6	48.8
18/09/2015 15:45	F1	15:00	75.2	61.8	65.5	50.2
18/09/2015 16:00	F1	15:00	71.5	61.4	65.6	46.2
18/09/2015 16:15	F1	15:00	77.0	61.8	65.6	47.8
18/09/2015 16:30	F1	15:00	78.1	61.9	65.6	49.0
18/09/2015 16:45	F1	15:00	79.9	61.1	64.6	47.7
18/09/2015 17:00	F1	15:00	72.8	60.9	64.9	48.6
18/09/2015 17:15	F1	15:00	75.0	61.4	65.1	49.5
18/09/2015 17:30	F1	15:00	76.0	61.3	65.3	47.2
18/09/2015 17:45	F1	15:00	74.0	61.5	65.5	48.1
18/09/2015 18:00	F1	15:00	78.9	61.3	65.3	48.7
18/09/2015 18:15	F1	15:00	71.7	61.5	65.4	49.2
18/09/2015 18:30	F1	15:00	72.3	60.9	65.1	46.8
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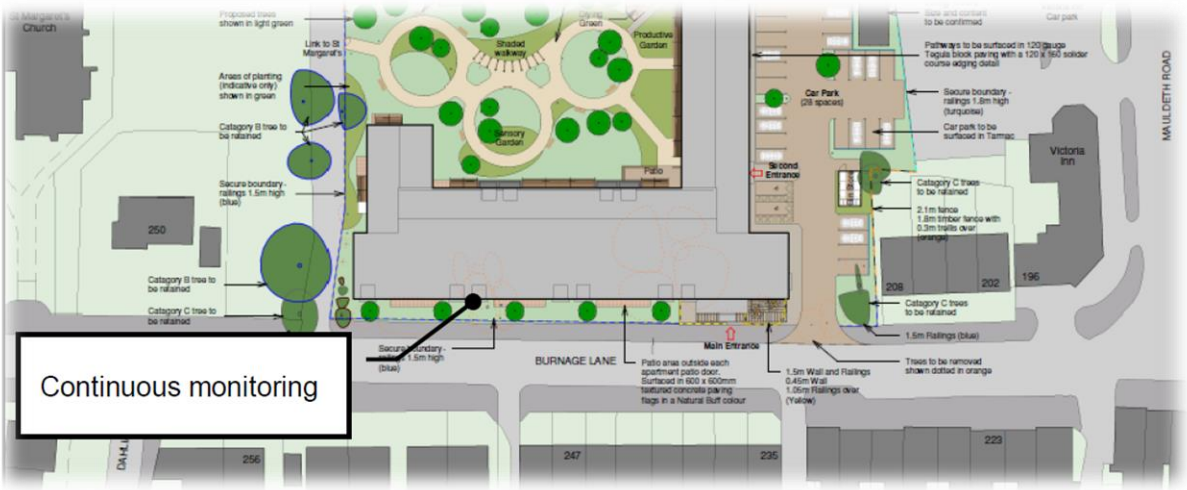

Figure 4: Continuous noise measurement position, Echo Affiliates 2015