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1.0 INTRODUCTION

1.1 At the request of Entrust this acoustic assessment to evaluate the impact of children noise on the resident at Rock View and The Willow has been carried out by Cheshire Environmental Associates.

1.2 The scope of this assessment therefore is to evaluate the impact of children noise from the class room free flow area at the rear of the school on the residents at Rock View and The Willow to comply with BS:8233:2014 requirements.
Appendix 1 shows the proposed classroom free flow shelter in relation to the two nearest residential properties.

1.3 Prior to any noise measurements being carried out on site the Local Authority's Pollution Control Officer was consulted regarding the location of the classroom free flow shelter. The Environmental Health Officer has commented as follows:

- "The Environmental Health Officer feels further measurements of noise from children playing will not contribute to anything other than cost but recommends to include a correction +5dB to account for reduced number of children in the free flow area.
- As the proposed play area will be raised then fencing will be included for health and safety reasons. A good quality full boarded fence would provide a measure of noise reduction.
- The distance between the proposed classroom free flow area and both the nearest residential properties (Rock View and The Willows) are approximately 35metres and which should adequately allow dissipation of sound in a relatively free field.
- The use of the problem area for general low level teaching should not cause a nuisance if used appropriately and would not cause objection from us".

2.0 SITE SURVEY

2.1 St Anne's CE (VC) Primary School is located in St Anne Vale, Brown Edge, Stafford, ST6 8TA. The area is very quiet.

2.2 From Appendix 1it can be seen the proposed ground level for the free flow classroom shelter will be the same level as the existing ramp to make it easier for children to access the shelter area. The shelter is approximately 5.8metres long by 5.0metres wide and will have three open sides to meet Ofstead requirements for a designated free flow classroom play area.
Although the free flow play area will have a perimeter wall the height of this retaining wall will be approximately 0.22m below the proposed Green Bow top fencing. The metal bow fencing will sit on top of the wall and will prevent children from wondering out of the school and for children security.

The classroom free flow shelter will also have a canopy. The purpose of the canopy will be to shelter children from rain.

2.3 Rock View is a semi-detached property 35metres away from the proposed classroom shelter. . Although there is no front garden for this property, the property does have a rear garden. Sections 6.2 & 6.3 indicate children noise from the proposed free flow classroom shelter will be sufficiently attenuated inside a habitable room and also in the rear garden of Rock View.
Noise measurements **(**Appendix 2 MP1**)** were carried out 35metres from the proposed free flow classroom shelter to the garden site boundary separating the sunken lawn area belonging to The Willow residential property from Rock View rear garden.

2.4 Although a Leylandi tree obstructs the line of sight from the proposed free flow classroom shelter to the first floor habitable room window of Rock View the tree is unlikely to give more than 1dB noise attenuation outside the window. The overall distance attenuation for noise from the shelter to the habitable room window at first floor will be 16dB outside the window.

2.5 The Willow is also a residential property 35metres from the proposed classroom free flow shelter. Noise measurements were carried out 3metres from The Willow car port and 3metres from St Anne's Primary School site boundary fence that separates the school play ground from The Willow residential property. (Appendix 2, MP2). The overall distance attenuation for noise from the shelter to the habitable room window at first floor will also be 16dB outside the window.

2.6 The number of children using the free flow area at any one time would likely be between 1 & 10. The reason for this is because the classroom extension is not large enough to accommodate more than 10 children comfortably at any one time. This was the observation made by the acoustic consultant on the 16th June 2016 and again on the 24th May 2017 when it was observed a maximum of 10 children were using the existing classroom extension (canopy cover

removed) at any one time. Noise measurements for the 10 children was recorded and entered into Table 1 below.

3.0 BS 8233:2014 ASSESSMENT FOR CHILDREN NOISE INSIDE A HABITABLE ROOM AT ROCK VIEW AND THE WILLOW PROPERTIES

3.1 BS 8233: 2014 is written on the back of The World Health Organisation Document "Community Noise."

3.2 BS 8233: 2014 is a leading standard used by all Local Authorities to evaluate the impact of source noise within habitable room. The standard recommended average noise levels in a living room, kitchen and dining room between 07.00 and 23.00 hours is $L_{aeq(16hours)}$ 35dB(A). This is an average level based on a 16hour daytime period.

3.3 BS 8233 recommended acceptable noise in gardens and open spaces during the day time period (07.00 –23.00 hours) is $L_{aeq(16hours)}$ 55dB(A).

4.0 INSTRUMENTATION USED FOR MEASUREMENT

4.1 Sound measurements were made using Bruel & Kjaer Type 1 Precision sound level meter 2236 (Serial Number 1763908) and Bruel & Kjaer Type 1 Precision sound level meter 2260 (Serial Number 2443378.)

4.2 The sound level meters were calibrated at the beginning and end of taking measurements. The sound level meters and their calibrator have calibration certificates.

4.3 A windshield was fitted to the sound level meter during the noise measurements.

4.4 The weather was dry and very warm throughout the measurement periods with little or no breeze.

4.5 Noise measurements were carried out with the noise meter mounted on a tripod and measurements made approximately 1.5 meter off ground level.

4.6 Noise measurements on site were carried out Mr. Ty Price from Cheshire Environmental Associates.

5.0 MEASURED NOISE LEVELS ON SITE.

5.1 Tables 1-5 provide measured noise level on site.

Table 1 Measured noise levels St Anne Primary School, Vale, Stafford.

Date	**Time Start (hours)**	**Time End (hours)**	**Location of measurement**	**Result dB(A)**
16/6/2016	08.50	09.00	Background measurement. Outside Holmlea front entrance door/ private access drive to the Willow. Approximately 5metres from new classroom play area. No children using new extension area. Noise from parents vehicles only. Vehicle registration T333 5MG and other vehicles passing by.	L_{aeq} 62 L_{a10} 63 L_{a90} 44 L_{amax} 88
16/6/2016 Temp 16° Wind 0.6m/sec	09.00	09.07	Measurement outside Holmlea front entrance door/ private access drive to the Willow. Approximately 5metres from new extension area. Road traffic noise plus children noise. **10 children** using extension area. Noise meter paused before vehicle pass by.	L_{aeq} 61 L_{a10} 64 L_{a90} 47 L_{amax} 75
16/6/2016 Temp 16° Wind 0.6m/sec	09.08	09.18	Measurement outside Holmlea front entrance door/ private access drive to the Willow. Approximately 5metres from new extension area. No vehicle noise. **10 children** using extension area. Noise meter paused before vehicle pass by.	L_{aeq} 62 L_{a10} 66 L_{a90} 49 L_{amax} 79
16/6/2016	09.40	09.55	Outside Holmelea front entrance door/ Private access drive to the Willow. Approximately 5metres from new classroom play area. Children using extension area with teacher present.	L_{aeq} 62 L_{a10} 66 L_{a90} 51 L_{amax} 79
16/6/2016	10.10	10.30	Near front entrance door to Holmlea. Waste bin collection noise. No children in front or rear play areas.	L_{aeq} 71 L_{a10} 74 L_{a90} 51 L_{amax} 78
16/6/2016	10.50	11.17	Background measurement. Front garden of Rockview by front entrance door. House acts as noise barrier. Children using extension area. Contribution form road traffic noise.	L_{aeq} 62 L_{a10} 66 L_{a90} 50 L_{amax} 94
16/6/2016	11.20	11.35	**Background noise** only. Front garden of Rockview. No children noise. 5metres form road. Mainly road traffic noise. Measurements stopped after this result because of noise from kitchen installation workman in front garden of Rockview.	L_{aeq} 59 L_{a10} 63 L_{a90} 50 L_{amax} 72

Table 2 Measured noise levels St Anne Primary School, Vale, Stafford

Date	**Time Start (hours)**	**Time End (hours)**	**Location of measurement**	**Result dB(A)**
6/3/2017 Temp 8 ^{0} C ^{0}Wind speed 0.6m/sec	08.00	08.15	Ambient measurement. **Outside Holmlea front entrance** door/ private access drive to the Willow. Approximately 5metres from new classroom play area. Noise from dawn chorus and vehicles passing by noise meter. No children using new extension area. SLM 2236 used	L_{aeq} 55 L_{a10} 43 L_{a90} 56 L_{amax} 73
6/3/2017	08.15	08.30	Ambient measurement. Continuing measurement from 08.15hours. **Outside Holmlea front entrance d**oor/ private access drive to the Willow. Approximately 5metres from new classroom play area. Noise from dawn chorus and vehicles passing by noise meter. No children using new extension area. SLM 2236 used	L_{aeq} 53 L_{a10} 54 L_{a90} 41 L_{amax} 79
6/3/2017	08.30	08.45	Ambient measurement. Continuing measurement from 08.30hours. Outside Holmlea front entrance door/ private access drive to the Willow. Approximately 5metres from new classroom play area. No children using new extension area. Noise from vehicles passing by noise meter.	L_{aeq} 54 L_{a10} 55 L_{a90} 41 L_{amax} 79
6/3/2017	08.45	09.00	Ambient measurement. Continuing measurement from 08.30hours. **Outside Holmlea front entrance** door/ private access drive to the Willow. Approximately 5metres from new classroom play area. No children using new extension area. Noise from children in school playground and noise from children arriving at school. Noise from vehicles passing by noise meter.	L_{aeq} 54 L_{a10} 56 L_{a90} 42 L_{amax} 80
6/3/2017	09.15	09.30	Ambient measurement. Continuing measurement from 08.30hours. **Outside front entrance door**/ private access drive to the Willow. Approximately 3metres from new classroom play area. No children using new extension area. SLM 2236 used	L_{aeq} 54 L_{a10} 53 L_{a90} 41 L_{amax} 77
6/3/2017	10.00	10.14	**Inside Rock View** first floor room facing directly towards classroom extension. Children in classroom extension. Room window open (half open) by resident. SLM 2236 used	L_{aeq} 54 L_{a10} 54 L_{a90} 36 L_{amax} 70
6/3/2017	10.14	10.30	Rock View **ambient measurement inside first floo**r room facing directly towards classroom extension. **No children in classroom extension**. SLM 2236 used Room window half open	L_{aeq} **33** L_{a10} 36 L_{a90} 25 L_{amax} 55

Table 3 Measured noise levels St Anne Primary School, Vale, Stafford

Date	**Time Start (hours)**	**Time End (hours)**	**Location of measurement**	**Result dB(A)**
6/3/2017 Temp 8^0 C ^{0}Wind speed 0.6m/sec	09.30	10.26	Ambient measurement. **Outside Holmlea** front entrance door/ private access drive to the Willow. Approximately 5metres from new classroom play area. 2260 SLM.	L_{aeq} 55 L_{a10} 56 L_{a90} 41 L_{amax} 76
6/3/2017 Temp 8^0 C ^{0}Wind speed 0.6m/sec	11.11	11.26	Ambient measurement. **Outside Holmlea** front entrance door/ private access drive to the Willow. Approximately 5metres from new classroom play area. 2260 SLM. No children in classroom extension or in rear playground.	L_{aeq} 48 L_{a10} 51 L_{a90} 39 L_{amax} 76
6/3/2017	11.12	11.27	Rock View ambient measurement **inside** first floor room facing directly towards classroom extension. No children in classroom extension. SLM 2236 used Room window half open. SLM 2236 used	**L_{aeq} 35** L_{a10} 37 L_{a90} 25 L_{amax} 59
6/3/2017	13.55	14.10	1metre from classroom extension at Willow dwelling drive entrance gate. Children using classroom extension. SLM 2236 used	L_{aeq} 68 L_{a10} 71 L_{a90} 57 L_{amax} 88
6/3/2017	13.55	14.10	At bow metal fencing simultaneous measurement with the above measurement. Children using classroom extension. SLM 2260 used	L_{aeq} 67 L_{a10} 71 L_{a90} 57 L_{amax} 86
6/3/2017	14.10	14.25	Follow on from (K) 1metre from classroom extension at Willow dwelling drive entrance gate. Children using classroom extension. SLM 2236 used	L_{aeq} 67 L_{a10} 70 L_{a90} 51 L_{amax} 85
6/3/2017	14.10	14.25	Follow on from (L). At bow metal fencing simultaneous measurement with the above measurement. Children using classroom extension. SLM 2260 used	L_{aeq} 67 L_{a10} 70 L_{a90} 51 L_{amax} 86

Table 4 Measured noise levels 24/5/2017 St Anne's Primary School, Brown Edge

Date	**Time Start (hours)**	**Time End (hours)**	**Location of measurement**	**Result dB(A)**
24/5/2017	08.10	08.47	Ambient measurement. 3m from The Willow property car port. Bird noise dominant noise on site. No children in school main playground hence no noise from children	L_{aeq} 56 L_{a10} 59 L_{a90} 40 L_{amax} 80
24/5/2017 Temp 22^0 C.^{0}Wind speed 0.2m/sec	08.47	09.03	Children arriving to school and playing in main play ground. 3m from The Willow property car port. Bird songs dominant noise on site.	L_{aeq} 59 L_{a10} 62 L_{a90} 49 L_{amax} 79
24/5/2017	09.05	09.30	Ambient measurement. 3m from The Willow property car port. No children in school main playground hence no noise from children.	L_{aeq} 56 L_{a10} 58 L_{a90} 42 L_{amax} 75
24/5/2017	09.30	10.25	Ambient measurement. 3m from The Willow property car port. No children in school main playground hence no noise from children.	L_{aeq} 56 L_{a10} 60 L_{a90} 41 L_{amax} 78
24/5/2017	10.36	10.54	School break time. Children in play ground. 35metres at Rock View rear garden boundary/sunken lawn area belonging to The Willow.	L_{aeq} 61 L_{a10} 65 L_{a90} 50 L_{amax} 77
24/5/2017	10.54	11.23	Ambient measurement. 3m from The Willow property car port. No children in school main playground hence no noise from children.	L_{aeq} 59 L_{a10} 62 L_{a90} 41 L_{amax} 77
24/5/2017	11.30	11.39	35metre from existing free flow extension in sunken lawn are of The Willow property. 10children in free flow extension + occasional road vehicle. Children noise not audible. Line of sight from existing free flow extension partially obstructed by perimeter masonry wall	L_{aeq} 50 L_{a10} 51 L_{a90} 41 L_{amax} 62
24/5/2017	11.37	12.00	Ambient measurement. No children in school main playground hence no noise from children. Site border separating sunken lawn area of The Willow property from rear garden of Rock View.	L_{aeq} 51 L_{a10} 55 L_{a90} 40 L_{amax} 73
24/5/2017	12.00	12.05	Children in Main playground furthest away from the proposed free flow classroom shelter	L_{aeq} 51 L_{a10} 55 L_{a90} 40 L_{amax} 73

Table 5 Measured noise levels 24/5/2017 St Anne's Primary School, Brown Edge

Date	**Time Start (hours)**	**Time End (hours)**	**Location of measurement**	**Result dB(A)**
24/5/2017	12.05	13.00	Lunch time for school. Free flow classroom children using main playground closest to The Willow residence. Older children also joined these children a little later. Measurements position sunken lawn garden 30metres from proposed free flow area.	L_{aeq} 60 L_{a10} 64 L_{a90} 52 L_{amax} 79
24/5/2017	13.00	13.25	Ambient measurement. 3m from The Willow property car port. No children in school main playground hence no noise from children	L_{aeq} 53 L_{a10} 54 L_{a90} 37 L_{amax} 74
24/5/2017	13.25	13.30	Ambient measurement. 3m from The Willow property car port. However children noise coming from open classroom door and windows. Measurement not valid and had to be dis-continued due to this flanking transmission noise. Readings not valid.	L_{aeq} 53 L_{a10} 62 L_{a90} 49 L_{amax} 79

6.0 ASSESSMENT USING BS 8233 PROCEDURES

6.1 Section 1.3 mentions "the Environmental Health Officer feels about further measurements of noise from children playing will not contribute to anything other than cost." In view of this measurement results in Table 1 will be used to evaluate the impact of children noise from the proposed free flow classroom shelter. From Table 1 it can be seen noise when children are using the extension area is $L_{aeq(10min)}$ 62dB(A) outside the front entrance door to Rock View.

6.2 **Rock View habitable room prediction**

From Table 1 the measured noise from children is $L_{aeq(10min)}$ 62dB(A) at 5metres. The distance from the free flow area to Rock View is a further 30 metres.

The formula for predicting noise 30metres further away from the proposed free flow classroom is

SPL 1 –SPL2 = 20log r_1/r_2

where SPL1 is measured noise @5metre = 62dB(A)

where SPL2 is predicted noise @ further25metre

where r_1 is distance 5metres

where r_2 is a further 30metres distance

SPL2 @ 30metres is 20log 5/30 = 16dB.

62-16 = $L_{aeq(10min)}$ 46dB(A)

Allowing 15dB noise attenuation (BS 8233: 2014 page 64) through a partly open window the predicted noise inside a habitable room in Rock View will be $L_{aeq(15min)}$ 31dB(A) in the absence of any three side elevations noise barrier or barrier at the site boundary separating the free flow area from Rock View. This is 4dB less than BS 8233 acceptable level of $L_{aeq(15min)}$ 35dB(A) for a habitable room during the daytime period of 07.00 –23.00 hours. It should however be noted BS 8233: 2014 acceptable noise in a habitable room is based on a 16hour time period (07.00 –23.00 hours) whereas the predicted level of $L_{aeq(15min)}$ 31dB(A) is for 10minutes per measurement periods. Measurements of children noise in Table 1 could only be made for a maximum 7-10minutes before all the children were back in the classroom or before any contribution for noise from the main school playground during breaks.

6.3 **Rock View rear garden prediction**

From section 6.1 the predicted level from the proposed free flow classroom area is $L_{aeq(15min)}$ 31dB(A). This is less than BS 8233:2014 acceptable level of $L_{aeq(15min)}$ 55dB(A) for gardens and open spaces without any noise barrier.

6.4 **The Willow property prediction for habitable room**

The distance from the proposed free flow classroom extension to the noise measurement point was 35metres.

Using the same formula as in the above Section the predicted level outside a habitable room window is

SPL2 @ 30metres is 20log 5/30 = 16dB.

62-16 = $L_{aeq(10min)}$ 46dB(A)
Allowing 15dB noise attenuation (BS 8233: 2014 page 64) through a partly open window the predicted noise inside a habitable room in The Willow will be $L_{aeq(15min)}$ 31dB(A) in the absence of three side elevations noise barrier. This is 4dB less than BS 8233 acceptable level of $L_{aeq(15min)}$ 35dB(A) for a habitable room during school time period 09.00 –15.30hours).

BS 8233acceptable level for noise in a habitable room during the daytime is $L_{aeq(16hours)}$ 35dB(A).School time period lasts for 7.5hours. The free flow area will be used not more than 5hours per day and the rest of the 1.5hours only ambient noise will exist. Correcting for on time noise is 10logt1/t2 giving 2dB correction. The predicted level in a habitable room at The Willow will be 31-2 = $L_{aeq(7.5hours)}$ 29dB(A). This is within BS 8233 acceptable noise for a habitable room during the daytime period.

6.5 **The Willow property prediction for garden noise (sunken lawn area of property)**

The distance from the proposed free flow classroom extension to the sunken lawn area is 5metres. From Table 1 the measure children noise at 5 metres is $L_{aeq(15min)}$ 62dB(A).

From Table 5 (24/5/2017) the measured **pre-development** noise between 12.05 and 13.00 hours 30metres away from the proposed free flow area was measured at $L_{aeq(15min)}$ 60dB(A) with free flow children and as well as older children using the main playground (playground nearest to The Willow). If the measurement was carried out at 5metres instead of 30metres from the proposed free flow area (school playground boundary /The Willow garden area) when both free flow area children and older children are using the main playground during school break times then the pre-development noise level for the same time period would be between $L_{aeq(15min)}$ 74dB(A) and $L_{aeq(15min)}$ 76dB(A). This would be the existing **pre-development** site noise at The Willow garden amenity. The addition of 14-16 dB on the free flow children noise 5 metres (Table 1 row 3) from the school main playground (playground closest to The Willow drive) gives a predicted level between $L_{aeq(15min)}$ 74dB(A) and $L_{aeq(15min)}$ 76dB(A).The pre-development noise in The Willow garden area is greater than BS 8233 acceptable noise level $L_{aeq(15min)}$ 55dB(A) for gardens and open spaces.

7.0 CONCLUSION

7.1 At the request of the Entrust Limited, Cheshire Environmental Associates has carried out this acoustic assessment.

7.2 The scope of the assessment is to evaluate the impact of children noise from the proposed free flow classroom shelter to the rear of the school building on the occupants of Rockview and the Willow residential properties.

7.3 The assessment indicates the following:

- Predicted noise in a habitable room at Rock View due to children using the free flow classroom shelter will be in compliance with BS 8233:2014 recommended noise for a habitable room during the daytime period (07.00 –23.00 hours) by 4dB(A) without any noise barriers in position (Section 6.2)
- The predicted noise in the garden of Rock View will be $L_{aeq(10min)}$ 31dB(A) without any noise barrier in position compared with BS 8233 acceptable level of $L_{aeq(60min)}$ 55dB(A) (Section 6.3)
- The predicted noise in a habitable room at The Willow due to children using the free flow classroom area is $L_{aeq(10min)}$ 31dB(A) which is less than BS 8233:2014 recommended noise for a habitable room during the daytime period (07.00 –23.00 hours) by 5dB(A) without any noise barriers in position (Section 6.4).
- The pre-development noise 5metres from the proposed free flow to the school playground / The Willow drive is between $L_{aeq(15min)}$ 74dB(A) and $L_{aeq(15min)}$ 76dB(A) This is greater than BS 8233 acceptable noise level $L_{aeq(15min)}$ 55dB(A) for gardens and open spaces.

ANNEX A

GLOSSARY OF TERMS

Decibel (dB) :

A unit of noise derived from the ratio between a measured levels and a reference value. The threshold of normal hearing is in the region of 0 dB whereas the threshold of pain is 140 dB.

A-weighting

Approximation of the way the human auditory system hears sound. The weighting de-emphasises the energy at high and low frequencies in favour of the mid-frequency range which humans are more likely to possess.

dB (A)

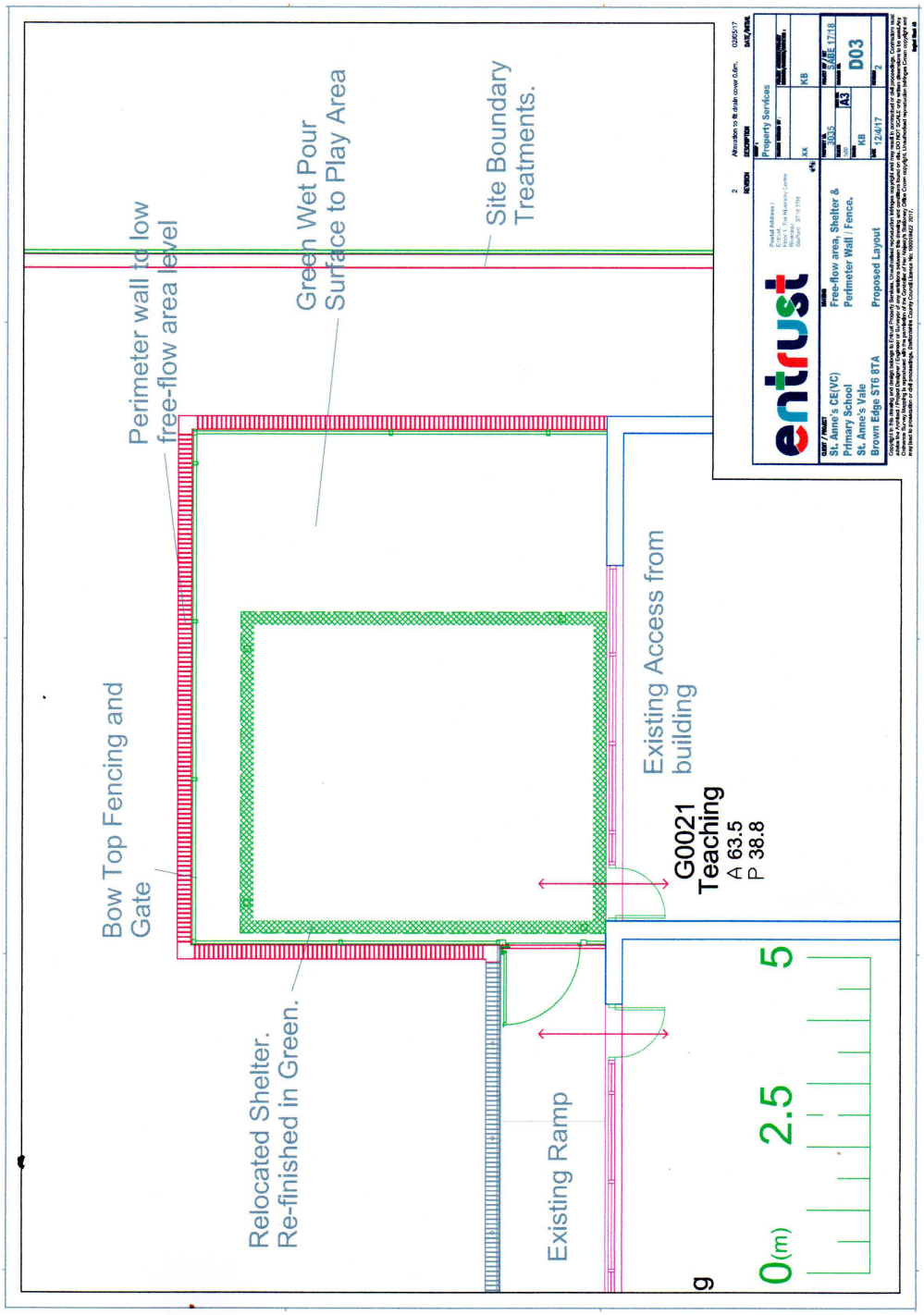
The (A) in dB(A) indicates that noise measurements were carried out in A-weighting. Decibels measured on a sound level meter incorporate a filter or weighting to mimic the way the sound is heard by the human ear. A change of 1dB(A) is only perceptible under controlled conditions and the average individual can only determine changes of over 3dB(A). A change of 10 decibels corresponds roughly to halving or doubling the loudness. The level inside a bedroom at night is typically 35dB(A). A typical office is 45 -55 dB(A), whereas a city street would be 70-80 dB(A).

L_{aeq} :

Known as the equivalent continuous sound level, L_{aeq} is the A-weighted energy level of fluctuating noise emission.

APPENDIX 1

PROPOSED CLASSROOM FREE FLOW SHELTER AREA FOR ST ANNE PRIMARY SCHOOL



PROPOSED CLASSROOM FREE FLOW SHELTER AREA FOR ST ANNE PRIMARY SCHOOL

