Our ref: NIA/9440/20/9447/v2/264 Dodworth Road

4th January 2021

Mr. Gordon Bird
c/o Mr. Andrew Bailey

By email only: aa2larchitects@btconnect.com

Dear Sir

NOISE IMPACT ASSESSMENT FOR A PROPOSED (OUTLINE) DEVELOPMENT OF 4 NEW DWELLINGS, LAND AT 264 DODWORTH ROAD, DODWORTH, BARNSLEY

1.00 INTRODUCTION

1.01 Environmental Noise Solutions Limited (ENS) has been commissioned by Mr. Gordon Bird to carry out a noise impact assessment for a proposed (outline) new build residential development at 264 Dodworth Road, Dodworth, Barnsley (hereafter referred to as the application site).

1.02 The objectives of the noise impact assessment were to:

- Determine external noise levels at the application site.
- Assess the potential impact of the external noise climate on the proposed (outline) residential development with reference to the National Planning Policy Framework Planning Practice Guidance on Noise and other pertinent guidelines.
- Provide outline recommendations for noise mitigation measures (be it layout, enhanced building envelope and/or boundary treatments) to avoid any unacceptable loss of amenity due to noise.

1.03 This report details the methodology and results of the assessment and provides outline recommendations for layout considerations, building envelope (fenestration and ventilation) and boundary treatments. It has been prepared to accompany an application for outline planning permission which is to be submitted to the local planning authority.

1.04 This report has been prepared for Mr. Gordon Bird or the sole purpose described above and no extended duty of care to any third party is implied or offered. Third parties making reference to the report should consult Mr. Gordon Bird and ENS as to the extent to which the findings may be appropriate for their use.

1.05 A glossary of acoustic terms used in the main body of the text is contained in Appendix 1.

2.00 APPLICATION SITE SETTING AND PROPOSED RESIDENTIAL DEVELOPMENT

2.01 The application site (see Appendix 3 for a site layout) is located within the Dodworth area of Barnsley and is bound by:

- Neighbouring existing residential dwelling, 264 Dodworth Road.
- Existing residential dwellings to the north, No. 262 and No. 266 Dodworth Road to the north.
- Agricultural fields to the south with the M1 motorway and slip road beyond to the south-west.
- Rear gardens of residential dwellings on Hunters Avenue to the east.
- Rear garden of residential dwelling to the west on Dodworth Road.

2.02 The proposed development comprises 4 no. dwellings with associated access roads, parking and gardens.

2.03 Outline planning permission is sought for the proposed residential development. As a consequence, a detailed layout is not available at this stage. Notwithstanding this, the objective of the noise impact assessment is to assess whether the ambient noise climate represents a constraint to the proposed residential development.

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3.00 NOISE SURVEY

3.01 In order to establish external noise levels at the application site, a noise survey was undertaken on Tuesday 24th November 2020 and the early hours of Wednesday 25th November 2020.

3.02 The following noise monitoring positions were adopted (the approximate locations of the noise monitoring positions are shown in Appendix 2 for reference):

- MP1 was located in the proposed location of the southern façade of Plot 1 at 1.5 metres above ground level (AGL).
- MP2 was located in the proposed location of the southern façade of plot 2 at 4 metres AGL.
- MP2A was the same as MP2 at 1.5 metres AGL.
- MP3 was located to the rear of the application site in the proposed location of Plot 4 at 4 metres AGL.
- MP4 was located on the existing access road between the two existing residential dwellings (No. 262 and No. 266 Dodworth Road) at 1.5 metres AGL.

3.03 Noise measurements were made in a free field environment using two Bruel & Kjaer 2250 Type 1 integrating sound level meters. A windshield was fitted for all measurements. The calibration of each measurement system was verified immediately before and after the survey using a Bruel & Kjaer Type 4231 calibrator. No drift in calibration level was noted. Weather conditions throughout the survey were appropriate for monitoring.

3.04 Measurements consisted of A–weighted broadband parameters, together with linear octave band L_{eq} levels. Table 3.1 presents a summary of the measurement data for each measurement session, at each measurement position, rounded to the nearest decibel.

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Table 3.1 – Summary of Noise Measurement Data

Position	Date	Time	L_{Aeq} (dB)	L_{A90} (dB)	L_{A10} (dB)	Comment
MP1	24/11/20	1018-1034	63	61	64	Dominated by Road Traffic on M1 Motorway
		1059-1159	62	60	64	
		1159-1259	62	60	64	
		1259-1359	62	60	63	
		2254-2324	57	53	59	
		2324-2354	56	52	58	
	24/11/20 –25/11/20	2354-0024	55	51	58	
Daytime noise level 61 dB $L_{Aeq\ (0700-2300)}$ based on CRTN methodology Night time noise level circa 58 dB $L_{Aeq\ (2300-0700)}$ based on TRL methodology Maximum noise levels measured up to 68 dB L_{AFMax} at night						
MP2	24/11/20	1037-1055	61	59	62	Dominated by Road Traffic on M1 Motorway
		1402-1417	61	59	63	
	25/11/20	0054-0109	53	49	56	
Daytime noise level circa 61 dB $L_{Aeq,\ T}$ and Night time noise level circa 53 dB $L_{Aeq,\ T}$ Maximum noise levels measured up to 62 dB L_{AFMax} at night						
MP2A	24/11/20	1037-1055	60	58	62	Dominated by Road Traffic on M1 Motorway
		1155-1211	61	59	62	
		1246-1302	60	58	61	
		1320-1340	60	58	62	
		1402-1417	61	59	62	
		2258-2318	56	53	58	
	24/11/20 –25/11/20	2355-0010	55	50	57	
	25/11/20	0054-0109	52	48	55	
Daytime noise level circa 60-61 dB $L_{Aeq,\ T}$ and Night time noise level circa 52-56 dB $L_{Aeq,\ T}$ Maximum noise levels measured up to 63 dB L_{AFMax} at night						
MP3	24/11/20	1101-1121	60	58	62	Dominated by Road Traffic on M1 Motorway Vehicle Passes on Dodworth Road
		1303-1318	59	57	61	
		1341-1357	60	58	62	
		1421-1437	60	58	61	
	25/11/20	0012-0027	53	49	56	
Daytime noise level circa 59-60 dB $L_{Aeq,\ T}$ and Night time noise level circa 53-56 dB $L_{Aeq,\ T}$ Maximum noise levels measured up to 67 dB L_{AFMax} at night						
MP4	24/11/20	1123-1153	64	59	67	Dominated by Road Traffic on M1 Motorway Vehicle Passes on Dodworth Road
		1213-1244	63	58	66	
		2337-2353	57	49	59	
	25/11/20	0029-0047	56	47	58	
Daytime noise level circa 63-64 dB $L_{Aeq,\ T}$ and Night time noise level circa 56-57 dB $L_{Aeq,\ T}$						

3.05 For the prediction of daytime road traffic noise, the Department of Transport's Memorandum on the Calculation of Road Traffic Noise (CRTN) explains that the following shortened measurement procedure may be used. Measurements of L_{A10} are made over any three consecutive hours between 10:00 and 17:00 hours. Using $L_{A10\ (3\ hour)}$ as the arithmetic mean of the three consecutive values of hourly L_{A10}, the $L_{A10\ (18\ hour)}$ can be calculated from the equation:

(i) $L_{A10\ (18\ hour)} = L_{A10\ (3\ hour)} - 1$ dB

(ii) $L_{Aeq\ (0700–2300)} \approx L_{A10\ (0600–0000)} - 2$ dB

3.06 Substituting (ii) into (i) gives the following approximation:

(iii) $L_{Aeq\ (0700–2300)} \approx L_{A10\ (3\ hour)} - 3$ dB

3.07 Based on the above formula, the daytime ambient noise level at MP1 is measured / calculated at **61 dB $L_{Aeq\ (0700–2300)}$.**

3.08 A study prepared by TRL Limited on behalf of the Department for Environment, Food and Rural Affairs (DEFRA) entitled 'Converting the UK Traffic Noise Index $L_{A10\ (18\ hour)}$ to EU Noise Indices for Noise Mapping' presents a methodology for calculating night time road traffic noise levels based on daytime road traffic noise level based on the following formulae:

(iv) $L_{Aeq\ (23:00–07:00)} \approx 0.87 * L_{A10,\ 18\ hour} + 4.24$ (for motorways)

3.09 Based on the above formula, the night time ambient noise level at MP1 is measured / calculated at **58 dB $L_{Aeq\ (2300–0700)}$.**

3.10 The noise environment at the application site was dominated by road traffic on the M1 motorway, with no other significant noise sources noted during the survey.

Coronavirus Travel Restrictions

3.11 During November 2020, the UK Government announced measures to stem the coronavirus pandemic, including restrictions on non-essential travel. The previous restrictions in March showed initially traffic volumes were reduced to circa 40 % of typical flows, traffic flows by the end of June 2020 were circa 65 % of typical traffic volumes and rising to 90 % in September 2020.

3.12 Data produced by the AA in June 2020, during similar conditions to the current November 2020 lock down restrictions, indicated that traffic volumes had recovered to circa 75 % of typical traffic volumes. This was due to the relaxing of restrictions including travel restrictions for work. Using the methodology in the Calculation of Road Traffic Noise (CRTN), a 25 % reduction in traffic volumes equates to a 1 dB reduction in noise levels – this correction has been robustly applied to the measured noise level across the application site to account for a potential increase in measured noise levels once traffic flows are back to 'normal'.

4.00 NATIONAL PLANNING POLICY FRAMEWORK AND OTHER RELEVANT GUIDANCE

National Planning Policy Framework

4.01 The National Planning Policy Framework (NPPF) was updated in 2019 and sets out the Government's planning policies for England and how these are expected to be applied.

4.02 Where issues of noise impact are concerned the NPPF provides brief guidance in paragraph 170 where it states that planning policies and decisions should contribute to and enhance the natural and local environment by:

'preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of…..noise pollution'.

4.03 Paragraph 180 advises that:

'Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should…..mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life'.

4.04 The NPPF also refers to the DEFRA publication, the Noise Policy Statement for England (NPSE) which reinforces and supplements the NPPF.

Noise Policy Statement for England

4.05 The Noise Policy Statement for England (NPSE) sets out the long-term vision of promoting good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development. This long-term vision is supported by the following aims:

- Avoid significant adverse impacts on health and quality of life.
- Mitigate and minimise adverse impacts on health and quality of life.
- Where possible, contribute to the improvement of health and quality of life.

4.06 NPSE describes the following levels at which noise impacts may be identified:

- NOEL – No Observed Effect Level. This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.
- LOAEL – Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected.
- SOAEL – Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur.

Planning Practice Guidance – Noise

4.07 Planning Practice Guidance (PPG) is an online resource (last updated 2019) which provides additional guidance and elaboration on the NPPF. It advises that the Local Planning Authority should consider the acoustic environment in relation to:

- Whether or not a significant adverse effect is occurring or likely to occur.
- Whether or not an adverse effect is occurring or likely to occur.
- Whether or not a good standard of amenity can be achieved.

4.08 In line with the Explanatory Note of the NPSE, the PPG references the LOAEL and SOAEL in relation to noise impact. It also provides examples of outcomes that could be expected for a given perception level of noise, plus actions that may be required to bring about a desired outcome. However, in line with the NPSE, no objective noise levels are provided for LOAEL or SOAEL although the PPG acknowledges that:

'…the subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation'.

4.09 The PPG also provides general advice on the typical options available for mitigating noise. It goes on to suggest that Local Plans may include noise standards applicable to proposed developments within the Local Authority's administrative boundary, although it states that:

'Care should be taken, however, to avoid these being implemented as fixed thresholds as specific circumstances may justify some variation being allowed'.

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ProPG Planning and Noise: New Residential Development

4.10 ProPG Planning and Noise: New Residential Development (ProPG) was published in 2017 by the Association of Noise Consultants, Institute of Acoustics and the Chartered Institute of Environmental Health.

4.11 Stage 2: Element 2 of ProPG sets indoor ambient noise levels for residential dwellings based on the guidance contained in British Standard 8233:2014 'Guidance on Sound Insulation and Noise Reduction for Buildings' (BS 8233), see Table 4.1.

Table 4.1 – Indoor Ambient Noise Levels in Dwellings

Activity	Location	Good Indoor Ambient Noise Levels	
Resting	Living Room	35 dB $L_{Aeq\ (0700–2300)}$	-
Dining	Dining Room/Area	40 dB $L_{Aeq\ (0700–2300)}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq\ (0700–2300)}$	30 dB $L_{Aeq\ (2300–0700)}$ 45 dB $L_{AFMax\ (2300–0700)}$

4.12 Note 4 to the above table states:

'A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values. In most circumstances in noise sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{Amax,F}$ more than 10 times a night.'

4.13 Note 5 to the above table states:

'Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded, subject to the further advice in Note 7'.

4.14 This is consistent with the guidance contained within the PPG, which states that:

'… consideration should also be given to whether adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time. In both cases a suitable alternative means of ventilation is likely to be necessary. Further information on ventilation can be found in the Building Regulations'.

4.15 On the basis of the above, the following criteria (with windows closed and an alternative means of ventilation provided) are considered appropriate for the proposed residential development and considered to represent good resting and sleeping conditions:

- ≤ 35 dB $L_{Aeq\ (0700-2300)}$ during the daytime.
- ≤ 30 dB $L_{Aeq\ (2300-0700)}$ and 45 dB L_{AFMax} not regularly exceeded during the night time.

4.16 With regard to external amenity, BS 8233 states:

'For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.'

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5.00 SOUND ATTENUATION SCHEME PROPOSALS

Sound Attenuation Scheme Proposals

5.01 Outline planning permission is sought for the proposed residential development and, as a consequence, detailed plans / elevations are not available at this stage.

5.02 The daytime and night time ambient noise levels at MP1 (facing towards the M1 motorway) have been measured / calculated (including the 1 dB L_{Aeq} adjustment for traffic flows, see paragraph 3.12) at 62 dB $L_{Aeq\ (0700\text{-}2300)}$ and 59 dB $L_{Aeq\ (2300\text{-}0700)}$, respectively (with maximum noise levels of 68 dB L_{AFMax} during the night time). These levels are representative of Plots 1 to 3, fronting toward the M1 motorway.

5.03 The daytime and night time ambient noise levels at MP3 at the rear of the application site have been measured / calculated at 61 dB $L_{Aeq\ (0700\text{-}2300)}$ and 57 dB $L_{Aeq\ (2300\text{-}0700)}$, respectively (with maximum noise levels of 67 dB L_{AFMax} during the night time).

5.04 Internal noise levels within proposed habitable rooms have been calculated with closed windows. Calculations have incorporated:

- The measured/calculated external noise level data acquired on site.
- The noise ingress calculation methodology outlined in Annex G.2 of BS8233:2014.
- An assumed room volume of 50 m^3 with a glazing area of 3 m^2 for living rooms.
- An assumed room volume of 25 m^3 with a glazing area of 1.5 m^2 for bedrooms.
- An assumed typical masonry external wall construction (e.g. 250mm – 300mm solid masonry or 100mm brick / 100mm cavity / 100mm block).
- An assumed reverberation time of 0.5 seconds for living rooms and bedrooms.

5.05 The scheme of sound insulation for the application site is set out in the following table.

Table 5.1 – Scheme of Sound Insulation Works

Location	Noise Level	Internal Criteria	Glazing and Ventilation
Plots 1 – 3 Facing towards the M1 motorway	62 dB $L_{Aeq\ (0700–2300)}$ 59 dB $L_{Aeq\ (2300–0700)}$ 68 dB $L_{AFMax\ (2300–0700)}$	≤ 35 dB $L_{Aeq\ (0700–2300)}$ ≤ 30 dB $L_{Aeq\ (2300–0700)}$ ≤ 45 dB $L_{AFMax\ (2300–0700)}$	Enhanced glazing rated at ≥ 32 dB R_w+C_{tr} i.e. 10 /(6-20) /6 and acoustic trickle vents *
Plot 4 Rear of the site	61 dB $L_{Aeq\ (0700–2300)}$ 57 dB $L_{Aeq\ (2300–0700)}$ 67 dB $L_{AFMax\ (2300–0700)}$	≤ 35 dB $L_{Aeq\ (0700–2300)}$ ≤ 30 dB $L_{Aeq\ (2300–0700)}$ ≤ 45 dB $L_{AFMax\ (2300–0700)}$	Enhanced glazing rated at ≥ 29 dB R_w+C_{tr} i.e. 8 /(6-20) /6 and acoustic trickle vents *

* Acoustic trickle vents rated at least 37 dB $D_{n,e,w} + C_{tr}$ (vent open), such as the Greenwood 5000EAW.AC1 (note: 1 no. required per habitable room) – ventilation requirements to be confirmed by developer.

5.06 A detailed building envelope specification can be provided when the detailed layout is determined (as part of a Reserved Matters application). The ambient noise climate does not pose a constraint to the proposed residential development.

Gardens

5.07 Daytime noise levels were measured / calculated up to 62 dB $L_{Aeq.}$ BS8233 recommends an upper guideline value for external amenity of 55 dB L_{Aeq} and states the following:

'However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.'

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5.08 As the application site is within close proximity to a strategic transport network (M1 motorway) a compromise of slightly elevated noise levels within gardens is appropriate. To further reduce the daytime garden levels, it is recommended that the gardens of Plots 1, 2 and 3 be enclosed using a 2.4 metres high solid timber fence along the garden boundaries, therefore further reducing the external noise levels through partial screening of the M1 motorway and surrounding road network (see Appendix 4).

Noise Associated with Proposed Access Road

5.09 It is understood that during a pre application consultation for the application site, noise disturbance from the proposed access road affecting existing residential dwellings was raised as a concern by the LPA.

5.10 Noise levels at MP4 (representative of the existing residential dwellings) were measured at up to 64 dB L_{Aeq} in the daytime and 57 dB L_{Aeq} during the night time. The noise levels are wholly dominated by road traffic associated with the M1 motorway and the vehicle passes on Dodworth Road.

5.11 Reference is also made to a comparative residential development within close proximity to the application site proximity (Ref 2015/0199, 315 Dodworth Road). This application was refused planning permission, one of the reasons was due to noise negatively impacting upon the existing residential dwellings.

5.12 The decision was appealed and later dismissed on other matters. The planning inspectorate however agreed that any additional noise would not be material and stated the following:

'26. In the context of the immediate noise environment of Dodworth Road, I conclude that any additional noise and disturbance resulting from the use of the shared drive by the four houses to the rear would not be material. As such it would not cause undue harm to the living conditions of the existing occupiers at no. 313 and it would not result in unsatisfactory living conditions of the intended occupiers of the replacement dwelling at no. 315. In this regard the proposal would be in conformity with the UDP policies and SPD outlined above.'

5.13 It is therefore considered that the vehicle use associated with the 4 no. proposed dwellings would not negatively impact on the existing residential dwellings and external amenity areas due to the elevated existing noise levels and the close proximity to the M1 motorway.

5.14 In terms of mitigation, the developer has proposed installing an acoustic barrier along the proposed access road (see Appendix 5) and therefore screening the existing gardens of 262 and No. 266 Dodworth Road. It is recommended this barrier has a minimum height of 1.8 metres and is constructed of close-boarded timber fencing (mass per unit area $\geq$ 10kg/m^2). The fence should have no gaps or holes and should be fully sealed at the ground (i.e. include a gravel board).

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6.00 CONCLUSIONS

6.01 A noise impact assessment has been undertaken for a proposed (outline) residential development for at 264 Dodworth Road, Dodworth, Barnsley.

6.02 The noise environment at the application site was dominated by road traffic on the M1 motorway, with no other significant noise sources noted during the survey.

6.03 An outline scheme of sound attenuation works (fenestration and ventilation), boundary treatment and layout considerations has been developed to protect the proposed residential development from the ambient noise climate in accordance with pertinent guidelines. On this basis, the ambient noise climate does not pose a constraint to the proposed residential development.

I trust the foregoing is sufficient for your needs. Should you have any queries regarding the above, please do not hesitate to contact me.

Yours sincerely



Richard Whitaker BSc (Hons)
MIOA, Diploma in Acoustics & Noise Control
For Environmental Noise Solutions Limited

Appendix 1
Glossary of Acoustic Terms

Sound Pressure Level (L_p)

The basic unit of sound measurement is the sound pressure level. As the pressures to which the human ear responds can range from 20 µPa to 200 Pa, a linear measurement of sound levels would involve many orders of magnitude. Consequently, the pressures are converted to a logarithmic scale and expressed in decibels (dB) as follows:

$$L_p = 20 \log_{10}(p/p_0)$$

Where L_p = sound pressure level in dB; p = rms sound pressure in Pa; and p_0 = reference sound pressure (20 µPa).

A-weighting Network

A frequency filtering system in a sound level meter, which approximates under defined conditions the frequency response of the human ear. The A-weighted sound pressure level, expressed in dB(A), has been shown to correlate well with subjective response to noise.

Equivalent continuous A-weighted sound pressure level, $L_{Aeq, T}$

The value of the A-weighted sound pressure level in decibels of continuous steady sound that within a specified time interval, T, has the same mean-square sound pressure as a sound that varies with time. $L_{Aeq, 16h}$ (07:00 to 23:00 hours) and $L_{Aeq, 8h}$ (23:00 to 07:00 hours) are used to qualify daytime and night time noise levels.

$L_{A10, T}$

The A-weighted sound pressure level in decibels exceeded for 10% of the measurement period, T. $L_{A10, 18h}$ is the arithmetic mean of the 18 hourly values from 06:00 to 24:00 hours.

$L_{A90, T}$

The A-weighted sound pressure level of the residual noise in decibels exceeded 90% of a given time interval, T. L_{A90} is typically taken as representative of background noise.

$L_{AF\ max}$

The maximum A-weighted noise level recorded during the measurement period. The subscript ‘F’ denotes fast time weighting, slow time weighting ‘S’ is also used.

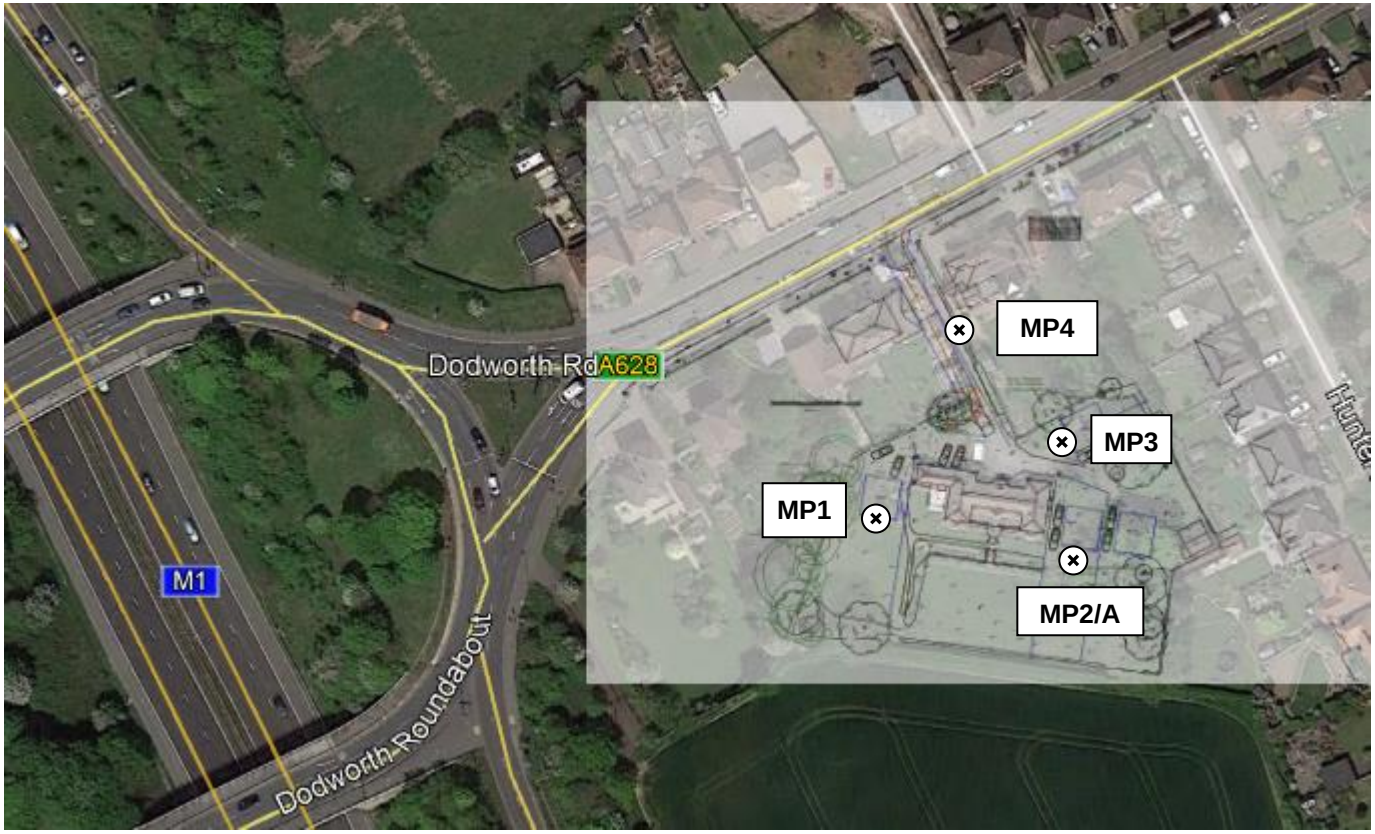
Sound Exposure Level (SEL or L_{AE})

The energy produced by a discrete noise event averaged over one second, no matter how long the event actually took. This allows for comparison between different noise events which occur over different lengths of time.

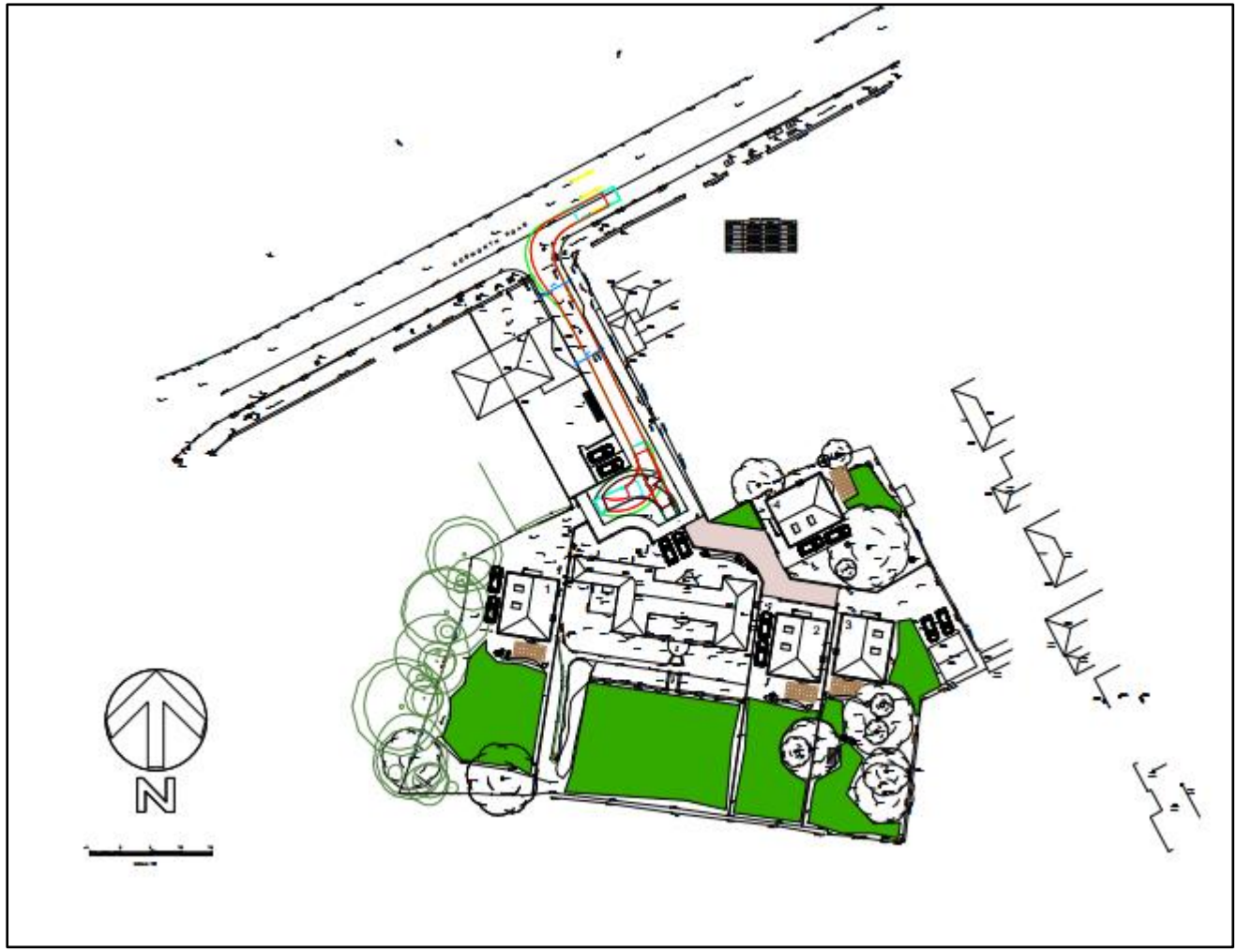
Weighted Sound Reduction Index (R_W)

Single number quantity which characterises the airborne sound insulation properties of a material or building element over a defined range of frequencies (R_W is used to characterise the insulation of a material or product that has been measured in a laboratory).

Appendix 2 - Noise Monitoring Positions



Appendix 3 – Site Layout Drawing (Outline)



Appendix 4 – Proposed Garden Boundary Treatment

= 2.4-metre-high solid timber fence



Appendix 5 – Proposed Acoustic Barrier

=1.8-metre-high solid timber fence

