24Acoustics
Armstrong House
3 Bassett Avenue
Southampton
SO16 7DP

T: 02381 555000

Neil Crowther
Arun District Council
Civic Centre
Maltravers Rd
Littlehampton
BN17 5LF

Date: 5th November 2021
Reference: 9200-3 Rev 1

Dear Mr Crowther,

RE: Fitzalan Link Road, Littlehampton – Noise Review

Further to our review of relevant documents that relate to noise mitigation, we are pleased to confirm the results and findings.

1.0 INTRODUCTION

1.1 An outline application for the link road was submitted in 2011 and approved subject to conditions in 2012 (reference LU/63/11/). The application was accompanied by a noise report (reference A044039-2 dated 21st February 2011) which concluded that a graded bund of up to 1m would provide sufficient mitigation.

1.2 A revised noise report was submitted in July 2011 and at section 5.3, a recommendation was made for a 3.0m close boarded timber fence to reduce noise from the road. The location of the barrier, shown at SK06, is adjacent to the proposed new highway. Both 2011 documents contain several inaccuracies which make the report difficult to follow (for example Table 4.3 repeats twice and contains the same predicted levels for materially different receptor locations). This report has not been considered further in this review.

1.3 A reserved matters application was submitted in 2016 (reference LU/234/16/RES). As part of the application, an updated noise report was prepared by WYG in July 2016 (reference A095004).

1.4 The 2016 report identified a 3.5m high noise barrier, adjacent to the highway as appropriate mitigation. This barrier alignment, next to the road, does not match the barrier location shown in the submitted landscape drawings which were subsequently approved (and as per where the barrier has now been constructed).

1.5 Condition 7 of the reserved matters approval required details of the 3.5m noise barrier to be submitted and approved by the LPA. The condition required completion of the barrier installation prior to first use of the road.

1.6 An addendum statement dated 20th March 2017 was produced to respond to the proposed change in road speed, from 30 mph to 40 mph, with low road noise surface. It is understood that the road was constructed using a standard hot rolled asphalt (HRA) finish, rather than a low noise surface.

1.7 A further note was issued by WYG on 29th November 2019 in respect of the barrier type, noting that the proposed metal GRAMM MetaSoundblock barrier (with vertical panels) was suitable in acoustic terms. The location of the barrier, in this note, matched that shown in the landscape drawings.

1.8 Significant concern has been raised by residents regarding the height and location of the now constructed noise barrier and the veracity of the submitted noise reports. This report, therefore, reviews the submitted documents and makes observations where necessary.

1.9 Specifically, the following key areas have been reviewed:

- Review of acceptability criteria
- Accuracy of modelling undertaken
- Review of noise barrier mitigation and assessment of alternative options

1.10 The road scheme, barrier and surrounding area is shown in Figures 1A and 1B. For reference, the term noise barrier may be used interchangeably with acoustic screen or acoustic barrier. It should be noted that light-weight close boarded timber fences are usually of insufficient weight and quality to be considered as a robust form of noise mitigation for new road schemes.

1.11 All sound pressure levels quoted in this report are in dB relative to 20 µPa. A glossary of the acoustic terminology used in this report is provided in Appendix A. The author's qualifications and experience are shown in Appendix B.

2.0 NOISE CRITERIA

NPPF and NPSE

2.1 The National Planning Policy Framework (NPPF), revised in 2021, states at paragraph 174 that:

> Planning policies and decisions should contribute to and enhance the natural and local environment by: …
>
> *e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; …*

2.2 Similarly, Paragraph 185 states:

> "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:

> *a) 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;*
> *b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason;*

2.3 The NPPF also refers to the Noise Policy Statement for England (NPSE) which is intended to apply to all forms of noise, including environmental noise, neighbour noise and neighbourhood noise. The NPSE sets out the Government's long-term vision to 'promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development'.

2.4 The NPSE defines the following key concepts in relation to noise impact:

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' - the level above which significant adverse effects on health and quality of life occur.

2.5 The following guidance is also provided within the NPSE:

> "*It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available*."

2.6 In 2014 the Planning Practice Guidance (PPG) was issued. The PPG reflects the NPSE and states that noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. It also states that opportunities should be taken, where practicable, to achieve improvements to the acoustic environment.

LA 111 Noise and Vibration

2.7 For this scheme the appropriate standard for use in assessing the noise impact is those given in Design Manual for Roads and Bridges (DMRB), LA 111 Noise and Vibration, Revision 2 (formerly HD 231/11). This provides guidance on the environmental assessment of noise impacts from new road schemes. The DMRB contains advice and information on transport-related noise and vibration, which has relevance to operational traffic impacts affecting sensitive receptors. The document also provides guideline significance criteria for assessing traffic related noise impacts.

2.8 With regard to the LOAEL and SOAEL lexicon used in the NPSE, absolute levels from Table 34.9.1

from LA 111 are shown below.

Table 3.49.1 Operational noise LOAELs and SOAELs for all receptors

Time Period	LOAEL	SOAEL
Day (06:00-24:00)	55dB $L_{A10,18hr}$ facade	68dB $L_{A10,18hr}$ facade
Night (23:00-07:00)	40dB $L_{night, outside}$ (free-field)	55dB $L_{night, outside}$ (free-field)

2.9 LA 111 sets an upper limit of 68 dB $L_{A10\ 18\ hour}$ as the threshold for significant adverse impact for new road schemes. This noise level, for context, corresponds to the trigger threshold for the noise insulation regulations. In addition, the change in noise level is considered and Tables 3.54a and 3.54b from LA 111 consider the impact magnitude in the short and long term respectively.

Table 3.54a Magnitude of change - short term

Short term magnitude	Short term noise change (dB $L_{A10,18hr}$ or L_{night})
Major	Greater than or equal to 5.0
Moderate	3.0 to 4.9
Minor	1.0 to 2.9
Negligible	less than 1.0

Table 3.54b Magnitude of change - long term

Long term magnitude	Long term noise change (dB $L_{A10,18hr}$ or L_{night})
Major	Greater than or equal to 10.0
Moderate	5.0 to 9.9
Minor	3.0 to 4.9
Negligible	less than 3.0

2.10 With regard to mitigation from operational noise, the guidance from LA111 states at para 3.65:

The suitability of each potential mitigation measure for use within the project area shall be determined based on the following criteria:

1) *for residential noise receptors only, a comparison of the monetised noise benefit of a mitigation measure against the cost of the measure over the anticipated design life of the project*
2) *the likely perceived benefit of the measure at any noise sensitive receptors.*
3) *the benefit of a measure in terms of elimination of likely significant effects.*
4) *practicality of the measure, for example, in terms of safety considerations and engineering constraints.*
5) *the impact of the measure across other environmental factors, for example the visual impact of a noise barrier.*

Calculation of Road Traffic Noise (CRTN)

2.11 CRTN (1988) provides a method for assessing noise from road traffic in the UK using both forecast Annual Average Weekday Traffic (AAWT) flows and from measured noise levels. The calculation methods provided include correction factors to take account of variables affecting the creation and propagation of road traffic noise, such as the percentage of heavy goods vehicles (HGV), road surface type, inclination, screening by barriers and relative height of source and receiver.

2.12 Noise levels arising from road traffic are typically calculated using a height of 4m at nearby receptors. All calculations are made using the L_{A10} parameter. Conversion of L_{A10} to L_{Aeq} can be achieved by the relationship: $L_{Aeq,16h} = L_{A10,18h} - 2$ dB.

British Standard 8233:2014

2.13 BS 8233:2014 recommends an upper guideline value of 55 dB $L_{Aeq,16hr}$ for free-field noise levels in external amenity spaces such as gardens (at a height of 1.5m). BS 8233 notes that this level is "*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.*"

Local Authority

2.14 Arun District Council's Policy QEDM1 (Adopted Local Plan 2018) notes for new noise generating development:

> *Developers proposing new noise generating development must seek advice from an early stage to determine the level of noise assessment required. Proposals will need to be supported by:*
>
> > *a. Evidence to demonstrate that there are no suitable alternative locations for the development.*
> > *b. A noise report which provides accurate information about the existing noise environment, and the likely impact of the proposed development upon the noise environment. The report must also demonstrate that the development meets appropriate national and local standards for noise, as set out in Annex 1 of the Planning Noise Advice Document: Sussex, and any mitigation measures required to ensure noise is managed to an acceptable level.*

2.15 Annex 1 of the 2021 Planning Noise Advice Document refers to the Design Manual for Roads and Bridges and the Noise Insulation Regulations (1975). It also suggests that noise levels should not exceed 40 dB $L_{Aeq\ 8\ hour}$ externally, though this is a very stringent level and not normally used as a threshold for acceptability for new road schemes.

2.16 Arun District Council was consulted during the planning phases for the road scheme. To protect existing residents from noise from the road, the consultation responses sought to establish how many properties would be subject to noise that exceeded 55 dB $L_{Aeq\ 16\ hour}$ (or 57 dB $L_{A10,\ 18\ hour}$). It should be noted that in planning terms, this is significantly lower than SOAEL and is not normally

used for new road schemes.

Summary

2.17 Noise arising from the road should be assessed against the both the absolute LOAEL / SOAEL values as well as the change significance criteria. Contextually, the increase in noise level should be balanced in planning terms against the benefits that arise from the scheme. In addition, the suitability of potential noise mitigation should take into account factors such as visual impact.

3 NOISE REVIEW

WYG Report 2016

3.1 A review of the RM report July 2016 shows that the input traffic flow data (18 Hr AAWT) appears to be broadly consistent with those recently received by 24 Acoustics from West Sussex CC (via email 29th September 2021). There are certain subsets of data (eg, %HGVs, porous road surface) that have not been stated. Although implied only from the 2017 update note, it is assumed that an operational traffic speed of 30 mph applies in the 2016 report. The model appears to have used a hybrid CRTN/ISO 9613 approach and a German standard for ground absorption, which is not consistent with the requirements of DMRB. The reasons for this approach are not clear.

3.2 This report, in line with the requirements of the Calculation of Road Traffic Noise (CRTN), predicts noise levels at a height of 4m. No noise predictions were made at ground height (1.5m) in response to the EHO's queries to assess the impact in gardens. The report, after Table 5.3, also directly compares the modelled $L_{A10\ 18\ hour}$ values at a height of 4m with the $L_{Aeq\ 16\ hour}$ criteria (at a height of 1.5m) in BS 8233 which is incorrect (the 2017 assessment also repeats this comparison). The study should have contained calculated levels at 1.5m height (ie, representing standing height in a garden) to address the EHO's query. No night-time values were calculated and this is considered to be an omission, given the potential impact to first floor bedrooms.

3.3 The report includes a reference to a 2.5m barrier in Drawing SK02b on Page 31; this appears to be a typographical error as all other references are to a 3.5m noise barrier.

3.4 Fundamentally, the alignment of the barrier in SK02b of the noise report (see Appendix C) is materially different to the approved plans (and as constructed). It follows that the predicted receptor noise levels are not likely to be representative of the barrier in its current / approved location.

3.5 Given that the modelling in the noise report deviates significantly from the approved plans, it is considered that none of the work undertaken is of practical use to demonstrate the impact of the Fitzalan Link Road. The uncertainties mean that a comparative or relative noise assessment which looks at the change in noise level cannot reliably be undertaken.

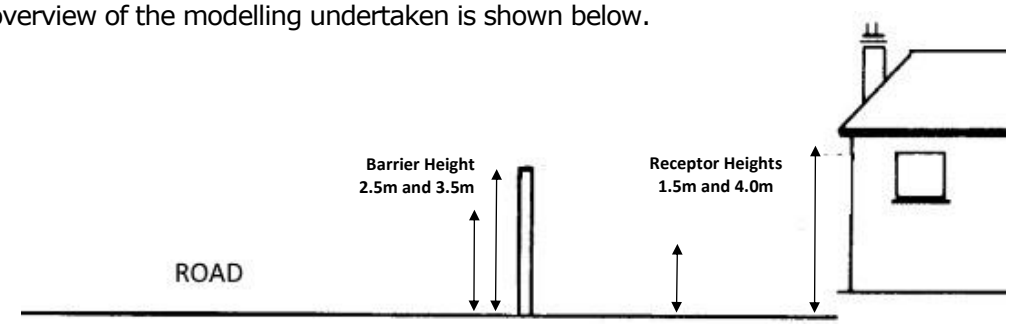
3.6 In summary, it is 24 Acoustics' opinion that the methodology and findings of the WYG study were not sufficient for a reasonable conclusion to be drawn by decision makers at ADC.

24 Acoustics Study

3.7 A study of noise from the Fitzalan Link Road has been undertaken by 24 Acoustics using the procedures in CRTN and via a 3D model constructed in Immi 2021 noise modelling software. The following input assumptions have been made:

a) Road flows as per advised by WSCC (email 29th September 2021) for 2019 and 2034
b) Topography – as per approved plans
c) Barrier location & height – as per approved plans / as built, 3.5m and 2.5m
d) Road speed – 40 mph / 64 km/hr
e) Percentage HGVs – 6%
f) Road surface – standard HRA (non-porous)
g) Receptor height – 4m (façade) and 1.5m (free-field in garden)

3.8 An overview of the modelling undertaken is shown below.



3.9 The predicted noise levels at key receptors in the year 2034, for the scheme as built, are shown in Table 1 below.

Receptor Location	WYG 2016 Reference	Sound Pressure Level (dB $L_{A10\ 18\ hour}$)	
		4.0m Receptor Height	1.5m Receptor Height
168 Highdown Drive	TR02	60	51
158 Highdown Drive	TR03	59	52
150 Highdown Drive	TR06	57	53
138 Highdown Drive	TR07	56	53
170 Highdown Drive	TR12	56	53
8 Amberley Close	TR20	58	54
10 Amberley Close	TR21	58	54
16 Amberley Close	TR24	56	54
58 Highdown Drive	TR28	57	53
28 Highdown Drive	TR33	55	54
26 Highdown Drive	TR34	54	54
2 Highdown Drive	TR36	55	51

Table 1 – Calculated Noise Levels, 3.5m Barrier and Scheme as Built (2034)

3.10 To convert between L_{10} and L_{eq} indices and allow a comparison with the query raised by the EHO, the modelled L_{10} levels must be reduced by 2 dB. Subtracting 2 dB from the values in the last

column shows that all of the properties would be at or below 55 dB $L_{Aeq\ 16\ hour}$ for the 3.5m barrier as built. The levels in Table 1 are, on average, between 8 dB to 13 dB lower than the scenario with no barrier, which shows that the barrier is effective (depending on receptor height) in mitigating noise impacts from the road.

3.11 Table 2 shows predicted levels for a scenario with a reduced barrier height of 2.5m.

Receptor Location	WYG 2016 Reference	Sound Pressure Level (dB $L_{A10\ 18\ hour}$)	
		4.0m Receptor Height	1.5m Receptor Height
168 Highdown Drive	TR02	63	54
158 Highdown Drive	TR03	63	54
150 Highdown Drive	TR06	61	55
138 Highdown Drive	TR07	60	55
170 Highdown Drive	TR12	59	55
8 Amberley Close	TR20	62	57
10 Amberley Close	TR21	62	57
16 Amberley Close	TR24	60	57
58 Highdown Drive	TR28	60	56
28 Highdown Drive	TR33	59	57
26 Highdown Drive	TR34	58	57
2 Highdown Drive	TR36	60	54

Table 2 – Calculated Noise Levels, 2.5m Barrier (2034)

3.12 As per para 3.8 above, subtracting 2 dB from the values in the final column yields a level in gardens of 55 dB $L_{Aeq,\ 16\ hour}$ or lower. Noise levels at 4m are typically 3-4 dB higher for the 2.5m barrier scenario. A change of 3 dBA is the minimum perceptible under normal conditions for steady noise sources such as road traffic noise. In this context, therefore the above result show that the change in noise level from a 3.5m barrier to 2.5m would be at the threshold of perceptibility.

Night-time Noise

3.13 Noise levels at 4m or first floor generally affect habitable bedrooms and therefore the impact at this height should also be considered. The method to calculate the night-time noise level uses the TRL conversion method TRL PR/SE/451/02. On this basis, night-time noise levels at first floor for the existing 3.5m barrier range between 46 – 49 dB $L_{Aeq\ 8\ hour}$. Internal noise levels with an open window would be approximately 15 dBA lower at 31 to 34 dB $L_{Aeq\ 8\ hour}$.

3.14 With a 2.5m barrier the night-time levels range between 50 – 53 dB $L_{Aeq\ 8\ hour}$. As above, internal noise levels would be in the range 35 to 38 dB $L_{Aeq\ 8\ hour}$.

Speed Limit

3.15 In the event the road speed limit reduces to 30 mph, noise levels would reduce by 1-2 dB across all scenarios (3.5m or 2.5m barrier and 4m or 1.5m receptor heights). As noted, a change of 3 dB (or lower) is below the threshold of detection for steady noise levels.

Barrier Relocation

3.16 Were relocation possible, positioning the barrier closer to the road would result in an improved performance. This is on the basis that improved screening occurs when the barrier is closest to either the source or receiver. In this case, placing the barrier closer to the road would result in an anticipated improvement of 2 - 4 dB. It is relevant to note that this option appears to be very limited in practice given the presence of the loop road that occurs towards the north of the scheme.

Barrier Material

3.17 In order for a barrier of a given height to be effective, a minimum superficial weight of 15 kg/m^2 is recommended. In addition, the barrier must contain no holes, gaps or openings. If an alternative material were to be considered, it would first be necessary to ensure that the barrier supplier's warranty would be maintained. If this were the case, then use of an alternative (eg, transparent) material would be possible. It is understood that the barrier supplier for the scheme, GRAMM provide a product ClearsSoundBlok which achieves this weight; GRAMM would need to confirm whether these panels are compatible and could be retrofitted.

Summary

3.18 In summary, noise arising from the proposed new link road has been re-calculated based on the as-built scheme and current assumptions regarding vehicle flow and speed.

3.19 Noise from the scheme will clearly have an impact at the nearest affected residential properties and the identification and inclusion of a noise barrier is considered an appropriate form of mitigation.

3.20 The difference in receptor noise level between the current 3.5m barrier and a reduced height barrier of 2.5m is marginal at between 3-4 dBA. In both cases, daytime noise in external amenity spaces will be lower than 55 dB $L_{Aeq\ 16\ hour}$. Contextually, a difference of 3 dB is the minimum perceptible under normal conditions for steady noise sources such as road traffic noise. Similarly, a reduction in speed to 30 mph would result in a change in noise level of 1 -2 dB, which is also below the threshold of perceptibility for a change in steady noise levels.

Yours sincerely,
For 24 Acoustics Ltd

Steve Gosling BEng MIOA MAES FRSA
Principal Consultant

FIGURE 1A – SCHEME OVERVIEW

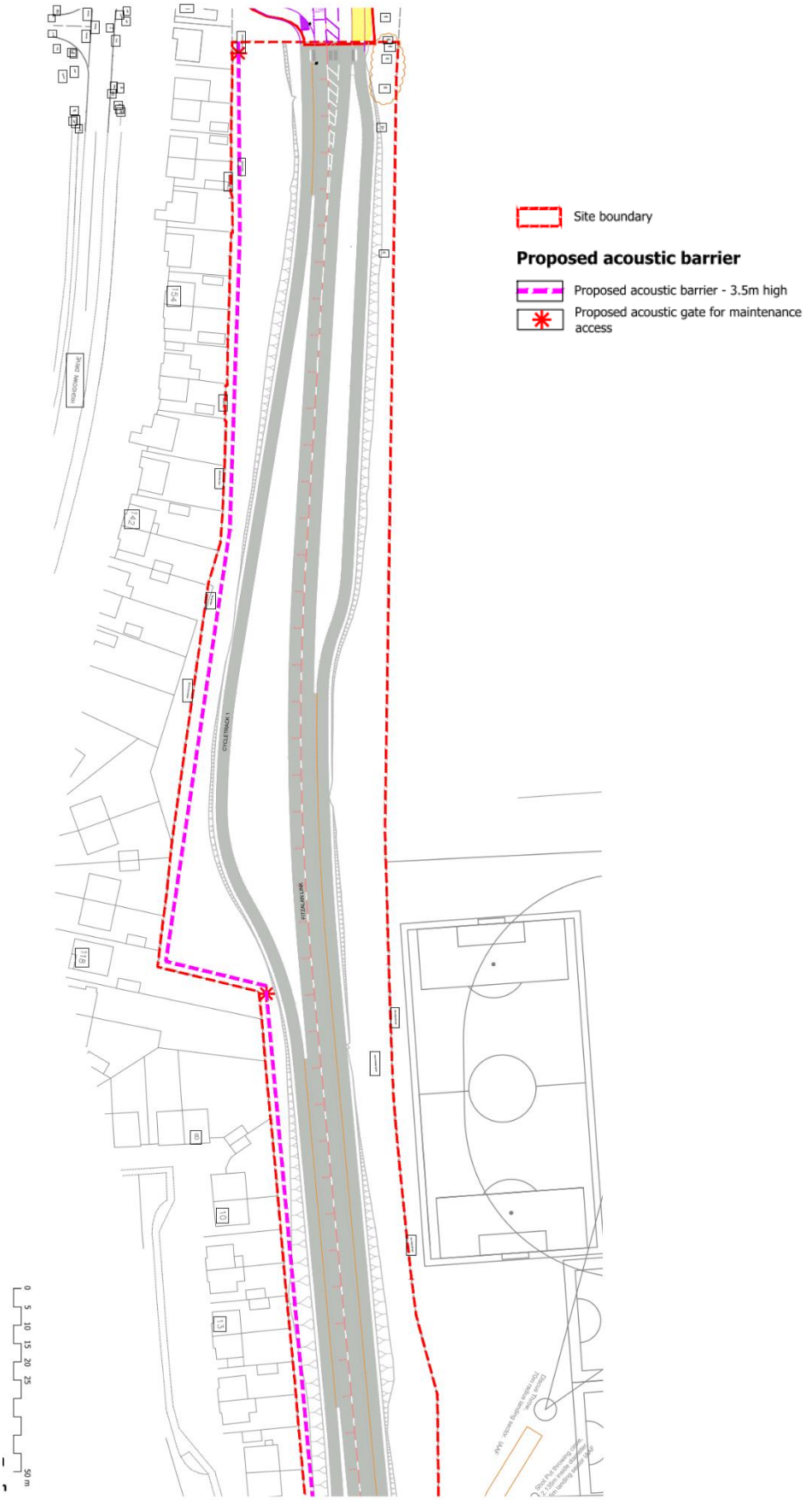
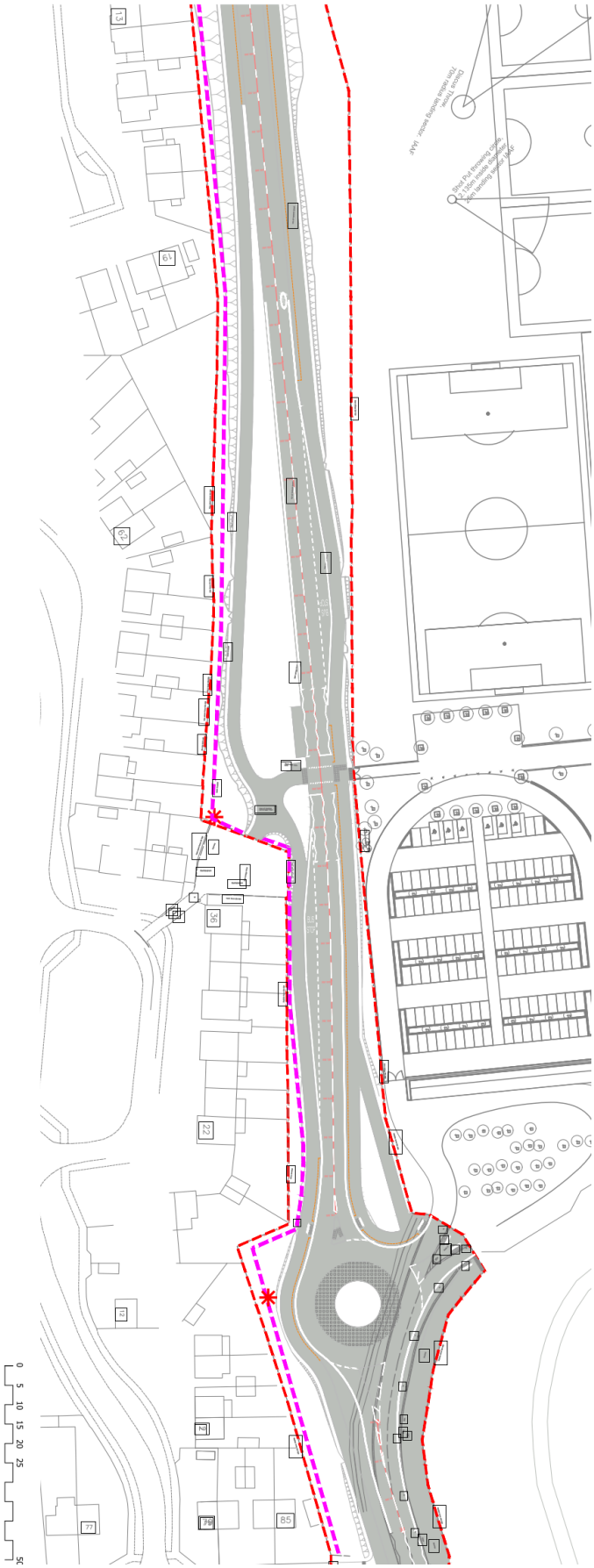


FIGURE 1B – SCHEME OVERVIEW



APPENDIX A – ACOUSTIC TERMINOLOGY

Noise is defined as unwanted sound. The range of audible sound is from 0 to 140 dB. The frequency response of the ear is usually taken to be around 18 Hz (number of oscillations per second) to 18000 Hz. The ear does not respond equally to different frequencies at the same level. It is more sensitive in the mid-frequency range than the lower and higher frequencies and because of this, the low and high frequency components of a sound are reduced in importance by applying a weighting (filtering) circuit to the noise measuring instrument. The weighting which is most widely used and which correlates best with subjective response to noise is the dBA weighting. This is an internationally accepted standard for noise measurements.

For variable sources, such as traffic, a difference of 3 dBA is just distinguishable. In addition, a doubling of traffic flow will increase the overall noise by 3 dBA. The 'loudness' of a noise is a purely subjective parameter, but it is generally accepted that an increase/ decrease of 10 dBA corresponds to a doubling/ halving in perceived loudness.

External noise levels are rarely steady, but rise and fall according to activities within an area. In attempt to produce a figure that relates this variable noise level to subjective response, a number of noise indices have been developed. These include:

i) The L_{Amax} noise level - This is the maximum noise level recorded over the measurement period.

ii) The L_{Aeq} noise level - This is "equivalent continuous A-weighted sound pressure level, in decibels" and is defined in British Standard BS 7445 as the "value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time internal, T, has the same mean square sound pressure as a sound under consideration whose level varies with time".

It is a unit commonly used to describe construction noise and noise from industrial premises and is the most suitable unit for the description of other forms of environmental noise. In more straightforward terms, it is a measure of energy within the varying noise.

iii) The L_{A10} noise level - This is the noise level that is exceeded for 10% of the measurement period and gives an indication of the noisier levels. It is a unit that has been used over many years for the measurement and assessment of road traffic noise.

iv) The L_{A90} noise level - This is the noise level that is exceeded for 90% of the measurement period and gives an indication of the noise level during the quieter periods. It is often referred to as the background noise level and is used in the assessment of disturbance from industrial noise.

APPENDIX B – QUALIFICATIONS AND EXPERIENCE: STEVE GOSLING

Steve Gosling is a Director and Principal Consultant of 24 Acoustics Limited, Southampton, a firm of consulting engineers specialising in acoustics and environmental noise.

Mr Gosling holds a BEng degree in Engineering Acoustics and Vibration from the Institute of Sound and Vibration Research (ISVR) at Southampton University. He is a corporate member of the Institute of Acoustics and also the Audio Engineering Society. He is a former Vice Chairman of the Association of Noise Consultants and former Chairman of the Association of Noise Consultants' Membership Steering Group. He was also a former Secretary of the Southern Branch of the Institute of Acoustics.

He has specialised as an independent consulting engineer in environmental noise for approximately twenty five years.

Mr Gosling has given evidence at Planning Appeals and various Courts, including the High Court. He has also presented evidence at various local government committees both for developers and those affected by developments.

APPENDIX C – EXTRACT FROM 2016 WYG REPORT SHOWING MODELLED BARRIER LOCATION (HIGHLIGHTED IN RED)