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Dear Sir

NOISE IMPACT ASSESSMENT FOR PROPOSED RESIDENTIAL LED MIXED USE SCHEME, LAND TO THE SOUTH EAST OF BEVERLEY

1.00 INTRODUCTION

1.01 Environmental Noise Solutions Ltd (ENS) has been commissioned by Linden Limited and Strata Homes Limited to undertake a noise impact assessment for the proposed residential led mixed-use development of land to the south east of Beverley (hereafter referred to as the application site).

1.02 The proposal consists of a hybrid planning application seeking permission for a residential led mixed-use scheme for up to 900 houses, including a Park and Ride facility, open space and other associated infrastructure.

1.03 The objectives of the noise impact assessment were to:

- Determine the ambient noise climate at the application site during representative periods of the daytime and at night.
- Assess the potential impact of the ambient noise climate on the proposed residential element of the development (with reference to the National Planning Policy Framework and other pertinent guidelines).
- Consider the potential impact of the proposed Park and Ride facility on existing and introduced noise sensitive receptors.
- Provide recommendations for a scheme of sound attenuation works, as necessary, such that the future occupants of the proposed residential element of the development do not experience any unacceptable loss of amenity due to external noise.

1.04 This report details the methodology and results of the assessment and provides recommendations for the residential building envelope (fenestration and ventilation). It has been prepared to accompany a planning application to be submitted to the local planning authority (LPA).

1.05 This report has been prepared for Linden Limited and Strata Homes Limited for 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 the parties above and ENS as to the extent to which the findings may be appropriate for their use.

1.06 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 DEVELOPMENT

2.01 The application site is located to the south east of Beverley in a predominantly agricultural/residential environment. An annotated aerial image of the site, including an overlay of the development layout (outline and detailed), is contained in Appendix 2. Roughly triangular in shape, the application site is bound by:

- A railway line to the west.
- Existing residential development and Beverley Leisure Complex to the north.
- The A164 Beverley South Bypass (Minster Way) to the south east.

2.02 During the course of the noise survey, the main noise sources were noted to be road traffic and rail movements.

2.03 The railway line is understood to be the Bridlington to Hull line and has a single track in each direction. Timetable information indicates that the line is used for passenger services, with circa four to five hourly movements during the daytime. There are ten timetabled passenger trains during the night time period, with the last passing the site at circa 23:20 hours and the first the next morning at circa 06:00 hours. During the survey, passenger trains were predominantly noted to be two to four car commuters. Timetable information does not indicate any freight use of the line.

2.04 The A164 runs along the south eastern boundary of the application site and is elevated above the ground level of the application site. Based on a manual traffic count, the A164 was noted to carry of the order of 500 vehicles per hour during the daytime period (circa 14% HGVs). A circa 2 metre high timber barrier runs adjacent to the road along the length of the proposed residential element of the proposed development.

2.05 The Beverley Leisure Complex is situated to the north of the application site and consists of indoor facilities and external pitches. The indoor facilities are circa 130 metres to the development footprint and the closest external pitch circa 60 metres (with the main body of the pitches a significantly greater distance). No significant noise emissions were noted from this complex during the course of the survey.

2.06 The proposed development consists of up to 900 houses, including a Park and Ride facility, open space and other associated infrastructure. The detailed (Phase 1) element of the application consists of 325 dwellings. An indicative masterplan and detailed layout for Phase 1 are contained in Appendix 2. With reference to the layout, the residential development footprint is circa 20 metres from the railway line to the east and circa 45 metres from the Park and Ride facility which is located in the southern corner of the application site. The detailed layout is the closest element of the development to the A164 and Park and Ride access road.

3.00 BASELINE NOISE SURVEY

3.01 In order to determine the ambient noise climate at the application site, a baseline noise survey was undertaken on Monday 16th and Tuesday 17th May 2016.

3.02 For the purpose of the assessment the following monitoring positions (MPs) were adopted (the approximate location of the MPs is shown in Appendix 2):

- MP1 was located towards the southern end of the western boundary of the site, at circa 20 metres to the nearside railhead, in a free field environment at 1.5 metres above ground level (mAGL).
- MP2 was located towards the northern end of the western boundary of the site, at circa 20 metres to the nearside railhead, in a free field environment at 1.5 mAGL.
- MP3 was located towards the northern boundary of the site, in a free field environment at 1.5 mAGL.

- MP4 was located towards the south eastern site boundary, representative of the nearest proposed residential development to the A164, at circa 30 metres from the nearside kerb of the A164 (barrier adjacent to road), in a free field environment at 1.5 mAGL.
- MP4A was at the same location as MP4, with measurements undertaken at 4.0 mAGL.
- MP5 was located towards the southern end of the south eastern site boundary, adjacent to the proposed Park and Ride facility (no boundary barrier in this location), at circa 30 metres to the nearside kerb of the A164, in a free field environment at 5.0 mAGL.

3.03 Noise measurements were undertaken using Bruel & Kjaer 2260 Type 1 integrating sound level meters. Measurements consisted of A–weighted broadband parameters, together with linear third octave band L_{eq} levels with a logging interval of 5 seconds.

3.04 The measurement systems calibration was verified immediately before the commencement of the measurement sessions and again at the end, using a Bruel & Kjaer Type 4231 calibrator. No drift in calibration level was noted. Weather conditions throughout the survey were appropriate for monitoring. A windshield was fitted for all measurements.

3.05 The following table contains a summary of the measurement data for each measurement session, at each measurement position, rounded to the nearest decibel.

Table 3.1 – Summary of noise measurement data

Position	Date	Time	$L_{Aeq,T}$ (dB)	L_{AFmax} (dB)	L_{AF10} (dB)	L_{AF90} (dB)	Comment
MP1	17/5/16	13:13-17:13	56	84	50	40	Noise climate consisting of distant traffic, birdsong and train passes. Typical L_{AFmax} of southbound train 82-84 dB, typical L_{AFmax} of northbound train 75-78 dB.
MP1	16/5/16	20:00-23:00	52	83	44	31	Noise climate consisting of distant traffic, birdsong and train passes. Typical L_{AFmax} of southbound train 82-84 dB, typical L_{AFmax} of northbound train 75-78 dB.
MP1	16/5/16	23:07-02:07	50	84	36	22	Noise climate consisting of distant traffic and train passes. Typical L_{AFmax} of southbound train 82-84 dB, typical L_{AFmax} of northbound train 75-78 dB.
MP2	17/5/16	17:41-18:08	57	84	51	40	Noise climate consisting of distant traffic, birdsong and train passes. Typical L_{AFmax} of southbound train 82-84 dB, typical L_{AFmax} of northbound train 75-78 dB.
MP2	16/5/16	20:27-21:47	57	84	48	34	Noise climate consisting of distant traffic, birdsong and train passes. Typical L_{AFmax} of southbound train 82-84 dB, typical L_{AFmax} of northbound train 75-78 dB.
MP3	17/5/16	14:58-15:28	46	60	49	40	Distant road traffic and trains. Birdsong.
MP4	17/5/16	14:08-14:40	50	70	53	44	Road traffic noise and birdsong. Circa 500 vehicles per hour.

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Position	Date	Time	$L_{Aeq,T}$ (dB)	L_{AFmax} (dB)	L_{AF10} (dB)	L_{AF90} (dB)	Comment
MP4	17/5/16	15:44-15:57	51	66	53	46	Road traffic noise and birdsong. Circa 500 vehicles per hour.
MP4	17/5/16	16:46-17:00	53	74	54	46	Road traffic noise and birdsong.
MP4A	17/5/16	17:01-17:16	54	72	56	49	Measurement at 4 mAGL. Road traffic noise and birdsong.
MP4	17/5/16	01:54-02:16	35	66	37	28	Distant and occasional local road traffic.
MP5	17/5/16	12:39-13:00	52	69	55	41	Road traffic noise and birdsong. Circa 500 vehicles per hour.
MP5	17/5/16	13:00-16:10	54	76	57	42	Road traffic noise and birdsong. Circa 500 vehicles per hour. Typical L_{AFmax} of vehicle pass <70 dB.
MP5	16/5/16	23:45-00:15	42	64	43	28	Distant and occasional local road traffic (circa 50 vehicles per hour on A164).
MP5	17/5/16	00:15-00:37	39	64	36	26	Distant and occasional local road traffic.

3.06 In summary, the ambient noise climate was relatively low across the site and consisted of distant and local traffic, together with train passes influencing the noise climate in the vicinity of the western site boundary. Based on the relative topography of the site and the A164, together with screening provided by the existing road barrier, no significant variation in noise level was noted on the road frontage with height.

4.00 NOISE IMPACT ASSESSMENT CRITERIA

4.01 The National Planning Policy Framework (NPPF), came into force on 27 March 2012 and is a material consideration in planning decisions. At the heart of the NPPF is a presumption in favour of sustainable development, and the policies in Paragraphs 18 to 219 of the NPPF, taken as a whole, constitute the Government's view on what sustainable development in England means in practice for the planning system.

4.02 The NPPF states that there are three dimensions to sustainable development, which include an economic role (contributing to building a strong, responsive and competitive economy), a social role (providing the supply of housing required to meet the needs of present and future generations) and an environmental role (which includes minimising waste and pollution).

4.03 The NPPF supersedes Planning Policy Guidance Note 24 (PPG 24). The main policy statement in relation to noise is Paragraph 123 of the NPPF, which states

Planning policies and decisions should aim to:

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

- *Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and*

- *Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.*

4.04 In relation to 'adverse impacts', the NPPF refers to the Explanatory Note to the Noise Policy Statement for England (NPSE) for guidance.

4.05 The Noise Policy Statement for England (NPSE) and associated Explanatory Note were published by DEFRA in 2010 and set out the Government's noise management strategy to enable noise management decisions to be made within the wider context (i.e. guiding principles of sustainable development), in a cost-effective manner and in a timely fashion.

4.06 Fundamental to this approach is '*there is a need to integrate consideration of the economic and social benefit of the activity or policy under examination with proper consideration of the adverse environmental effects, including the impact of noise on health and quality of life. This should avoid noise being treated in isolation in any particular situation, i.e. not focussing solely on the noise impact without taking into account other related factors'*.

4.07 The noise policy aims of NPSE are to (i) avoid significant adverse impact on health and quality of life, (ii) mitigate and minimise adverse impacts on health and quality of life, and (iii) where possible, contribute to the improvement of health and quality of life. The policy aims are always to be considered within the context of the Government's policy on sustainable development.

4.08 In relation to the mitigation and minimisation of adverse impacts, NPSE considers that '*in reality, although not always stated, the aim has tended to be to minimise noise 'as far as is reasonably practical'*. This is reinforced in Paragraph 2.24 of the Explanatory Note, which requires that '*all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur'*.

4.09 In relation to explaining the 'significant adverse' and 'adverse' effects quoted in the NPPF, NPSE uses the two established concepts from toxicology that are currently being applied to noise impacts, for example by the World Health Organisation (WHO), these are:

- 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 noise.

- LOAEL – Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected.

4.10 The NPSE then extends these concepts to lead to a SOAEL – Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur.

4.11 No specific criteria are presented in the NPSE, to provide the necessary policy flexibility until further evidence and suitable guidance is available. In lieu of specific criteria, for this assessment, ENS makes reference to existing guideline documents, which are summarised in the following paragraph(s).

4.12 BS 8233:2014 '*Guidance on sound insulation and noise reduction for buildings'* (BS 8233) sets guideline indoor ambient noise levels for dwellings, for steady external noise sources, which it is desirable are not exceeded. These levels are reproduced in Table 4.1 and are based on guidelines issued by the World Health Organisation (WHO). The Standard also states that where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and

reasonable internal conditions still achieved. The Standard considers that for regular individual noise events, a guideline value may be set in terms of SEL or L_{AFmax} depending on the character and number of events per night. The WHO Guidelines on Community Noise (1999) considers that if negative effects on sleep are to be avoided, noise events exceeding 45 dB L_{Amax} should be limited.

Table 4.1 – Indoor Ambient Noise Levels in Dwellings (as recommended in BS 8233:2014)

Activity	**Location**	**07:00 – 23:00**	**23:00 – 07:00**
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

4.13 For traditional external areas that are used for amenity space, such as gardens and patios, BS 8233 considers that 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. BS 8233 also states '*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'.*

4.14 With reference to the BS 8233 guidelines, by definition, 'reasonable internal conditions' cannot represent a significant adverse impact (the prevention of which is the 1st aim of NPSE). With cognisance to the 2nd aim of NPSE (to minimise noise impact), the internal ambient noise levels detailed in Table 4.1 are considered appropriate.

4.15 Likewise, for external amenity space, a design range of 50 to 55 dB $L_{Aeq,T}$ is considered appropriate to comply with the requirements of the NPPF. Furthermore, the BS 8233 guidance that in certain circumstance '*development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited',* is considered to be in keeping with the NPSE Explanatory Note, which requires that '*all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur*'.

4.16 On the basis of the above, for the residential development of the application site, the following criteria are considered to be in keeping with the aims of the NPPF:

- 35 dB $L_{Aeq(0700-2300)}$ in living rooms and bedrooms during the daytime.
- 30 dB $L_{Aeq(2300-0700)}$ in bedrooms at night.
- 45 dB L_{AFmax} not normally exceeded in bedrooms at night.
- Guideline range of 50 - 55 dB $L_{Aeq(0700-2300)}$ in gardens during the daytime and where this is not achievable, design to achieve the lowest practicable levels.

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5.00 SOUND ATTENUATION SCHEME PROPOSALS

5.01 The following sound attenuation scheme proposals are based on the noise criteria specified above and with reference to the indicative masterplan/proposed layout (detailed element of the application). Should layout changes be considered, ENS should be consulted with regards to the effect on the sound attenuation scheme proposals.

5.02 In order to calculate the sound insulation requirements of the building envelope for habitable rooms throughout the development, the Building Research Establishment (BRE) building envelope insulation calculation spreadsheet was used. This spreadsheet is based on the calculation methodology advocated in BS 8233. The spreadsheet allows input of external noise levels, room dimensions and reverberation time together with parameters for the various elements of the building envelope and calculates the internal noise level in terms of the external noise level metric (L_{Aeq} and L_{AFmax} in this case). For the calculations, a standard masonry construction has been assumed.

OUTLINE ELEMENT OF THE APPLICATION

5.03 The outline residential element of the application is set back from the A164, but runs adjacent to the railway line beyond the western site boundary.

5.04 Based on the noise measurements undertaken at 30 metres to the nearside kerb of the A164 (MP4, MP4A and MP5), there are no specific attenuation measures required to control road traffic noise for the outline residential element of the application.

5.05 Based on the noise measurements undertaken adjacent to the railway line (MP1 and MP2), there are no specific attenuation measures required to control rail traffic noise in living/dining rooms or external amenity areas.

5.06 Discrete event maxima (L_{AFmax}) levels associated with train passes were measured at up to 78 dB (northbound) and 84 dB (southbound). Based on train timetable information, there are ten scheduled passenger trains during the night time period, with the last passing the site at circa 23:20 hours and the first the next morning at circa 06:00 hours. In order to control discrete event maxima internally to bedrooms, it is recommended that bedrooms fronting onto the railway line are fitted with acoustic laminate double glazing rated at ≥ 34 dB $R_w + C_{tr}$ (e.g. Pilkington 10-12-6.4 PVB), together with acoustic wall ventilators and double boarded ceilings.

DETAILED ELEMENT OF THE APPLICATION

5.07 The detailed residential element of the application is set back from the railway line, but adjacent to the A164 (with dwellings predominantly set back circa 30 metres, but closer adjacent to the proposed access roundabout).

5.08 Based on the noise measurements undertaken at 30 metres to the nearside kerb of the A164 (MP4, MP4A and MP5), there are no specific attenuation measures required to control road traffic noise for dwellings set back circa 30 metres to the A164.

5.09 For dwellings in closer proximity to the A164, habitable rooms on the road frontage elevation should be fitted with enhanced glazing rated at $\geq$ 28 dB R_w+C_{tr}, such as a generic 6 mm float glass (16 mm air) 4 mm float glass double glazing system. Where the enhanced glazing specification is required, trickle vents should have a vent open $D_{n,e,w} + C_{tr}$ of ≥ 33 dB per 5000 mm^2 EA (e.g. Greenwood 5000EAW.AC1, or equivalent). See Appendix 2 for locations.

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PARK AND RIDE FACILITY

5.10 The proposed Park and Ride facility is located in the southern area of the site and is circa 45 metres from the closest proposed residential curtilage and a greater separation distance from existing residential receptors (farm house located to the west of the railway line and circa 120 metres from the Park and Ride boundary).

5.11 Based on previous measurements undertaken by ENS, the noise level associated with a busy supermarket car park (taken as representative of the Park and Ride facility) has been measured as being ≤ 48 dB $L_{Aeq,\,T}$ at a distance of 10 metres. On this basis, the noise impact associated with the Park and Ride facility is considered to be negligible.

5.12 Access to the Park and Ride facility is to be via a spur road off the access roundabout to the application site. The spur road is, in part, elevated and runs adjacent to the road frontage dwellings of the detailed element of the application.

5.13 A Transport Assessment (TA) for the application site has been undertaken by Local Transport Projects. Based on the TA, the predicted trip rate on the Park and Ride access road is 375 arrivals in the AM peak (08:00 to 09:00 hours) and 375 departures in the PM peak (17:00 to 18:00 hours). The majority of dwellings adjacent to the access road are set back at least 15 metres from the nearside kerb (with the exception of Plot L80). Based on the Calculation of Road Traffic Noise (CRTN), the predicted AM and PM peak noise level is 64 dB $L_{Aeq,T}$ at 15 metres to the nearside kerb, increasing to 67 dB $L_{Aeq,T}$ at Plot L80.

5.14 On this basis, for dwellings adjacent to the access road, habitable rooms on the road frontage elevation should be fitted with enhanced glazing rated at $\geq$ 28 dB R_w+C_{tr}, such as a generic 6 mm float glass (16 mm air) 4 mm float glass double glazing system. Where the enhanced glazing specification is required, trickle vents should have a vent open $D_{n,e,w}$ + C_{tr} of ≥ 33 dB per 5000 mm^2 EA (e.g. Greenwood 5000EAW.AC1, or equivalent). For Plot L80, the requirement is a generic 10 mm float glass (16 mm air) 6 mm float glass double glazing system. See Appendix 2 for location.

6.00 CONCLUSIONS

6.01 A noise impact assessment has been undertaken for the proposed residential led mixed-use development of land to the south east of Beverley.

6.02 The ambient noise climate across the application site is associated with road and rail traffic.

6.03 Recommendations for a scheme of sound insulation works have been developed to protect the proposed residential element of the development from the ambient noise climate in accordance with the requirements of the National Planning Policy Framework. On this basis, the ambient noise climate is not considered to represent a constraint to the proposed residential element of the application site. Furthermore, proposals for a Park and Ride facility are not considered to represent an adverse impact for proposed or existing noise sensitive receptors.

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 Pennell
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.

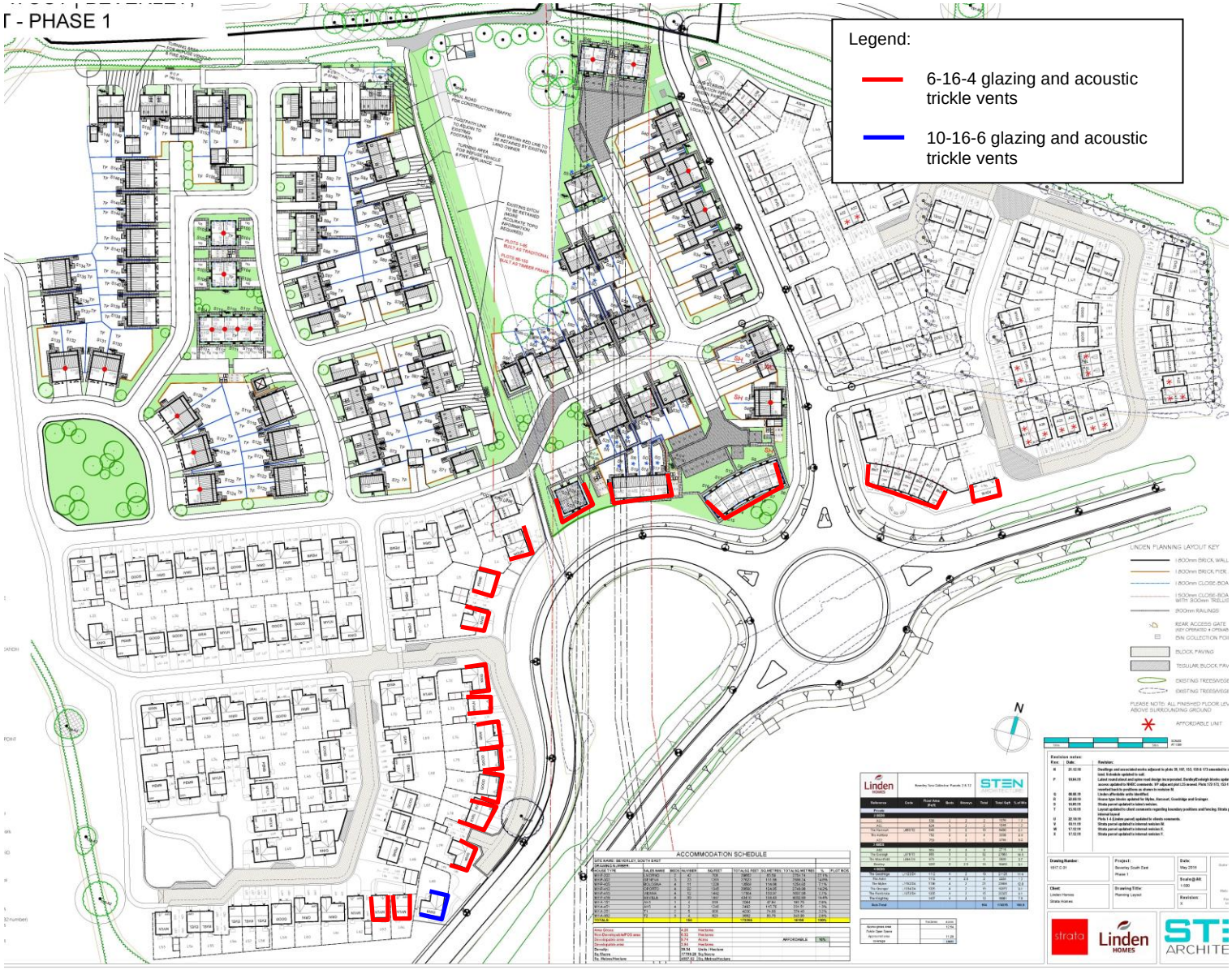
Weighted Sound Reduction Index (R_W)

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).

Weighted Airborne Sound Insulation ($D_{nT,w}$)

Single number quantity which characterises the airborne sound insulation between rooms.

Appendix 2
Annotated aerial image indicating the application site and approximate noise monitoring positions

Appendix 2
Indicative Masterplan

Appendix 2
Annotated proposed layout (Phase 1)