

Land at Barnham, Eastergate and Westergate (BEW Parcel SC1) Environmental Statement

Chapter H: Noise and Vibration

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H1.0 Introduction

- H1.1 This Chapter forms part of an Environmental Statement ('ES') which sets out the findings of an Environmental Impact Assessment ('EIA') of the proposed residential led mixed use development of land near the villages of Barnham, Eastergate and Westergate ('BEW') in West Sussex. The proposals also include the realignment of the A29 strategic route south of Barnham Road.
- H1.2 The Proposed Development forms a first phase of a wider strategic allocation of land which is known for the purposes of this ES as 'BEW Parcel SC1'. A description of the background to the proposal, including its role as part of the strategic allocation; the relationship of this chapter to the wider ES; and a description of the site and the Development is provided at Chapters A to C of this ES.
- H1.3 Chapter N considers cumulative effects including a review of the potential for effects associated with the Development of the wider strategic allocation at BEW.
- H1.4 This chapter should be read in conjunction with Chapters A, B, C and N.
- H1.5 This Chapter reports the assessment of the potential for likely significant environmental effects arising from the Proposed Development in relation to noise and vibration during the construction and operation phases.
- H1.6 Significant effects (adverse or beneficial) from the Proposed Development have been assessed using relevant legislation, guidelines, and technical standards, as well as consultations with the local authority, to determine whether the effects from the Proposed Development will be significant.
- H1.7 Significant effects from the Proposed Development can either be temporary, due to the construction activities or permanent, due to the operation of the Proposed Development.
- H1.8 The assessment of temporary effects from the Proposed Development considers:
- noise and vibration from construction activities on the application site; and
 - noise from off-site construction traffic on neighbouring roads.
- H1.9 The assessment of operational noise and vibration from the Proposed Development considers:
- effects from building services plant noise from proposed commercial units to existing and proposed sensitive receptors.
 - effects from changes of traffic noise caused by the proposed A29 realignment to the existing road network
 - effects from noise from proposed A29 realignment on existing and future sensitive receptors.
 - effects from vibration caused by the existing railway line, on residential units within the Proposed Development.
- H1.10 This chapter describes the methodology used to assess the effects from the Proposed Development; the baseline conditions currently existing at the site and surrounding area; the future baseline conditions arising out of changes due to traffic increases; the mitigation measures required to prevent, reduce, or offset any significant adverse effects; and the likely residual effects after these measures have been adopted.
- H1.11 The chapter should be read in conjunction with the following technical appendices provided at Volume 2 to this ES:-

- **Appendix H1 - Noise Glossary**
- **Appendix H2 - Graphs of baseline survey results**
- **Appendix H3 - Construction noise plant lists**
- **Appendix H4 - Traffic noise assessment**
- **Appendix H5 - Noise Chapter Figures**

About the Author

- H1.12 This chapter of the ES has been prepared by Roger Dentoni on behalf of AF Acoustics Limited. Roger Dentoni has an undergraduate BSc (Hons) degree in Physics, a MSc degree in Environmental and Architectural Acoustics, and he became a member of the Institute of Acoustics shortly after graduating.
- H1.13 Roger Dentoni has over 15 years of experience in the field of acoustics and has worked on a wide range of projects in the UK and overseas. He has worked on acoustic design and delivery projects within the private and public sectors, which included coastal defence schemes, residential/mixed-use Developments, and major road and railway infrastructure projects. As well as a strong technical background in acoustics Roger has gained significant experience in leading teams during the design and implementation phases of projects.
- H1.14 Roger has also carried out noise and vibration monitoring on various sites from rural to urban areas and is very competent with organising surveys for multi-site monitoring stations. Roger has extensive experience in the preparation of the Noise and Vibration sections of EIA associated with road, rail, residential and commercial Developments. Roger has significant experience in developing computer-generated models to predicted noise levels across large residential areas.

H2.0 Policy Context

Legislation

- H2.1 The Control of Pollution Act 1974 (Ref 1), was introduced to cover a wide range of environmental pollution including noise. Parts of the Act have been superseded by the Environmental Protection Act (EPA) 1990 (Ref 2). The EPA 1990 amongst other things empowers local authorities to issue a Noise Abatement Notice where a noise nuisance can be proven.

National Policy

National Planning Policy Framework (NPPF)

- H2.2 The National Planning Policy Framework (NPPF) (Ref 3), first published in March 2012, and recently updated in July 2021, sets out the Government's planning policies for England and how these are expected to be applied. In respect to noise, the NPPF requires that planning policies and decisions should:

- prevent new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of noise pollution;
- avoid noise giving rise to significant adverse impacts on health and quality of life as a result of new development;
- mitigate and reduce to minimum potential adverse impacts arising from noise from new development, including through the use of conditions;
- identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and,
- recognise that existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.

- H2.3 For what constitutes a significant adverse impact, the NPPF refers to the Noise Policy Statement for England.

Noise Policy Statement for England 2010

- H2.4 The Noise Policy Statement for England 2010 (NPSE) (Ref 4) expands on the term 'significant adverse impact' from the NPPF. The document also defines the meanings of relevant terms as follows:

- **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 health effects on health and quality of life occur.

- H2.5 The NPSE notes that 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 for a project to identify relevant SOAELs taking account of the different sources of exposure and different receptors.
- H2.6 Any receptor forecast to experience an overall exposure from the Proposed Development that exceeds the relevant SOAELs is identified as being subject to significant adverse impact on health and quality of life (under Government noise policy) and that impact identified as a likely significant adverse effect.
- H2.7 Where the noise level from the Proposed Development is between LOAEL and SOAEL, the NPSE states: *“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.”*
- H2.8 Other factors, such as the number of dwellings affected and the magnitude of noise change, can result in impacts between LOAEL and SOAEL being reported as likely significant effects in EIA terms. The EIA process requires that likely significant effects are identified along with the envisaged mitigation to avoid or reduce these significant effects.

Planning Practice Guidance

- H2.9 National Planning Practice Guidance (PPG) (Ref 5), first published in March 2014 and updated in July 2019, provides advice on how planning can manage potential noise impacts in new development, the principles to be followed in considering the noise effects of developments, and sets out a noise exposure hierarchy table, based on the likely average response of those affected.

Guidelines for Environmental Noise Impact Assessment

- H2.10 The ‘Guidelines for Environmental Noise Impact Assessment’ published by the Institute of Environmental Management and Assessment in 2014 (Ref 6), set out good practice in respect of scoping and undertaking noise assessments. The guidelines are applicable to noise impact assessment for any scale of development proposal, including core principles to achieve effective integration with the EIA, and provide advice on the issues that need to be considered in a noise impact assessment and whether the appropriate conclusions are being reached. The factors include:
- The appropriateness of the noise parameters used for the situation;
 - The reference time period used in making the assessment;
 - The level, character and frequency content of the noise sources under investigation; and,
 - How the predicted noise levels relate to relevant Standards and guidelines.
 - The guidelines also recommend that the assessor should determine the degree of impact based on evidence derived from the assessment.
- H2.11 The ‘Guidelines for Environmental Noise Impact Assessment’ provide advice on the selection of sensitive receptors which may include land uses other than dwellings, and animals other than human beings, and advice on how sensitivity may be assigned to individual receptors, that is relevant to all forms of environmental noise assessment.

Local Policy

Arun Local Plan 2011-2031

H2.12 The Arun Local Plan 2011-2031 (Ref 7), was adopted by resolution of Full Council on 18th of July 2018. The following policies set out in the Arun Local Plan 2011-2031 are potentially relevant in respect of noise and vibration and are in preparing the noise and vibration chapter of the ES:

- Policy QE DM1 - Noise pollution
- Policy LAN DM1 – Protection of landscape character
- Policy D DM1 - Aspects of form and design quality
- Policy ECC DM1 - Renewable energy
- Policy QE SP1 - Quality of the environment

Barnham Eastergate and Westergate (BEW) Framework Masterplan (updated on 10 November 2020)

H2.13 This masterplan demonstrates how the requirements for the Barnham Eastergate and Westergate site can be delivered.

Other Relevant Standards and Guidelines

H2.14 The following standards and guidelines are relevant to this assessment.

- British Standard BS5228:2009+A1:2014. Code of Practice for Noise and Vibration Control on Construction and Open Sites. Part 1 Noise and Part 2 Vibration. Noise Control on Construction and Demolition Sites (Ref 8)
- Design Manual for Roads and Bridges Sustainability & Environment Appraisal LA 111 Noise and vibration (formerly HD 213/11, IAN 185/15) Revision 2 (Ref 9)
- Noise and Vibration, Highways Agency and Welsh Office, 2011.
- Calculation of Road Traffic Noise (CRTN), Department of Transport, Welsh Office, 1988 (Ref 10)
- Professional Practice Guidance on Planning & Noise (ProPG), 2017 (Ref 11), which provides noise practitioners with guidance on a recommended approach to the management of noise within the planning system. The guidance document encourages better acoustic design for new residential development and aims to protect people from the harmful effects of noise. ProPG recommends a 2-stage approach, an initial noise risk assessment of the proposed development site and where the results indicate that noise requires further consideration a full assessment in the form of an Acoustic Design Statement (ADS). The main emphasis of the ProPG is the encouragement of good acoustic design, such as site layout, building massing, orientation and internal layout, at an early stage of the development process.
- British Standard 8233:2014 (Ref 12) 'Guidance on sound insulation and noise reduction for buildings' provides recommendations for the control of noise in and around new or refurbished buildings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new or refurbished buildings undergoing a change of use rather than to assess the effect of changes in the external noise climate.

- British Standard 4142:2014+A1:2019 (Ref 13) '*Methods for rating and assessing industrial and commercial sound*' provides a methodology for determining whether commercial noise of an industrial nature is likely to cause an adverse impact at dwellings.
- British Standard 6472: 2008 (Ref 14): Guide to evaluation of human exposure to vibration in buildings, Part 1, Vibration sources other than blasting.

H3.0 **Assessment Methodology & Significance Criteria**

H3.1 The methodologies below are based on the legislation policies and standards mentioned in section H2.0. The methodology for the baseline survey is contained in section H4.0 Baseline conditions.

H3.2 Each noise topic has a specific methodology for assessing significant effects, but in general, a noise change criteria is set out, as well as absolute criteria, and considerations are made in relation to the duration of impacts and the sensitivity of the receptors.

H3.3 As determining significance relies on associating impact magnitudes to the sensitivity of the receptor, the next section has established the study area and a list of noise and vibration sensitive receptors.

Study Area and Noise Sensitive Receptors

H3.4 The Proposed Development consists of residential dwellings (Use Class C3), care home/senior living accommodation (Use Classes C2/C3), flexible retail and community floorspace (Use Classes E/F2/sui generis), a primary school, plus associated open space, landscaping, and all other associated ancillary works; and realignment of the A29 and early connection to existing A29, including construction of a new road carriageway, junctions and associated infrastructure.

H3.5 The site is located to the east of the A29 and is bound to the north by residential properties in Eastergate and Barnham. To the south, the site is bound by agricultural land and the site is divided across the centre, west to east, by the West Coastway railway line between Portsmouth and Brighton.

H3.6 The boundary of the northeastern portion of the site runs adjacent to St Philip Howard Catholic School and is bounded by agricultural land in the south. Lidsey oil field and the Southern Water Waste Water Treatment Works are located to the south-east of the site.

H3.7 The study area for all assessments, with the exception of the traffic noise assessments, includes all properties where there is potential for adverse noise or vibration effects due to the construction or operation of the Development, these are shown in Figure 1 at Appendix H5 and listed in Table H3.1 These receptors and representative locations have been identified through initial calculations of the distance that potential effects may extend to, and they are grouped for ease of reference. All receptors are considered to be of high sensitivity to noise and vibration.

H3.8 As the extra vehicles from the operation of the Proposed Development can increase traffic along many of the existing major road links, the study area for the traffic noise assessment includes all the links assessed in the Traffic Assessment, which extends several kilometres.

Table H3.1 Study area and representative locations for construction assessments

Receptor Groups	Assessment locations	Shortest Distance to nearest working area (m)
A	St George's Church, Church Lane,	130
B	Residential properties on Church Lane and Critchmere Drive	50
C	Residential properties along Upton Brooks, off Barnham Road	50
D	Residential properties with Elm's Grove S, off Barnham Road	40
E	Saint Philips Primary School, Elm's Grove	60

Receptor Groups	Assessment locations	Shortest Distance to nearest working area (m)
F	Residential properties on Gospond Road	70
G	Residential properties in Westgate on East boundary of Site adjacent to the existing A29	200

H3.9 The next section of this chapter explains how significant effects have been determined for each assessment topic.

Assessment of Effects During Construction

H3.10 Noise and vibration impacts from construction noise are always temporary and can range from being negligible to major adverse.

Significant effects from construction noise

H3.11 British Standard 5228-1:2009 + A1:2014 'Code of practice for noise and vibration control on construction and open sites – Part 1: Noise' provides noise source levels for typical construction equipment, prediction methods to determine construction noise levels at distances from the works and provides example methods of determining the potential significance of impacts.

H3.12 The construction noise assessment has predicted the noise levels associated with fixed/mobile construction plant, material haulage within the site, the movements of deliveries within the Development Site and car movements associated with staff parking in accordance with British Standard 5228-1:2009 + A1:2014.

H3.13 Table H3.2 below sets out the LOAELs and SOAELs for construction effects.

Table H3.2 LOAEL and SOAEL Construction noise effect levels for permanent residential buildings (outdoor at the façade)

Day	Time (hours)	Averaging Period T	Lowest Observed Adverse Effect Level LpAeq,T (dB)	Significant Observed Adverse Effect Level LpAeq,T (dB)
Mondays to Fridays	0700 - 0800	1 hour	60	70
	0800 - 1800	10 hours	65	75
	1800 - 1900	1 hour	60	70
	1900 - 2200	1 hour	55	65
Saturdays	0700 - 0800	1 hour	60	70
	0800 - 1300	5 hours	65	75
	1300 - 1400	1 hour	60	70
	1400 - 2200	1 hour	55	65
Sundays & Public Holidays	0700 - 2200	1 hour	55	65
Any night	2200 - 0700	1 hour	45	55

H3.14 The levels used to represent LOAELs are the 'lower cut offs' identified in Part 1 of the Code of Practice for noise and vibration control on construction and open sites (BS5228) below which there is no satisfactory evidence of observable adverse effects due to noise.

H3.15 The levels used to represent SOAELs are levels identified in Part 1 of BS5228 that, if exceeded for "significant" periods of time (either continuous or sporadic), could result in "widespread community disturbance, or interference with activities or sleep is likely to occur".

- H3.16 A final assessment of significance is established as follows: The comparisons between the predicted construction noise levels from the Proposed Development against the defined SOAEL and LOAELs, determines a set of impact magnitudes. Significance is established by the comparison of predicted impact magnitudes to the sensitivity of the receptor. This is summarised in table H3.3 below.

Table H3.3 Significant effects – construction noise

Construction noise level	Magnitude*	Significance criteria**		
		Receptor Sensitivity		
		High	Medium	Low
Above or equal to SOAEL +5dB	Major	Major adverse (significant)	Moderate to major adverse	Minor
Above or equal to SOAEL and below SOAEL +5dB	Moderate	Moderate adverse (significant)	Minor	Negligible
Above or equal to LOAEL and below SOAEL	Moderate to Minor	Moderate to minor adverse	Minor	Negligible
Below LOAEL	Negligible	Negligible	Negligible	Negligible

*Source: The impact magnitudes have been taken from the relevant construction noise assessment tables within LA11

** Professional Judgment has been used to determine the Significance Criteria

- H3.17 In line with Bs5228- Part 1, construction noise shall constitute a significant effect where it is determined that a major or moderate magnitude of impact will occur for a duration exceeding: 1) 10 or more days or nights in any 15 consecutive days or nights; 2) a total number of days exceeding 40 in any 6 consecutive months.

Significant effects from construction traffic noise

- H3.18 The noise effects of construction deliveries and diversions on the local road network have been determined by a comparison of the Baseline Noise Levels (BNL) for road links calculated in accordance with the Department of Transport 'Calculation of Road Traffic Noise' (1988) and assessed using the significance criteria set out in LA 111 'Noise and vibration' (Revision 2, May 2020) published by Highways England and shown in the table below.
- H3.19 Table H3.4 below shows that a construction traffic noise effect is significant when the impact magnitude is either major or moderate for a receptor with high sensitivity.
- H3.20 Construction traffic noise shall constitute a significant effect where it is determined that a major or moderate magnitude of impact will occur for a duration exceeding: 1) 10 or more days or nights in any 15 consecutive days or nights; 2) a total number of days exceeding 40 in any 6 consecutive months.

Table H3.4 Significant effects – construction traffic noise

Increase in BNL of closest public road used for construction traffic (dB)	Magnitude	Significance criteria		
		Receptor Sensitivity		
		High	Medium	Low
Greater than or equal to 5.0	Major	Major adverse (significant)	Moderate to major adverse	Minor
3.0 to 4.9	Moderate	Moderate adverse (significant)	Minor	Negligible

1.0 to 2.9	Minor	Minor – adverse	Minor	Negligible
Less than 1.0	Negligible	Negligible	Negligible	Negligible

Significant effects from construction vibration

H3.21 Significance for receptors with high sensitivity is set out by 1) establishing the LOAEL and SOAEL; 2) establishing the impact magnitude table, and finally by looking at the duration of impacts.

H3.22 The LOAEL and SOAELs for construction vibration are taken from the advice contained in DMRB(LA111), which reference BS5228 – part 2 and are presented below in Table H3.5.

Table H3.5 Vibration levels - magnitude of impact

Time period	LOAEL	SOAEL
All time periods	0.3mm/s PPV	1.0mm/s PPV

H3.23 The magnitude of impact shall be determined in accordance with Table H3.6 below taken from DMRB LA11 3.

Table H3.6 Vibration level - magnitude of impact

Magnitude	Vibration level
Major	Above or equal to 10 mm/s PPV
Moderate	Above or equal to SOAEL and below 10 mm/s PPV
Minor	Above or equal to LOAEL and below SOAEL
Negligible	Below LOAEL

H3.24 Construction vibration shall constitute a likely significant adverse effect where it is determined that a major or moderate magnitude of impact will occur for a duration exceeding:

- 10 or more days or nights in any 15 consecutive days or nights; or
- a total number of days exceeding 40 in any 6 consecutive months.

Significant Effects from Operational Phase

H3.25 Noise and vibration impacts from the operational phase are permanent and range from being major beneficial to major adverse.

Significant effects from operational traffic

H3.26 Significance of effects from operational traffic has been established by the following steps in DMRB(LA11): Set out LOEAL and SOAEL values using tables from DMRB; determining impact magnitudes using noise change categories within DMRB and making final assessments of significance based on the findings of the first two steps.

H3.27 LOAEL and SOAEL values set out in DMRB (LA111) for operational traffic noise are set out in the Table H3.7 below:

Table H3.7 LOAELs and SOAELs for operational traffic

Operation Traffic Noise	Time Period	Noise level
LOAEL	Day	55dB LA10,18hr façade
	Night	40 dB L _{night} free field
SOAEL	Day	68 dB LA10,18hr façade
	Night	55 dB L _{night} free field

H3.28 People react differently to changes in noise in the short to the long term. In line with section 3.51 of DMRB(La11), noise change as a result of the Proposed Development has been determined at noise sensitive receptors within the study area, during the periods for which LOAEL and SOAEL have been set, for:

- 1 Short-term: DMOY compared against the DSOY (the opening year is the year in which most disturbance is expected as receptors will still be familiar with the noise environment prior to the Proposed Development);
- 2 Long-term: DMOY compared against the DSFY;
- 3 Non-project noise change: do-minimum future year (DMFY) compared against the DMOY.

H3.29 Where DMOY is the Do Minimum Opening Year, DSOY is the Do Something Opening Year, the DSFY is the Do Something Future Year; and DMOY is the Do Minimum Future Year as defined in DMRB(LA11).

H3.30 Noise change has been calculated using methods from CRTN that consider the percentage of heavy vehicles and vehicle speed. The CRTN model assesses noise change by predicting noise at a reference difference, known as the Basic Noise Level (BNL), for each assessed scenario: DMOY, DSOY, DMFY, DSFY. If necessary, corrections for other aspects that can change noise, such as distance, road gradients and barriers can be applied to the BNL via relevant tables within CRTN.

H3.31 An initial assessment of significance is established via the magnitude of impact in Tables H3.8 and H3.9 below, where a moderate adverse and major adverse impact, are considered to cause a significant effect for a receptor of high sensitivity.

Table H3.8 Initial assessment of significant effects – short-term

Short-term noise change	Magnitude	Significance criteria		
		Receptor Sensitivity		
		High	Medium	Low
Greater than or equal to 5.0	Major	Major adverse (significant)	Moderate to major adverse	Minor
3.0 to 4.9	Moderate	Moderate adverse (significant)	Minor	Negligible
1.0 to 2.9	Minor	Minor – adverse	Minor	Negligible
Less than 1.0	Negligible	Negligible	Negligible	Negligible

Table H3.9 Initial assessment of significant effects – long-term

Long-term noise change	Magnitude	Significance criteria		
		Receptor Sensitivity		
		High	Medium	Low
Greater than or equal to 10.0	Major	Major adverse (significant)	Moderate to major adverse	Minor
5.0 to 9.9	Moderate	Moderate adverse (significant)	Minor	Negligible
3.0 to 4.9	Minor	Minor – adverse	Minor	Negligible
Less than 3.0	Negligible	Negligible	Negligible	Negligible

H3.32 For noise sensitive receptors where the magnitude of change in the short-term is minor, moderate or major, Table 3.60 of DMRB(La11) has been used, together with the output of the

initial assessment, to determine final significance. A complete version of Table 3.60 of DMRB(LA11) is found in Appendix H4, and some of its main points which are most relevant to the assessment in terms of determining the operational significance of noise receptors are summarised below:

- A noise change where all do-something absolute noise levels are below SOAEL requires no modification of the initial assessment.
- Where the long-term impact is predicted to be greater than the short-term impact, it can be appropriate to conclude that a minor change in the short-term is a likely significant effect. Where the long-term impact is predicted to be less than the short-term it can be appropriate to conclude that a moderate or major change in the short-term is not significant.
- A similar change in the long-term and non-project noise change can indicate that the change is not due to the project and not an indication of a likely significant effect.

Significant effects from traffic and rail noise on future residents (site suitability)

H3.33

Impacts from future traffic and rail noise on the Proposed Development have been assessed by comparing predicted noise levels to the Arun Noise Exposure Categories, set out in the Arun Local Plan* (2011- 2031), Policy QE DM1 - Noise pollution, and shown in the table H3.10 below, and making judgments on whether internal noise levels for bedrooms and living spaces, will meet appropriate noise standards.

Table H3.10 Arun Plan Noise Exposure Categories for Road Noise

NEC		Advice
Traffic	Rail**	
A	A	Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as a desirable level.
Day (<55)	Day (<55)	
Night (<45)	Night (<45)	
B	B	Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection against noise.
Day (55-63)	Day (55-66)	
Night (45-57)	Night (45-59)	
C	C	Planning permission should not normally be granted. Where it is considered that permission should be given, for example, because there are no alternative quieter sites available*, conditions should be imposed to ensure a commensurate level to protect against noise
Day (63 – 72)	Day (66 – 74)	
Night (57-66)	Night (59-66)	
D	D	Planning permission should normally be refused
Day (>72)	Day (>72)	
Night (>66)	Night (>66)	

*Note: The Development Site is allocated within the Arun Local Plan

**Note: Night-time noise levels (23.00-07.00): sites where individual noise events regularly exceed 82dB LAmax (5 time weighting) several times in any hour should be treated as being in NEC C, regardless of the LAeq, 8h (except where the LAeq, 8h already puts the site in NEC D).

H3.34

Effects are deemed to be not significant if the design of residential dwellings are likely to meet the relevant internal noise standards for bedrooms and living spaces, set out in BS8223:2014 'Guidance on sound insulation and noise reduction for buildings'.

H3.35 BS8233:2014 sets out appropriate internal and external noise levels for Bedrooms, Living Rooms, Dining Rooms and Gardens for the daytime (07:00 – 23:00) and night-time (23:00 – 07:00). It also provides guidance on the design of sound insulation for buildings and methods of achieving appropriate noise reduction for new build dwellings.

H3.36 At detail design a sound insulation mitigation report for residential properties shall include the specification and acoustic datasheets for glazed areas of the Proposed Development and any complementary acoustic ventilation scheme. The residential properties shall be designed to achieve the following internal noise levels:

- Not exceeding 30dB $L_{Aeq(1 \text{ hour})}$ in bedrooms for any hour between 23.00 and 07.00,
- Not exceeding 35dB $L_{Aeq(1 \text{ hour})}$ for bedrooms and living rooms for any hour between 07.00 and 23.00,
- Not more than 45dB $L_{Amax(5 \text{ min})}$ in bedrooms (measured with F time weighting) between the hours of 23.00 and 07.00,
- Not more than 50dB $L_{Aeq(1 \text{ hour})}$ for garden areas (including garden areas associated with residential homes or similar properties).

Significant effects from the operation of the proposed commercial buildings

H3.37 The proposed retail and community buildings could generate adverse effect from building service plant noise emission on both proposed and existing sensitive receptors. As such this has been assessed by the following methodology:

H3.38 BS4142:2014 Methods for rating and assessing industrial and commercial sound (BS4142), gives a method for rating sound from industrial and commercial sources affecting people inside or outside dwellings or premises used for residential purposes.

H3.39 An initial estimate of the significance of the sound from the retail and community premises can be assessed by subtracting the measured background noise level from the rating level (this is the specific sound level of the source with any corrections or penalties for distinctive acoustic characteristics). Typically, the greater the difference, the greater the magnitude of the impact.

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

H3.40 It is not possible to determine noise emission levels from the proposed commercial buildings at this stage. However, BS4142 has been used to define a maximum plant noise limit based on typical background levels at the nearest unscreened noise sensitive receptors to the application site. For this purpose, a noise limit of 5dB below typical background levels is adopted as this will avoid any potential adverse effects at nearby residential or other sensitive receptors; however, at receptors where the background sound levels are very low the context of the situation should be considered and absolute noise thresholds associated with the lowest observable adverse effect levels in relation to health and quality of life may be deemed as or more important than the difference between the rating level and background sound level.

Significant effects from vibration of the existing railway to the Proposed Development

- H3.41 Guidance on the impact of vibration on people in buildings is presented in BS6472: 2008. Part 1 of the Standard assesses the impact of vibration using the Vibration Dose Value (VDV). This is an indicator taking into account how people respond to vibration in terms of frequency content, vibration magnitude and the number of vibration events during an assessment period.
- H3.42 Vibration of 0.2 VDV m/s^{1.75} daytime (0700-2300) and/or 0.1 VDV m/s^{1.75} night-time (2300 – 0700) are considered the LOAELs for ground-borne vibrations. These correspond to the threshold for ‘low probability of adverse comments’ stated within BS6472: 2008.
- H3.43 Vibration of 0.8 VDV m/s^{1.75} daytime (0700-2300) and/or 0.4 VDV m/s^{1.75} night-time (2300 – 0700) are considered the SOAELs for ground-borne vibration. These correspond to the threshold for ‘Adverse comment possible’ within BS6472: 2008.
- H3.44 A significant adverse effect is considered to occur if the level of vibration from the existing West Coastway railway will exceed the SOAEL for groundborne vibration at any of the residential units of the Proposed Development. Vibration levels will take into account relevant transfer functions, from the outside to the inside of a building, and for different floor heights. In addition, the design of residential dwellings should ensure that reasonable practicable steps are taken such that vibration does not exceed the LOAELs, at any of the assessment locations of a building.

Consultation

- H3.45 The Local Authority was consulted as part of the submission of the Barnham, Eastergate and Westergate, Environmental Impact Assessment Scoping Report, in which principles of the assessment methodology were set out. The LA’s response dated 11 November 2020, and parts pertinent to noise and vibration have been highlighted in the table below with information on how issues have been addressed.

Table H3.11 LA queries from scoping review of scoping report

LA's comment	How issues have been addressed
<i>I have concerns about cumulative noise from road and rail sources affecting residents of the new Development and the noise assessment should ensure that it takes into account all potential noise sources in combination</i>	Addressed in the Baseline section : Surveys have been undertaken in areas of the site that are exposed to noise from roads and the existing railway line. These have been used to assess site suitability. The combined data will also be used when establishing glazing specs within mitigation reports.
<i>Environmental Health would expect to see that the submitted noise assessment includes a scheme that proves internal noise levels within all new residential properties will conform to the "Indoor Ambient Noise Levels for Dwellings" guideline values specified within Table 4 under section 7.7.2 of BS 8233:2014 and demonstrates that the external noise levels within the curtilage of residential units will conform to the "Design Criteria for External Noise" upper guideline value of 55 dB LAeq,T as specified within section 7.7.3.2 of BS 8233:2014;</i>	Addressed within sections of the report that talk about operational noise. The Acoustic Façade Mitigation report at detailed design will ensure that the glazing specification of any new dwellings will be sufficient to mitigate against traffic noise and railway noise, such that the design guidelines taken from BS8233:2014 are met.

LA's comment	How issues have been addressed
<i>Noise assessments should also include noise and vibration from any proposed or existing pumping stations and electrical sub stations which may impact the noise environment.</i>	None have been identified.
<i>Noise levels deriving from road sources may be subject to change due to changes in traffic flows from nearby and surrounding Developments. To account for these variations and changes in baseline conditions, modelling should be undertaken in accordance with the Department of Transport Calculation of Road Traffic Noise (1988; as recommended in the Design Manual for Roads and Bridges (LA111).</i>	DMRB (LA111) has been followed as described throughout this chapter
<i>Noise and Vibration assessments should be conducted in accordance with the principles set out in the National Planning Policy Framework (July 2018) or any document in succession, NPPG guidance and the Arun Local Plan (2011-2031), Guidelines for Environmental Noise Impact Assessment published by the Institute of Environmental management and Assessment in 2014.</i>	NPPF, NPPG and the Arun Local Plan have been considered in the relevant sections of the chapter.
<i>Construction and road traffic noise assessments, within the Environmental Statement, should be undertaken using software which meets the requirements for Quality Assurance of software for the calculation of sound outdoors, according to DIN45687 and OSP17534 Series, and fully implements the UK calculation methodologies such as Calculation of Road Traffic Noise (CRTN) and BS5228- 1:2009 + A1:2014, used for construction noise predictions.</i>	CRTN has been followed as a part of the LA111 methodology. BS5228- 1:2009 + A1:2014, has been used for construction noise predictions. Modelling of construction has been undertaken using the Cadnaa software, which complies with the mentioned assurance requirement. Any modelling of construction noise or traffic noise required at detail design will also be undertaken with a software package that meets these requirements

Assumptions and Limitations

- H3.46 The construction noise assessment has been based on a draft Construction Environmental Management Plan (CEMP) (Appendix C3 to this ES) which at this stage of the project, as is usual, does not contain information on specific plant numbers and type. As such the details of the plant used for construction noise and vibration assessments has been based on professional judgement gained from similar projects, and the guidelines within BS5228- part 1 and part 2.
- H3.47 Construction noise predictions have not been carried out for the entire programme of works but are limited to worse case assessment areas. Construction noise predictions are for each assumed construction task, and it is assumed that all tasks will overlap within the programme. It is common to follow this approach within construction noise and vibration assessments as it avoids the need to reassess impacts following changes to programme and schedules.
- H3.48 It is assumed that during construction the project will have a CEMP that will outline how construction noise will be managed and how Best Practicable Means will be adopted.

- H3.49 It is assumed that percussive piling and any other activities that generate high levels of vibration will not occur.
- H3.50 Notwithstanding these limitations, the construction assessment is considered to represent a realistic outcome of the likely effects of the Proposed Development.
- H3.51 It is difficult to understand if there have been decreases in ambient noise due to the Covid19 pandemic, which may have reduced road traffic and rail numbers. However, this limitation has led to a worse case selection of the threshold categories that set out LOAEL and SOAEL values for construction impacts, which assumes that ambient data at the time of future construction works will not be higher than predicted construction noise levels at the assessment locations.
- H3.52 The limitation in the noise survey data can cause a potential issue when classifying the application site in accordance with the Noise Exposure Categories set out in the Arun Plan, as the lower the measured noise level the better the NEC. However, this issue will be overcome at the detailed design stage when choosing appropriate glazing for the façades of the Proposed Development facing road traffic, where the calculations will either be based on further surveys specific to the assessment or the highest forecast of traffic data. This is explained further in the relevant sections of this chapter.

H4.0 Baseline Conditions

Existing Conditions

- H4.1 The existing area surrounding the boundary of the proposed site consists mainly of residential properties. There are also schools and churches, all of which are considered highly sensitivity to noise and vibration.
- H4.2 An environmental noise survey has been undertaken to determine the noise climate around the boundary of the Proposed Development. The measurements have been taken for two different types of assessments:
- 1 the first is for assessments of noise from existing noise sources that have the potential to affect the Proposed Development (site suitability) and
 - 2 the second is the assessment of new noise sources from the Proposed Development, such as noise emission from commercial buildings, that have the potential to affect existing and future sensitive dwellings.
- H4.3 Four unattended continuous noise measurements and one attended 3-hour measurement, were undertaken between Thursday 10 June 2021 and Tuesday 15 June 2021. Measurement locations are shown in Figure H5.1 (Appendix H5) and listed below:
- Location MP1 - the sound level metre was set up on the north boundary of the site, on Barnham Road (on land for A29 realignment). The purpose of the measurements was to establish baseline noise levels for properties on Barnham Road and areas such as Upper Brooks and Murrel Gardens for the construction and road noise assessments.
 - Location MP2 – Southeast boundary of the Proposed Development site, approximately 8m from the nearest rail of the West Coastway railway. The purpose of the measurements was to capture noise from Barnham Station (announcements, railway points), and ambient noise from the residential area on Gospond Road.
 - Location MP3 – South boundary of the proposed site, adjacent to West Coastway railway line. The sound level metre and vibration equipment were set up 8m from the nearest rail of the railway line.
 - Location MP4 – On footpath across open ground to the east of Pine Close, adjacent to where the secondary road will join existing A29. The purpose of the survey was to establish baseline noise measurements for properties in Westergate for the construction and road noise assessments.
 - Location MP 5 -Adjacent to path leading from Church Lane, 150m east of St George's Church. Measurements to provide background noise levels for nearby properties during the evening and night.
- H4.4 A summary of the measurements at location 1 to 5 is provided in Tables H4.1, H4.2, H4.3, H4.4, and H4.5, and the graphs of the complete data are contained in Appendix H2. L_{Aeq} , L_{A10} , L_{A90} , $L_{AF,max}$. A full daytime period is from 07:00 to 23:00 and a full night-time period is from 23:00 to 07:00.

Table H4.1 Location 1 – daytime and night-time measured baseline noise levels

Date	Period	$L_{Aeq,T}$	$L_{AF,max}$	$L_{A10,T}$	$L_{A90,T}$
10/06/2021	Day*	62.5	86.4	66.1	45.9
11/06/2021	Day	62.9	93.7	66.6	47.4
12/06/2021	Day	62	95.5	65.9	44.6

Date	Period	L _{Aeq,T}	L _{Af,max}	L _{A10,T}	L _{A90,T}
13/06/2021	Day	61.7	100	65.2	42.8
14/06/2021	Day	61.9	88.7	65.7	45.8
15/06/2021	Day**	63.9	86.5	67.6	49.9
10/06/2021	Night	56.9	91.1	50.6	31.2
11/06/2021	Night	54.9	82.7	50.1	31.2
12/06/2021	Night	54.8	81.6	52.1	34.4
13/06/2021	Night	57.1	90.9	51.1	34.2
14/06/2021	Night	57.3	94.1	50.7	33.7

Notes: * started at 11:55 ** finished 04:05

Table H4.2 Location 2 – daytime and night-time baseline survey

Date	Period	L _{Aeq,T}	L _{Af,max}	L _{A10,T}	L _{A90,T}
10/06/2021	Day*	54.9	89.8	43.9	31.8
11/06/2021	Day	55.2	82	38	26.4
12/06/2021	Day	54.5	87.4	46.5	34.2
13/06/2021	Day	48.5	82.4	36.3	26.9
14/06/2021	Day	52.5	82.7	44.9	32.9
15/06/2021	Day**	52.1	75.8	38.8	29.4
10/06/2021	Night	52.3	82.1	41.2	29.6
11/06/2021	Night	51.6	81.8	36.3	28.5
12/06/2021	Night	48.6	93.2	47.1	32.4
13/06/2021	Night	47.6	76.1	38.2	29.3
14/06/2021	Night	48.5	76.7	49.5	39.2

Notes: * started at 10:15 ** finished 02:45

Table H4.3 Location 3 – daytime and night-time baseline survey

Date	Period	L _{Aeq,T}	L _{Af,max}	L _{A10,T}	L _{A90,T}
10/06/2021	Day*	64.1	92.2	40.8	31.5
11/06/2021	Day	63.6	91.8	43.3	33.5
12/06/2021	Day	66.3	92.1	42.2	31.3
13/06/2021	Day	39.2	60.8	37.2	27.5
14/06/2021	Day	63.8	91.8	41.4	30.4
15/06/2021	Day**	63.2	91.6	43.3	33.2
10/06/2021	Night	60.9	91.8	32.6	24.3
11/06/2021	Night	61.2	91.5	33.9	25.5
12/06/2021	Night	56.2	87.7	37.5	29.1
13/06/2021	Night	56.7	87.3	36.1	29.6
14/06/2021	Night	59.5	89.3	34.3	27.6

Notes: * started at 12:15 ** finished 11:30

Table H4.4 Location 4 – 3hr day time survey

Date	Period	L _{Aeq,T}	L _{Af,max}	L _{A10,T}	L _{A90,T}
15/06/2021	Day	48.6	74.2	51.9	41.3

Table H4.5 Location 5 – daytime and night-time baseline survey

Date	Period	L _{Aeq,T}	L _{Af,max}	L _{A10,T}	L _{A90,T}
10/06/2021	Day*	45.5	86.4	45.6	42.7
11/06/2021	Day	46.9	77.6	46.9	43.7
12/06/2021	Day	45.9	73.6	46.4	43.4
13/06/2021	Day	45.9	77.2	46.1	42.9
14/06/2021	Day	47.2	86.8	45.9	43.1
15/06/2021	Day**	47.2	76.8	47.3	43.2
10/06/2021	Night	43.8	67.3	44.6	42.7
11/06/2021	Night	45.2	68.8	44.9	42.7
12/06/2021	Night	45.9	88.5	44.2	42.8
13/06/2021	Night	45.5	69.3	45.3	43.2
14/06/2021	Night	43.9	68.6	45.1	43

Notes: *started at 09:34 ** finished 05:10

H4.5

To establish if the Proposed Development site is currently exposed to high levels of vibration, a vibration measurement was undertaken approximately 8m from the West Coastway railway line, close to the noise monitoring location MP-3. Results are summarised for the daytime (0700-2300) and night-time (2300-0700) periods in Table H4.6 below.

Table H4.6 Location 5 – daytime and night-time unattended vibration survey

Date	Period	Measured VDV ms ^{-1.75}		
		Axis		
		X	Y	Z
10/06/2021	Day	0.028	0.035	0.129
10/06/2021	Night	0.021	0.030	0.110
11/06/2021	Day	0.028	0.033	0.136
11/06/2021	Night	0.021	0.030	0.107

Future Baseline

H4.6

The future baseline will not significantly change as a result of the outline design assessed as part of the Proposed Development. However, once the realignment of the A29 is completely operationally there will be potential decreases to the future baseline noise levels. This has been mentioned in the Strategic Allocation section (H8).

H5.0 Potential Effects

Built-in Mitigation

- H5.1 The construction noise assessment assumes that works will adopt Best Practicable Means (BPM) as defined in section 72 of the Control of Pollution Act 1974 and that this will also include a 2.4m high hoarding around the perimeter of the Development Site. This is set out in the draft CEMP.
- H5.2 Where visual impacts may require that hoarding is replaced with Heras fencing, this will be discussed with the council at the Reserved Matters stage and noise impacts will be reassessed for the areas concerned.
- H5.3 In relation to mitigation against traffic noise and the future baseline, it is expected that planning will secure mitigation assessment reports at the detailed design stage, which should demonstrate that with adequate mitigation internal noise levels will comply with BS 8233: 2014 *Sound insulation and noise reduction for buildings – Code of practice*. The cumulative noise from all building services plant within the Proposed Development will be designed with necessary mitigation measures to meet the limits set out in Table H5.3 and therefore significant adverse effects will be avoided.

During Construction

Construction

- H5.4 Construction noise predictions have been based on information contained in the draft CEMP, which is summarised in Table H5.1.

Table H5.1 Construction phasing strategy – from the draft CEMP

Phase	Description of likely works
Phase 0	Enabling works
Phase 1	Phase 1 of the construction works will commence at the northern end of the Site. Construction will consist of 920 residential units; 1250sqm local centre; the A29 'Barnham connection' (south of Barnham Road to roundabout); the Easterly connection to Barnham station of east-west link Barnham station car parking; the Green link 2FE primary school; and a Community centre
Phase 2	330 residential buildings and the Westerly connection of East-West link; a Cricket pitch; and a Linear Park
Phase 3	Remainder of A29 south of railway line and Hanbury Spur

- H5.5 Construction noise predictions based on the Bs5228 calculation method, were undertaken from the proposed construction activities to the nearest sensitive receptors, and the following input data were included:
- A plant list with corresponding Sound Power Levels and on-times.
 - Percentage on time of equipment.
 - Correction factors: for ground absorption, façade calculations and attenuation due to hoardings or physical barriers such as buildings.
- H5.6 Construction noise predictions have not been carried out for the entire programme of works or for the entire geographical scope, but are limited to worse case assessment areas, which correspond to the boundary of the site. Construction noise predictions are for each main construction activity, and it is assumed that all activities will overlap within the programme. It is common to follow this approach within construction noise and vibration assessments as it

avoids the need to reassess impacts every time that there is a change in programme dates or schedules.

H5.7 The assumed plant lists that are based on information contained in the BS5228- part 1 are contained in Appendix H3. To represent a worse case assessment scenario, the following four main construction activities have been assumed to occur simultaneously at the boundaries of the Development Site:

- Enabling works;
- Piling works;
- Concrete works; and
- Road works.

H5.8 Daytime Noise predictions are shown in Table H5.2 below, based on the shortest assumed distances between the works and the nearest sensitive receptors from Table H3.1.

Table H5.2 Construction noise prediction for all works (façade level)

Receptor Groups	Assessment locations	Predicted total noise level (0800 - 1800) for all activities, dB LAeq,10hrs
A	St George's Church, Church Lane,	65
B	Residential properties on Church Lane and Critchmere Drive	72.6
C	Residential properties along Upton Brooks, off Barnham Road	72.6
D	Residential properties with Elm's Grove S, off Barnham Road	71.1
E	Saint Philips Primary School, Elm's Grove	69.7
F	Residential properties on Gospond Road	66.4
G	Residential properties in Westgate on East boundary of Site adjacent to the existing A29	52.6

H5.9 Predictions are between the LOAEL and SOAEL for daytime constructions noise, and of **Minor to Moderate Adverse** impacts. As such temporary adverse effects from construction works during the daytime period **are Not Significant**.

H5.10 The above predictions are likely to be lower in practice as the embedded mitigation will provide a 2 to 4m around the site, and the majority of works will be occurring at distances that are further away than those assumed at the boundary of the Proposed Development Site.

H5.11 At this stage of the project, no works are planned outside of daytime hours. Should there be a requirement to work outside of core hours at a later stage, the local authority will be consulted, and works will be planned such that noise and vibration effects from the proposed works will not be significant, with the aim of reducing levels to as close to the defined LOEL values as reasonably practicable.

Construction traffic

H5.12 The draft CEMP has estimated that during the peak build out periods, in the region of 50 construction vehicles could be expected daily, equating to 100 overall trips. The routes to and from the proposed site are to be confirmed once a contractor is on board. Maximising the number of routes will reduce any potential impact.

- H5.13 The proportional change in HGV composition along major links is expected to increase by a maximum of 8% to 10 % assuming a worse case where all HGVs will access either the northern or southern site entrances. These increases result in noise changes above 1dB but below 3dB, which correspond to a **Minor Adverse** impact magnitude.
- H5.14 At present there is no information on road diversions or closures due to construction traffic, however, these changes are not expected to be above 3dB, or higher than the defined SOAEL.
- H5.15 Based on the above considerations, temporary adverse effects from construction traffic noise are **Not Significant**.

Construction vibration

- H5.16 The CEMP states that foundations are expected to be conventional strip foundations or flat foundations for the majority of the Proposed Development. Piling may be required to the school and commercial space. Depending on the piling technique that will be adopted there is potential for temporary **Moderate Adverse** impacts, should piling occur on parts of the Proposed Development that are adjacent to existing residential properties. This is the case on the northern boundary, which is approximately 50m to 70m from residential properties on Upper Brooks. As such without considering mitigation measures it is considered that adverse effects from piling can be significant. The mitigation section of this report will discuss what further measures need to be in place to avoid these adverse effects. Adverse vibration effects from all other construction activities including demolition of structures are not considered to be significant with BPM and a CEMP in place.

During Operation

Operational traffic noise

- H5.17 Traffic flows for over two thousand links were supplied for the Do Minimum (Traffic forecast without the Proposed Development) and Do something scenarios (Traffic forecast with the Proposed Development).
- H5.18 The short-term study DMOY vs DSOY (Do Minimum Open Year 2031 vs the Do Something Opening Year 2031) identified links that had a noise change of +1dB, which can occur with any of the following criteria:
- Where the flow changes are estimated to be greater than +25%
 - Where HGV composition would change by 5% or more; and/or
 - Where mean traffic speeds would change by 10km/h or more.
- H5.19 The impact caused by the traffic from the Proposed Development on the mentioned road links is explained in detail in Appendix H.4 and summarised below.
- H5.20 As the tables in Appendix H4 show that the impact magnitudes for all the assessed links that showed increases in traffic are **Minor Adverse** in accordance to the initial assessment criteria shown in Table H3.8, and their corresponding absolute noise levels are less than the SOAEL values for the short-term operational traffic, effects from traffic in the short-term are **Not Significant**. This conclusion is in accordance with the advice in row 3 of table 3.60 of LA 111, which states that:

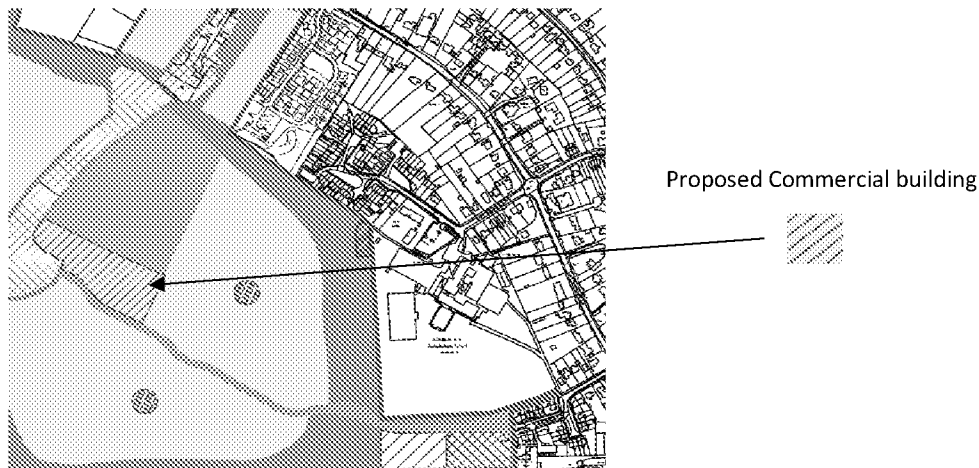
A noise change where all do-something absolute noise levels are below SOAEL requires no modification of the initial assessment. (This means that when looking at noise emissions from the future scheme in absolute terms, these are not considered high enough to cause any adverse effects)

- H5.21 Traffic flow comparison between the DMOY vs DSFY does not show any increases of above 3dB. Impact magnitudes are negligible, and it is therefore not necessary to calculate absolute noise levels. The long-term (permanent) adverse effects from operational traffic noise are **Not Significant**.
- H5.22 Appendix H.4 contains a list of traffic links for which noise will decrease during the Do Something open year.
- H5.23 When considering distance attenuation, adverse effects on existing and future receptors, due to the realignment of the A29, are not significant. Furthermore, the Proposed Development is likely to provide further screening of noise between the A29 realignment and the existing sensitive receptors, and this will be taken into account within the detailed design mitigation reports, where relevant,

Building service plant noise

- H5.24 The Proposed Development has retail and community buildings approximately at the centre of the site, adjacent to the proposed realignment of the A29, as shown in Figure H5.1. There are therefore potential noise impacts from building services plant to the existing and proposed receptors. However, it is likely that the layout of the Proposed Development will block the line of sight between the building services plant and the existing sensitive receptors, hence attenuating noise to levels at which impacts will be negligible, at the existing sensitive receptors.

Figure H5.1 Indicative location of commercial plot



- H5.25 Table H5.3 below set out indicative noise limits in accordance with Bs4142 that noise emissions will need to meet at the most sensitive receptors, such that adverse effects are not significant.
- H5.26 The indicative noise limits are set for both the daytime (07:00 to 23:00 hours) and night-time (23:00 to 07:00 hours) periods and are derived from observations of the typical background noise levels at positions MP 1, 2 and 5.

Table H5.3 calculated rating noise levels for plant noise emissions

Location	Period	Measured Background Noise Level (L _{A90})	Noise Limit (L _{A,T})
All sensitive receptors	Daytime	42	37
	Night-time	30	25

- H5.27 The noise limits in table H5.3 may be revisited at detailed design, where the location of the building service plant will be known, and background noise levels can be chosen considering

context, as stated in BS4142. Furthermore, the detailed design mitigation report may undertake further surveys of background noise once the exact locations of the plant are known.

- H5.28 A building services plant within the Proposed Development will be designed such that the cumulative noise meets the limits set out above, or those agreed with the local authority at detailed design. Therefore, permanent adverse effects from building services plant noise are **Not Significant**.

Impacts from operational traffic noise and railway noise on future residential receptors (site suitability)

- H5.29 Noise levels have been derived from the baseline noise surveys to categorise the Proposed Development site in accordance with the Arun Local Plan NEC guidelines shown in table H5.4.
- H5.30 A summary is contained in Table H5.4 below, where it is shown that the majority of the site will fall between NEC A . However, the worst-case areas of the site that are adjacent to the existing railway line fall in the NEC C category, which the guideline states:

Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level to protect against noise.

Table H5.3 NEC Categories

Location	Period	Derived Noise Level(LAeq,t)	Noise Exposure Category
North boundary of the Site (Road noise)	Daytime	62	B
	Night-time	56	B
Southern boundary of the site facing the railway.	Daytime	64	B/C
	Night-time	60	C
Southern boundary of the site facing railway.	Night	L _{Amax,s} > 82	C
Majority of the site will fall in NEC A			

- H5.31 Where the site falls into NEC A and B, it is likely the BS 8223:2014 design criteria will be met with a standard level of mitigation, such as glazing with a sound insulation performance of 29 dB RW, which can normally be achieved with 4/6/4 double glazed window.
- H5.32 Where the site falls into NEC C – it is likely that a high level of acoustic mitigation will be required to meet the BS 8223:2014 design criteria.
- H5.33 The mitigation reports at detailed design will confirm the glazing specification by undertaking predictions of internal noise levels of residential units, in accordance with the methodology set out in BS 8223 :2014. These calculations will also consider traffic noise from the proposed A29 realignment, for all areas of the Proposed Development site.
- H5.34 The mitigation reports at detailed design will also consider the layout of the Proposed Development, such that external noise levels within the curtilage of residential units will conform to the “Design Criteria for External Noise” upper guideline value of 55 dB L_{Aeq,T} as specified within section 7.7.3.2 of BS 8233:2014.
- H5.35 As such, with the embedded mitigation in place, permanent adverse effects from traffic noise on future residential properties are **Not Significant**.

Operational vibration from existing railway on future residential receptors (site suitability)

- H5.36 The vibration baseline survey results have been used to predict vibration at the different floors of buildings. The transfer functions used to predict amplification of vibration at different floor heights have been taken from a review of major infrastructure projects such as High Speed 2, and these are highlighted in Table H5.5. For the purpose of this assessment, it has been assumed that the ground floor type is 'at grade'.

Table H5.4 Transfer functions used to derive vibration levels from the outside to the inside of buildings

Transfer function from outside to:	Ground floor type	
	Suspended	At grade
Property foundation	0.5	0.5
Centre of ground floor	2	1
Centre of first floor	4	2
Centre of second floor and above	4	4

Table H5.5 Vibration Predictions at various floor heights, 8m from the nearest rail

Highest VDV Measurement from survey	Ground Floor	1st Floor	Upper floors
0.14 (Day)	0.14	0.27	0.54
0.11 (night)	0.11	0.22	0.44

- H5.37 As mentioned in the earlier sections of this Chapter a significant adverse effect from the operational railway will occur for levels of vibration of 0.8 VDV m/s^{1.75} daytime (0700-2300) and/or 0.4 VDV m/s^{1.75} night-time (2300 – 0700).

As such the results in Table H5.6 show that there are potential significant adverse effects at night for the upper floors of residential units, should the nearest residential unit be located at 8m from the nearest rail. These effects can be avoided by setting the distance of the building façade further away from the railway, bearing in mind that vibration generally varies as the square root of distance.

- H5.38 Based on the proposed parameter plans it is likely that the buildings are already set at distances that are sufficiently distant from the railway line to void significant adverse effects, however this will be confirmed at detail designed.

- H5.39 The majority of the site will not have any significant adverse effects from operational vibration, and the boundary of the site adjacent to the existing railway will not have any significant adverse effect from vibration as a mitigation report will be undertaken at detailed design.

H6.0 Mitigation and Monitoring

During Construction

- H6.1 All noise and vibration site mitigations and noise and vibration monitoring will be under the responsibility of the appointed construction contractor/s.
- H6.2 All works will be undertaken using Best Practicable Means as defined in the Control of Pollution Act and draft CEMP. Works are planned to only occur during the daytime hours, avoiding the potential to disturb residents during the most sensitive periods of the night. Although mitigation measures will become bespoke once a contractor has been appointed, the draft CEMP has identified the following standard, generic measures:
- Provide suitable hard standings for vehicles at designated areas;
 - Loading of materials into lorries in designated areas only;
 - Switching off engines of site and delivery vehicles when not in use;
 - Deliveries to be spread throughout the day avoiding peak hours;
 - All on-site compressors and other large potentially noisy plant to be fitted with appropriate silencing measures;
 - Care taken when erecting or striking scaffold to avoid impact noise; and
 - Maintenance of all plant in a good and workmanlike condition so that extraneous noise from mechanical vibration, creaking and squeaking is reduced to a minimum.
- H6.3 The following specific measures will be adopted where possible:
- Noisy plant or equipment shall be situated as far as possible from noise sensitive buildings. Barriers (e.g. site huts, acoustic sheds, or partitions) to mitigate noise affecting sensitive buildings should be employed where practicable.
 - The operation of static noisy plant or construction activities shall be placed within a shed or an enclosure lined with sound absorbent material.
 - Vehicles and plant used for the purpose of the works shall be fitted with effective exhaust silencers, maintained in good and efficient working order and be operated in such a manner as to minimise noise emissions.
 - The contractor must ensure that all plant complies with the relevant statutory requirements e.g. NRMM Regs. All construction vehicles should have upward pointing exhausts.
 - Compressors shall be fitted with properly lined and sealed acoustic covers that should be kept closed whenever in use. Pneumatic percussive tools should be fitted with anti-ring devices, mufflers or silencers of the type recommended by the manufacturers.
 - Machines in intermittent use shall be shut down in the intervening periods between work or throttled down to a minimum where this is not possible.
 - All vehicles and plant servicing the site shall be fitted with white noise/broadband vehicle reversing alarms.
 - Equipment that breaks concrete, brickwork or masonry by bending or bursting shall be used in preference to percussive tools where practicable.
 - Rotary drills and bursters actuated by hydraulic, chemical or electrical power shall be used for excavating hard or extrusive material where practicable.

- Care should be taken to reduce impact noise when loading or unloading vehicles, scaffolding or moving materials, etc.
- Equipment powered by mains electricity shall be used in preference to equipment powered by internal combustion engine or locally generated electricity where practicable.
- The contractor shall ensure that measures are taken to protect the residents, users of buildings close by and passers-by from nuisance or harm and protect buildings from physical damage caused by vibration.

H6.4 The vibration assessment has identified potential temporary adverse effects during piling within 50m of residential receptors. As such the following best practice will be followed and included in the CEMP:

- selection of construction method and plant to minimise vibration generated;
- training of site personnel to raise awareness of vibration and nearby vibration-sensitive receptors;
- provision of information to the public on expected construction vibration, including duration, especially to those likely to be exposed to moderate and major impacts.

H6.5 Specific vibration mitigation measures may include:

- restrictions on construction method to reduce vibration; and
- liaison with the local community to establish if there are any residents with special circumstances such as night-time workers.

H6.6 Specific vibration mitigation measures will be listed within the construction part of the CEMP for the project, which will be based on the draft CEMP included in Appendix C3.

During Operation

H6.7 The appointed engineering designer will be responsible for specifying noise mitigations within the detailed design phase of the Development. The appointed construction contractor will be responsible for procuring and installing these mitigations. This is explained in more detail in the sections below.

Operational traffic noise

H6.8 No significant effects are predicted to occur as a result of road traffic noise therefore no mitigation is required in respect of the existing network. However, it is expected that the residential use of the Proposed Development will have mitigation in the form of appropriate glazing and ventilation, to ensure that internal noise levels of living areas and bedrooms comply with British Standard BS 8223:2014 Guidance on sound insulation and noise reduction for buildings.

H6.9 To achieve this an Acoustic Façade Mitigation report will specify appropriate glazing and ventilation systems for each façade of the Proposed Development used for residential purposes, to account for areas of the building that are more exposed to traffic noise than others. This will be undertaken for all residential buildings of the Proposed Development.

H6.10 It is expected that the Acoustic Façade Mitigation report will form part of the detailed design assessment and that this will be secured through a suitably worded condition.

H6.11 The mitigation reports will also demonstrate how the layout of the Proposed Development, will provide sufficient acoustic screening to the surrounding community (Receptors A to G) from noise generated by the proposed realignment of the A29.

H6.12 When specifying glazing, noise from the existing railway line will also be considered for facades of buildings with direct line of sight to trains.

H6.13 Furthermore, when specifying glazing noise level from the realignment of the A29 will be based on the scenario in which traffic flows will be at a maximum, as this will represent worse case assessment.

Building service plant noise - commercial buildings

H6.14 During detailed design, building services plant associated with the retail and community buildings within the Proposed Development will be located to minimise noise impacts to the defined limits that are set out in the relevant assessment section of this chapter. Enclosures and screening will also be included as mitigations. It is expected that this will be secured through a suitably worded condition.

H6.15 The Building Service Plant Mitigation Report at detailed design stage may consider it necessary to undertake further surveys to define the noise limits, once the plant locations have been specified.

H6.16 Once the scheme is operational, no further mitigation will be required.

H7.0 **Residual Effects**

During Construction

H7.1 There are **No Significant Adverse** effects after mitigation during construction work.

During Operation

H7.2 There are **No Significant Adverse** effects during operation, assuming that any mitigation that stems from the Façade Mitigation Report and Building Service Plant Mitigation report will be in place once the Proposed Development is completed.

H8.0 Summary & Conclusions

- H8.1 The assessment has predicted that with embedded mitigation, temporary **Minor Adverse** effects from construction noise, construction traffic and construction vibration are **Not Significant**. Suitable piling methods will be identified within the CEMP to reduce vibration levels below the SOAEL.
- H8.1 The assessment has predicted that permanent minor traffic noise effects are **Not Significant**. T Acoustic mitigation reports at detailed design will ensure that the glazing specification of any new dwellings will be sufficient to mitigate against the future noise environment.
- H8.2 The assessment has predicted that permanent **Minor Adverse** effects from building service emission from the Proposed Development are **Not Significant**. Acoustic mitigation reports at detailed design will ensure that any required noise mitigation will be incorporated into the design of the building services plant and will be in place before the plant comes in use.
- H8.3 The mitigation reports will also demonstrate how the layout of the Proposed Development, will provide sufficient acoustic screening to the surrounding community (Receptors A to G) from noise generated by the proposed realignment of the A29.
- H8.4 A summary of the assessment is included in Table H8.1 below.

Table H8.1 Summary Table

Potential Effects	Receptors	Sensitivity of Receptors	Magnitude (prior to mitigation)	Significance (prior to mitigation)	Mitigation	Magnitude (post mitigation)	Significance (post mitigation)	Comments
Temporary Construction noise, including demolition	Group A to G	High	Minor (adverse)	Not significant	BPM and CEMP	Minor (adverse)	Not significant	Will be updated during construction as part of the CEMP when plant lists are available
Temporary Construction vibration, including demolition	Group A to G	High	Moderate (adverse)	Significant (due to a lack of information)	BPM and CEMP	Minor (adverse)	Not significant	Will be updated during construction as part of the CEMP when plant lists are available
Temporary Construction traffic noise	Group A to G	High	Minor (adverse)	Not significant	Not necessary	Minor (adverse)	Not significant	-
Permanent Operational Traffic noise	Group A to G	High	Minor (adverse)	Not significant	Not necessary on the existing road network. However, the facades, with living rooms or bedroom windows of the residential buildings, will have noise mitigation in form of glazing and ventilation.	Minor (adverse)	Not significant	Acoustic Façade Mitigation reports at detailed design will ensure that the glazing specification of any new dwelling will be sufficient to mitigate against traffic and railway noise. The mitigation reports will also

Potential Effects	Receptors	Sensitivity of Receptors	Magnitude (prior to mitigation)	Significance (prior to mitigation)	Mitigation	Magnitude (post mitigation)	Significance (post mitigation)	Comments
								demonstrate how the layout of the Proposed Development, will provide sufficient acoustic screening to the surrounding community (Receptors A to G) from noise generated by the proposed realignment of the A29.
Permanent Operational building emission noise	Group A to G	High	N/A	Not significant	An Acoustic Building Service Plant Mitigation Report at the detailed design stage	N/A	Not significant	A Building Service Plant Mitigation Report at detailed design will ensure that any required noise mitigation will be in place before the plant comes in use.

H9.0**Abbreviations & Definitions**

1	BNL	Baseline Noise Levels
2	BPM	Best Practicable Means
3	CRTN	Calculation of Road Traffic Noise
4	DMOY	Do Minimum Opening Year
5	DMRB	Design Manual for Roads and Bridges
6	DSFY	Do Something Future Year
7	DSOY	Do Something Opening Year
8	ES	Environmental Statement
9	HGV	Heavy Good Vehicle
10	LOAEL	Lowest Observed Adverse Effect Level
11	NOEL	No Observed Effect Level
12	NPPF	National Planning Policy Framework
13	NPSE	Noise Policy Statement for England
14	PPG	Planning Practice Guidance
15	ProPG	Professional Practice Guidance on Planning & Noise
16	SOAEL	Significant Observed Adverse Effect Level

H10.0 **References**

- 1 UK Government, (1974); The Control of Pollution Act 1974, HMSO.
- 2 UK Government, (1990); Environmental Protection Act.
- 3 Department of Communities and Local Government, (2019); National Planning Policy Framework.
- 4 Department for Environment, Food and Rural Affairs, (2010); Noise Policy Statement for England.
- 5 The Ministry of Housing, Communities and Local Government, (2019) National Planning Practice Guidance (PPG).
- 6 Institute of Environmental Management and Assessment (2014) The Guidelines for Environmental Noise Impact Assessment.
- 7 Arun District Council (2018) The Arun Local Plan 2011-2031.
- 8 British Standard Institute BS5228:2009+A1:2014. Code of Practice for Noise and Vibration Control on Construction and Open Sites. Part 1 Noise and Part 2 Vibration.
- 9 Highways England, Design Manual for Roads and Bridges Sustainability & Environment Appraisal LA 111 Noise and vibration (formerly HD 213/11, IAN 185/15) Revision 2.
- 10 Calculation of Road Traffic Noise (CRTN), Department of Transport, Welsh Office, 1988.
- 11 Chartered Institute of Environmental Health (2017) Professional Practice Guidance on Planning & Noise (ProPG).
- 12 British Standard Institute BS 8233:2014, Guidance on sound insulation and noise reduction for buildings.
- 13 British Standard Institute BS4142: 2014, Methods for Rating and Assessing Industrial and Commercial Sound.
- 14 British Standard Institute Bs 6472: 2008: Guide to evaluation of human exposure to vibration in buildings, Part 1, Vibration sources other than blasting.