7. NOISE AND VIBRATION

7.1. INTRODUCTION

7.1.1. This chapter reports the outcome of the assessment of likely significant effects arising from the Scheme upon noise and vibration.

7.1.2. This chapter describes the assessment methodology and the baseline conditions relevant to the assessment, which have been used to reach these conclusions, as well as a summary of the likely significant effects leading to the secondary mitigation measures required to avoid, prevent, reduce or, if possible, offset any likely significant adverse effects, and the likely residual effects and any required monitoring after these measures have been employed.

7.1.3. This chapter (and its associated figures and appendices) is intended to be read as part of the wider ES, with particular reference to **Chapter 10: Landscape and Visual**.

7.2. LEGISLATIVE FRAMEWORK, POLICY AND GUIDANCE

LEGISLATIVE FRAMEWORK

7.2.1. The applicable legislative framework is summarised in **Table 7-1** below.

Table 7-1 - Noise and Vibration: Summary of Legislation

Legislation	Summary
Control of Pollution Act 1974 (Ref. 7.1)	Part III of Control of Pollution Act (CoPA) 1974 gives local authorities powers to control construction site noise and vibration. Best Practicable Means (BPM) is defined in Section 72 of CoPA (Ref 7.1). In this definition 'practicable' means reasonably practicable having regard among other things to local conditions and circumstances, to the current state of technical knowledge and to the financial implications. The 'means' to be employed include the design, installation, maintenance and manner and periods of operation of plant and machinery, and the acoustic design.
Environmental Noise (England) Regulations 2006 (Ref. 7.2)	The Environmental Noise (England) Regulations 2006 implement the European Commission Directive 2002/49/EC (known as the Environmental Noise Directive or END). The Regulations entail Noise Action Plans to be adopted by central Government to manage and (where necessary) reduce environmental noise, including from roads. The current Noise Action Plan: Roads identifies a number of Important Areas (IAs) most affected by road noise, within which measures to reduce noise should be focussed. The Action Plan advises highways authorities take the following action within IAs: 'For each Important Area, identify proposed actions that will meet the vision and aims set out in the Government's policy on noise or state why, in their view, no further action can or needs to be taken in order to meet this objective'
Noise Insulation Regulations (NIR) 1975, as amended 1988 (Ref 7.3)	The NIR provides the framework to determine the entitlement to noise insulation treatment at eligible buildings (i.e. dwellings and other building used for residential purposes within 300m from the nearest point on the new or altered highway). The following three conditions should be met for potential qualification under the NIR:

Legislation	Summary
	The combined expected maximum noise traffic level, i.e. the relevant noise level from the new or altered highway together with any other traffic in the vicinity must not be less than the specified noise level, LA10,18h 68 dB; The relevant noise level is at least 1.0 dB more than the prevailing noise level, i.e. the total traffic existing before the works to construct or improve the highway were begun; The contribution to the increase in the relevant noise level from the new or altered highway must be at least 1.0 dB. The noise should be assessed at a reception point located 1 metre in front of the most exposed façade part of an external window or door of an eligible room. Traffic flows used in the calculations should be the highest expected in a period of 15 years after opening to traffic. The predictions will be normally undertaken using the Annual Average Weekly Traffic (AAWT).

POLICY

7.2.2. The applicable policy framework is summarised in **Table 7-2** below.

Table 7-2 - Noise and Vibration: Summary of Policy

Policy	Summary
National Policy	
National Planning Policy Framework, 2019 (NPPF) (Ref. 7.4)	The NPPF (revised February 2019 and amended June 2019) provides guidance and key objectives for local policy development. Relevant policies are outlined below: Paragraph 11 states (inter alia): Plans and decisions should apply a presumption in favour of sustainable development… For decision-taking this means:… approving development proposals that accord with an up-to-date development plan without delay; or where there are no relevant development plan polices, or the policies which are most important for determining the application are out-of-date, granting permission unless: the application of policies in this Framework [i.e. the NPPF] that protect areas or assets of particular importance provides a clear reason for refusing the development proposed; or any adverse impacts of doing so would significantly and demonstrably outweigh the benefit, when assessed against the policies in this Framework [i.e. the NPPF] taken as a whole" Paragraph 170 (inter alia): "Planning polices and decisions should contribute to and enhance the natural local environment by:…

Policy	Summary
	Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of…noise… Paragraph 180 (inter alia): "Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should: mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life; identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason".
Noise Policy Statement for England, 2010 (NPSE) (Ref 7.5)	The Noise Policy Statement for England (NPSE) outlines central Government vision, aims and principles for managing and controlling environmental noise affecting people. The NPSE describes key conceptual thresholds considered to represent the onset of the (adverse) effects of environmental noise: Lowest Observed Adverse Effect Level (LOAEL) – the level above which adverse effects on health and quality of life can be detected; below this threshold noise is considered to be in the No Observed Effect Level (NOEL) range. Significant Observed Adverse Effect Level (SOAEL) - the level above which significant adverse effects on health and quality of life can occur. Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development, the three aims of the NPSE are defined as: Avoid significant adverse impacts on health and quality of life; Mitigate and minimise adverse impacts on health and quality of life; and Where possible, contribute to the improvement of health and quality of life.
Local Policy	
Arun District Local Plan 2011-2031 (Ref 7.6)	The Arun District Local Plan 2011 – 31 replaced the existing 2003 Arun District Local Plan. Relevant policies relating to noise in the adopted Local Plan include policy QE DM1 (Noise Pollution), which requires that developers proposing new noise generating development must seek advice from an early stage to determine the level of noise assessment required. This policy indicates that the proposal will need to be supported by: "Evidence to demonstrate that there are no suitable alternative locations for the development; A noise report which provides accurate information about the existing noise environment, and the likely impact of the proposed development upon the noise environment. The report must also demonstrate that the development meets appropriate national and local standards for noise, as set out in

Policy	Summary
	Annex 1 of the Planning Noise Advice Document: Sussex, and any mitigation measures required to ensure noise is managed to an acceptable level; Evidence to demonstrate that the development will not impact upon areas identified and valued for their tranquillity, including Gaps Between Settlements which are important to the enjoyment of Arun's countryside, its habitat and biodiversity."

GUIDANCE

The applicable guidance documents are summarised in **Table 7-3** below.

Table 7-3 - Noise and Vibration: Summary of Guidance

Policy	Summary
British Standard 5228:2009+A1:2014 (Ref 7.7)	BS 5228:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites' provides advice on prediction methods, noise and vibration measurements and assessment of impacts.
Design Manual for Roads and Bridges (DMRB) LA111 (Ref 7.8)	The DMRB is a comprehensive manual providing wide-ranging guidance as well as requirements for the design and impact assessment for road development schemes in the UK. LA111 (2020) (Revision 2) provides requirements for evaluating noise and vibration impacts. This section highlights the use of the Calculation of Road Traffic Noise (CRTN) as the primary methodology for predicting road traffic noise and also describes threshold criteria for assessment in terms of the magnitude of noise change. LA111 guidance is further described in the Assessment Methodology section.
Calculation of Road Traffic Noise (Ref 7.9)	The Calculation of Road Traffic Noise (CRTN) memorandum describes the methodology to calculate the road traffic noise at a given distance from the highway. The methodology takes into account the intervening ground cover, road configuration and road layout. Noise levels are presented in terms of the noise descriptor LA10,18h which is the noise level exceeded for just 10% of the time between 0600 and 2400 hours. The method also predicts LA10,1h which is the noise level exceeded for just 10% of the time within any one hour period.
British Standard 4142:2014+A1:2019 (Ref 7.10)	British Standard 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sounds' sets out a methodology for assessing noise from industrial sources. The method set out in BS 4142 compares a rating of the noise from the specific source being assessed with the background sound climate existing at relevant noise-sensitive receptors (NSRs) in the absence of the source operation. The difference in levels established is taken as an indication of the magnitude of the noise impact, subject to contextual considerations [from BS 4142]: "Typically, the greater this difference, the greater the magnitude of the impact.

Policy	Summary
	A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context. A difference of around +5 dB 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 a 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." It is clear from this guidance that context is an important consideration in the assessment. The examples included in BS 4142:2014+A1:2019 Annex A illustrate the contextual factors that may be of importance, for example: The magnitude of the differences between rating level and background sound; The character of the existing noise environment at receptors; History of noise issues (e.g. complaints) associated with the operator or the site of the specific source under assessment; The diurnal period during which impacts are identified, and the relevance to the type of receptor; and The location at which actual impacts on the receptor could occur, i.e. indoor or outdoor. BS 4142:2014+A1:2019 provides guidance on minimising and reporting factors likely to contribute to uncertainty in the assessment. This includes following best practice guidance with regards to measurement of sound levels.
Planning Practice Guidance (Ref 7.11)	The Planning Practice Guidance web-based resource that supports the NPPF. The guidance advises that local planning authorities' plan-making and decision making should take account of the acoustic environment and in doing so consider: Whether or not a significant adverse effect is occurring or likely to occur. Whether or not an adverse effect is occurring or likely to occur. Whether or not a good standard of amenity can be achieved.
Planning Noise Advice Document: Sussex (Ref 7.12)	This document provides advice for developers and consultants for planning applications in East and West Sussex. The document complements the aims in the Noise Policy Statement for England. Section 6, Transport Schemes, refers to DMRB HD213/11 as the guidance which should be followed for noise assessments related to road schemes. HD213/11 was withdrawn in 2019 and has been replaced by LA111 (revision 2) (Ref 7.8)

7.3. CONSULTATION, SCOPE, METHODOLOGY AND SIGNIFICANCE CRITERIA

CONSULTATION UNDERTAKEN TO DATE

Table 7-4 provides a summary of the consultation activities undertaken in support of the preparation of this chapter.

Table 7-4 - Noise and Vibration: Summary of Consultation Undertaken

Body / organisation	Individual / stat body / organisation	Meeting dates and other forms of consultation	Summary of outcome of discussions
Arun District Council.	Environmental Health, Scoping Opinion	2nd May 2019	Close proximity of the existing noise sensitive residential and commercial premises (Murrell Gardens, on B233, Fontwell Avenue and Fordingbridge Industrial Estate) must be assessed in full and the findings / recommendations must be adhered to by the developer during the clearance works, ground works and construction phase. If there are recommended works from the report to scope the future protection of these noise sensitive dwellings and commercial buildings, these mitigation measures must be agreed approved by the LPA before construction. Reliance on the CEMP alone will not suffice.
Arun District Council.	Chris Davis, Environmental Health Department	2nd July 2019	Telephone and email correspondence to agree locations and duration for the noise monitoring in advance of commencing the survey.

SCOPE OF THE ASSESSMENT

7.3.1. The scope of this chapter has been established through an ongoing scoping process. Further information can be found in **Chapter 5: Approach to EIA**.

7.3.2. This section provides an update to the scope of the assessment and re-iterates the evidence base for scoping out elements of the topic following further iterative assessment.

ELEMENTS SCOPED OUT OF THE ASSESSMENT

7.3.3. The elements shown in **Table 7-5** are not considered to give rise to likely significant effects as a result of the Scheme and have therefore not been considered within the ES.

Table 7-5 - Elements Scoped Out of the Assessment

Element scoped out	Justification
Noise generated by construction-related vehicular movements	Potential impacts of noise generated by construction-related vehicular movements along the existing road network and then accessing into the Site are considered not to be significant. The additional construction-related HGV vehicle movements to and from the Site are anticipated to be minimal in the context of the existing traffic flows
Operational vibration	Given the nature of the Scheme, it is expected that levels of vibration during the operational phase are unlikely to be significant at the identified sensitive receptors

ELEMENTS SCOPED INTO THE ASSESSMENT

Construction Phase

7.3.4. The following elements are considered to have the potential to give rise to likely significant effects during construction of the Scheme and have therefore been considered within the ES:

- Disturbance to sensitive receptors from the generation of noise and vibration from on-site activities during the construction phase of the Scheme.

Operation Phase

7.3.5. The following elements are considered to have the potential to give rise to likely significant effects during operation of the Scheme and have therefore been considered within the ES:

- Disturbance to noise sensitive receptors from noise generated by road traffic on the Scheme;
- Disturbance to noise sensitive receptors from noise level changes generated by a combination of changes in road traffic flow and / or composition on existing roads as a result of the Scheme; and
- Disturbance to noise sensitive receptors from noise generated by the relocated substation.

EXTENT OF THE STUDY AREA

7.3.6. The study area has been defined in accordance with DMRB LA111 (Revision 2) (Ref 7.8) and is illustrated in **Figure 7-1: Noise Assessment Study Area, Sensitive Receptors and Noise Survey Locations**. The following steps were used to determine the study area:

- A 600m area from the Scheme and roads links physically changed or bypassed by the Scheme; and

- A 50m area from other road links with the potential to experience a Basic Noise Level (BNL) change of more than 1dB(A) in the short term or more than 3 dB(A) in the long term, as a result of the Scheme.

7.3.7. Guidance within BS 5228 (Ref 7.7), which has been used to assess the potential impacts during construction, states that at distances beyond 300m, noise predictions should be treated with caution. Similarly, for predicted vibration levels at distances greater than 100 m there is uncertainty. Therefore, the study area for potential construction effects is limited to these distances from the Scheme.

7.3.8. The study area adopted for the assessment of potential construction effects and noise from the relocated substation has focused on the closest noise sensitive receptors. These receptors are also representative of neighbouring properties in their vicinity. By choosing a selection of the closest identified potentially sensitive receptors the reported impacts are, therefore, typical of the worst affected receptors and all potentially significant effects are identified. At receptors further away from the works the impact would be reduced.

METHOD OF BASELINE DATA COLLATION

DESK STUDY

7.3.9. A review of the Strategic Noise maps published by Department of Environment, Farming and Rural Affairs (DEFRA) (Ref 7.13) under the requirements of the Environmental Noise (England) Regulations 2006 (Ref 7.2) show that there are no Noise Action Planning Important Areas (IAs) within the study area of the Scheme. IAs are identified by DEFRA as locations where the top 1% of the population that are exposed to the highest noise levels is located. The closest IA identified to the Scheme is associated with rail noise and located at Barnham station (RI_550), approximately 950 m south west of the Scheme. The closest IA for road noise is located on the A27 at Fontwell, approximately 1.2 km north of the Scheme and outside of the study area for the Scheme.

SURVEYS

7.3.10. A baseline noise survey was carried out between 10th and 19th July 2019. The locations and survey methodology were agreed with the Environmental Health Officer (EHO) at Arun District Council prior to the commencement of the monitoring (see **Table 7-6**). The purpose of the noise monitoring was to establish the existing noise environment and validate the accuracy of the noise model predictions.

7.3.11. The measurements were taken in accordance with BS 7445 (Ref 7.14), CRTN (Ref 7.9) and BS 4142: 2014+A1: 2019 (Ref 7.10).

7.3.12. Measurements were taken in free-field conditions at a height of approximately 1.5 m. Third-octave band noise levels were recorded at intervals of 15-minutes (LAeq, LAmax, LAmax, LA10 and LA90), along with 1 second fast time-weighted sound pressure levels.

7.3.13. Weather conditions during the survey were suitable for noise measurements as set out in BS 7445, with no rain and light winds.

7.3.14. Monitoring was conducted using Class 1 Sound Level Meters. A field calibrator was used to calibrate and check the meter before and after the measurement period with no change in

level recorded. Specific details of the equipment used, including serial numbers and calibration dates is provided in Noise Monitoring Forms contained with **Appendix 7.1**.

7.3.15. Long-term unattended measurements were taken at four locations and short-term attended measurements taken at four further locations which are described in **Table 7-6** and shown in **Figure 7-1: Noise Assessment Study Area, Sensitive Receptors and Noise Survey Locations** shows the location of the measurements.

Table 7-6 - Baseline Noise Monitoring Locations

Monitoring ID	Location	Duration and Description of Survey	Rationale
LT1	Fields north of Barnham Road at site of Barratts Development immediately adjacent to the Scheme	4 days unattended	Establish baseline noise levels for proposed residential development.
LT2	Barnham Road (B2233)	5 days unattended	Long-term Calculation of Road Traffic Noise (CRTN) measurement to establishing road traffic noise levels on B2233.
LT3	Fields west of Downview Road	5 days unattended	Establish baseline noise levels for noise sensitive receptors on Ewens Gardens.
LT4	Orchard Farm, Eastergate Lane	4 days unattended	Establish baseline noise levels for noise sensitive receptors north of the Scheme and contribution from road traffic on Eastergate Lane.
ST1	Fields north of Fordingbridge Industrial Estate (Halo), at site of Barratts Development immediately adjacent to the Scheme	3 x 15 minutes attended during daytime	CRTN comparative measurement procedure for model verification.
ST2	Barnham Road, between Halo site and Downview Road	2 x 15 minutes attended during daytime	CRTN shortened measurement procedure for model verification to quantify road traffic noise from B2233 as a predominant noise source in the area.
ST3	Fontwell Avenue, A29	2 x 15 minutes attended during daytime	CRTN shortened measurement procedure for model verification to quantify road

			traffic noise from A29 as a predominant noise source in the area.
ST4	Fontwell Avenue, A29 – junction with Wandley's Lane	2 x 15 minutes attended during daytime	CRTN shortened measurement procedure for model verification to quantify road traffic noise from A29 as a predominant noise source in the area.

ASSESSMENT METHODOLOGY

Construction Noise

7.3.16. The likely construction noise levels have been predicted using the methodology set out in BS 5228 (Ref 7.7). At this stage, before contractors have been appointed to construct the Scheme, precise information on the construction works is not available. However, a contractor has been appointed to provide reasonable assumptions on the likely works. Therefore, the estimated construction noise levels are based on information which includes the number and type of plant likely to be required for each activity, typical 'on' times for each item of plant, working areas, working times and durations. Further details on the activities and plant throughout the construction works are provided in **Appendix 7.2**.

7.3.17. Construction noise levels are predicted as a 'free-field' equivalent continuous noise level averaged over the assessment period (LAeq,T), corrected to account for the variations in noise due to plant-on / plant-off time during the assessment period.

7.3.18. Estimates of reasonable worst-case construction noise levels have been made for a selection of 7 of the closest identified potentially sensitive receptors to the works. These selected receptors are also representative of neighbouring properties in their vicinity. By choosing a selection of the closest identified potentially sensitive receptors the reported impacts are, therefore, typical of the worst affected receptors and all potentially significant effects are identified. At receptors further away from the works the impact would be reduced.

7.3.19. The significance of construction noise effects is assessed on the category threshold for the noise sensitive receptor as required in the ABC assessment methodology set out by BS 5228, shown in **Table 7-7**.

Table 7-7 - BS 5228 ABC Construction Noise Assessment Categories

Evaluation Period	Assessment Category dB (L_{Aeq})		
	A	B	C
Night-time (23:00-07:00)	45	50	55
Evening and Weekends*	55	60	65
Daytime (07:00-19:00)	65	70	75
* 19:00-23:00 weekdays, 13:00-23:00 Saturdays and 07:00-23:00 Sundays. Category A: threshold values to use when ambient Noise levels (when rounded to the nearest 5 dB) are less than these values.			

Category B: threshold values to use when ambient Noise levels (when rounded to the nearest 5 dB) are the same as Category A values.
Category C: threshold values to use when ambient Noise levels (when rounded to the nearest 5 dB) are higher than Category A values.
The Category (A, B or C) is to be determined separately for each time period and the lowest Noise category is then used throughout the 24-hour cycle, e.g. a site which is category A by day and category B or C in the evening and night will be treated as category A for day, evening and night.

7.3.20. The methodology identifies potential significant effects where predicted noise levels exceed Categories A and B. These categories consider the impact of construction in locations with lower existing ambient noise levels. Where construction noise levels are predicted to exceed the A or B Categories, but are less than the Category C threshold, then this is assessed as potentially significant in quieter areas.

7.3.21. When considering construction noise effects in terms of the Lowest Observed Adverse Effect Level (LOAEL) and Significant Adverse Effect Level (SOAEL) as described in the NPSE (Ref. 7.5), the approach as set out in DMRB LA111 (Ref.7.7) has been adopted. The LOAEL value is not fixed and will depend on the measured (or derived representative) baseline noise level at each receptor location. The SOAEL value is aligned with the ABC assessment values shown in **Table 7-7**.

Construction Vibration

7.3.22. Some construction activities can be a source of ground-borne vibration, which can be a cause for concern at the nearest receptors. The main sources of ground borne vibration are anticipated to be from compacting activities in close proximity to adjacent sensitive receptors. Impacts are considered for both damage to buildings and annoyance to occupiers.

7.3.23. BS 7385 (Ref 7.15) establishes the basic principles for carrying out vibration measurements and processing the data with regard to evaluating vibration impacts on buildings. **Table 7-8** provides recommended peak particle velocity (PPV) vibration limits for transient excitation for different types of buildings (as set out in BS 7385-2). The PPV values in **Table 7-8** are given in two ranges as very low frequency vibration (between 4Hz to 15Hz) is potentially more damaging to light framed building structures, and therefore has a lower threshold.

Table 7-8 - Peak Particle Velocity (PPV) Limits for Cosmetic Damage

Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse[1]	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures. Industrial and heavy commercial buildings.	50 mm/s at 4 Hz and above	50 mm/s at 4 Hz and above
Un-reinforced or light framed structures. Residential or light commercial type buildings[2]	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

[1] Values referred to are at the base of the building.

[2] At frequencies below 4 Hz a maximum displacement of 0.6 mm (zero to peak) should not be exceeded

7.3.24. BS 7385-2 states that the probability of building damage tends towards zero for transient vibration levels less than 12.5 mms-1 PPV. For continuous vibration, such as from vibratory rollers, the threshold is around half this value.

7.3.25. It is also noted that these values refer to the likelihood of cosmetic damage. ISO 4866:2010 (Ref 7.16) defines three different categories of building damage:

- Cosmetic – formation of hairline cracks in plaster or drywall surface and in mortar joints of brick concrete block constructions;
- Minor – formation of large cracks or loosening and falling of plaster or drywall surface or cracks through brick/block; and
- Major – damage to structural elements, cracks in support columns, loosening of joints, splaying of masonry cracks.

7.3.26. BS 7385-2 defines that minor damage occurs at a vibration level twice that of cosmetic damage and major damage occurs at a vibration level twice that of minor damage. Therefore, this guidance has been used to define the magnitude of impact identified in **Table 7-9** for continuous vibration.

Table 7-9 - Construction Vibration Magnitude of Impact Criteria for Assessment Building Damage

Magnitude of Impact	Damage Risk	Continuous Vibration Level PPV mms-1
Negligible	Negligible	< 6
Minor	Cosmetic	6
Moderate	Minor	15
Major	Major	30

In addition to building damage, BS 5228-2 (Ref 7.7) contains guidance on PPV vibration levels and provides a semantic scale for the description of construction vibration effects on human receptors. The criteria adopted to assess the potential impacts to nearby receptors for this study are set out in **Table 7-10**.

Table 7-10 - Construction Vibration Magnitude of Impact Criteria for Human Receptors (Annoyance)

Peak Particle Velocity (PPV) mms-1	Description	Magnitude of Impact
0.14 to < 0.3	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration	Negligible

0.3 to < 1	Vibration might be just perceptible in residential environments	Minor
1.0 to < 10	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents	Moderate
≥ 10	Vibration is likely to be intolerable for any more than a very brief exposure to this level	Major

7.3.27. For human receptors the LOAEL is defined as a PPV of 0.3 mms-1, this being the point as which construction vibration is likely to become perceptible. The SOAEL is defined as a PPV of 1.0 mms-1, this being the level at which construction vibration can be tolerated with prior warning. These values are in line with guidance in DMRB LA111, Table 3.31 (Ref 7.8).

Operation Road Traffic Noise

7.3.28. The assessment of operational road traffic noise has been undertaken in line with guidance set out in DMRB (Ref 7.8).

7.3.29. Noise from a flow of road traffic is generated by both the vehicle engines and the interaction of tyres with the road surface. The traffic noise level at a receptor, such as an observer at the roadside or residents within a property, is influenced by a number of factors including traffic flow, speed, composition (percentage of HGVs), road gradient, type of road surface, distance from the road and the presence of any obstructions between the road and the receptor.

7.3.30. Noise from a stream of traffic is not constant, but to assess the noise impact a single figure estimate of the overall noise level is necessary. The index adopted by the Government in 'The Calculation of Road Traffic Noise' (CRTN) (Ref 7.9) to assess traffic noise is LA10,18h. This value is determined by taking the highest 10% of noise readings in each of the 18 one-hour periods between 06:00 and 00:00, and then calculating the arithmetic mean.

7.3.31. CRTN provides the standard methodology for predicting the LA10,18h road traffic noise level. Noise levels are predicted at a point measured 1m horizontally from the external façade of buildings.

7.3.32. Although the main focus of the assessment is on daytime impacts, DMRB also requires an assessment of night-time (i.e. between 23:00 and 07:00) traffic noise levels (Lnight,outside). DMRB refers to three methods for calculating night-time traffic noise levels developed by the Transport Research Laboratory (TRL) (Ref 7.16). Night-time traffic noise levels have been calculated using Method 3.

7.3.33. Predicted daytime and night-time traffic noise levels for the operational phase have been generated using a 3D computer noise model created using CadnaA 2020 and ArcGIS 10.4.1 software. The following parameters and assumptions were used in the noise model:

- CRTN calculation procedures;
- Topographic data at 2m height intervals;
- OS Addresspoint data;
- Building height derived from LIDAR data with new buildings, or those for which data is missing, at a height of 6m;
- Receptor façade noise levels calculated at 4m (first floor);
- Ground absorption value of 0.5;

- 18 hr AAWT traffic flows (0600 – 2400hrs) with average speed (kph) and percentage of heavy vehicles defined as vehicles with a weight greater than 3.5 tonnes;
- Scheme horizontal and vertical alignment;
- 30 mph (48 kph) speed limit on Scheme; and
- Noise mitigation feature with a height of 3m and length of approximately 440m; the northern section (approximately 280m) has been modelled as absorptive (see **Figure 7.5** and **Figure 7.6**).

7.3.34. For the purposes of this assessment, the following scenarios have been modelled:

- Existing/baseline year (2017). This scenario was used to validate the noise model against the noise monitoring;
- Do-minimum opening year (DMOY) as 2023;
- Do-minimum future year (DMFY) as 2038;
- Do-something (with Scheme) opening year (DSOY); and
- Do-something (with Scheme) future year (DSFY).

7.3.35. The DSFY has been modelled using traffic flows which assume Phase 2 of the A29 Realignment has been constructed (in addition to other schemes as set out in Chapter 14: Cumulative Effects). Phase 2 of the A29 Realignment is located to the south of the Scheme from the junction with Barnham Road to re-join the existing A29 south of Westergate. Whilst noise generated by traffic on any new road which forms Phase 2 will be assessed as part of any future planning application, the changes in traffic flow on Phase 1 (i.e. the Scheme) and associated noise has been included in this assessment. This represents a worst-case scenario in terms of increased traffic flow and noise increase at properties within the study area for the Scheme.

7.3.36. In line with DMRB LA111 guidance, the following comparisons have been undertaken for the predicted change in road traffic noise:

- Short term noise change comparing the DMOY with the DSOY for both day-time (0600 – 2400hrs) and night-time (2300 – 0700 hrs) periods;
- Long term noise change comparing the DMOY with the DSFY for both day-time (0600 – 2400hrs) and night-time (2300 – 0700 hrs) period; and
- Non-project change comparing the DMOY with the DMFY for both day-time (0600 – 2400hrs) and night-time (2300 – 0700 hrs) periods.

7.3.37. Day-time noise contours have been prepared for the comparisons listed above and are presented in the associated figures for this chapter (**Figure 7.2** – **Figure 7.4**). Assessment tables, providing the number of sensitive receptors predicted to experience an increase or decrease in road traffic noise levels, for these comparisons are provided in **Appendix 7.3**.

7.3.38. The calculated absolute noise levels produced have also been analysed to indicate the potential eligibility for compensation under the Noise Insulation Regulations 1975 (as amended) (Ref 7.3) and to assess the implications in respect to the NPSE (Ref 7.5).

7.3.39. The magnitude of change for the short term and long-term operational noise impacts presented in DMRB LA111, and replicated in **Table 7-11**, have been used to inform the initial assessment of likely significant effects.

Table 7-11 - Magnitude of Traffic Noise Impacts

Short Term Change		Long Term Change	
Noise Level Change, dB (LA10, 18h or Lnight)	Magnitude of Impact	Noise Level Change, dB (LA10, 18h or Lnight)	Magnitude of Impact
0	No Change	0	No Change
0.1 - 0.9	Negligible	0.1 - 2.9	Negligible
1 - 2.9	Minor	3 - 4.9	Minor
3 - 4.9	Moderate	5 – 9.9	Moderate
5+	Major	10+	Major

7.3.40. For noise sensitive receptors where the magnitude of change in the short term is either minor, moderate or major and therefore there is a potential for a significant effect, other factors have been considered to determine final significance. This approach is set out in DMRB LA111 and lists the following factors to be considered:

- Magnitude of noise level change within 1 dB of minor/moderate classification boundary;
- Differing magnitude of impact in the long term to magnitude of impact in the short term;
- Absolute level with reference to the LOAEL and SOAEL;
- Location of the noise sensitive parts of the receptors;
- Acoustic context; and
- Likely perception of change by residents.

7.3.41. The operational road traffic LOAEL and SOAEL for all noise sensitive receptors presented in DMRB LA111 and replicated in **Table 7-12** have been used in the assessment.

Table 7-12 - Operational road traffic noise LOAEL and SOAELs

Time Period	LOAEL	SOAEL
Day (06:00 – 24:00)	55 dB LA10, 18hr facade	68 dB LA10, 18hr facade
Night (23:00 – 07:00)	40 dB Lnight, outside (free-field)	55 dB Lnight, outside (free-field)

Relocated Substation

7.3.42. The methodology for the assessment of noise from the relocated substation has been undertaken with consideration to the guidance contained in BS 4142:2014+A1:2019 (Ref 7.10) and outlined in **Table 7-3**.

7.3.43. In considering the relevant SOAEL and LOAEL for fixed plant (e.g. the substation), BS 4142 states a rating level 10 dB above the background sound level, is likely to be an indication of significant adverse impact, depending on context. Therefore, this has been taken as indicative of the SOAEL, depending on context. A rating level of 5 dB above the residual noise level at receptors is likely to be an indication of an adverse impact, depending on

context. Where the rating level does not exceed the background sound level, this is an indication of low impact, depending on context. Therefore, the LOAEL, again depending on context, falls between 0-5 dB above the background sound level.

SIGNIFICANCE CRITERIA

7.3.44. The significance level attributed to each effect has been assessed based on the sensitivity/value of the affected receptor(s) and the magnitude of change arising from the Scheme, as well as a number of other factors that are outlined in more detail in **Chapter 5: Approach to EIA**. The sensitivity of the affected receptor is assessed on a scale of high, medium, low and negligible, and the magnitude of change is assessed on a scale of large, medium, small, negligible and no change, as set out in **Chapter 5: Approach to EIA.**

7.3.45. For noise and vibration, all sensitive receptors within the study area have been considered as having a high sensitivity value.

EFFECT SIGNIFICANCE

7.3.46. The following terms have been used to define the significance of the effects identified and apply to both beneficial and adverse effects:

- **Major effect**: where the Scheme could be expected to have a substantial improvement or deterioration on receptors;
- **Moderate effect**: where the Scheme could be expected to have a noticeable improvement or deterioration on receptors;
- **Minor effect**: where the Scheme could be expected to result in a perceptible improvement or deterioration on receptors; and
- **Negligible**: where no discernible improvement or deterioration is expected as a result of the Scheme on receptors, including instances where no change is confirmed.

As set out in **Chapter 5: Approach to EIA**, effects that are classified as **moderate or above** are considered to be **significant**. Effects classified as minor or below are considered to be **not significant**.

7.4. BASELINE CONDITIONS

Table 7-13 and **Table 7-14** present a summary of the baseline noise survey results. This information has been used to validate the noise model. A complete set of results in presented in **Appendix 7.1**.

Table 7-13 - Long Term Unattended Noise Survey Results

Measurement Location	Road Traffic Noise Level, $L_{A10, T}$ dB		Typical Ambient Sound Level, L_{Aeq} dB		Typical Background Sound Level, L_{A90} dB	
	Daytime (06:00 – 24:00)	Night-time (23:00 – 07:00)	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
LT1	45	40	44	40	38	26
LT2	67	53	63	57	49	23
LT3	47	39	46	41	46	30
LT4	45	40	47	43	42	32

Table 7-14 - Short Term Attended Noise Survey Results (Daytime)

Measurement Location	Road Traffic Noise Level, LA10,,T dB	Typical Ambient Sound, LAeq,,T dB	Typical Background Sound Level, LA90,,T dB
ST1	44	42	38
ST2	75	71	51
ST3	68	65	52
ST4	74	60	51

7.4.1. The baseline noise survey results show that road traffic is the dominant noise source across the study area. Locations close to Barnham Road (LT2 and ST2) and Fontwell Avenue (ST3 and ST4) are exposed to high levels of road traffic noise during the daytime (67 dB LA10, 18h and 68-75 dB LA10, 15min). During the night-time, road traffic noise levels fall to approximately 53dB LA10, T.

7.4.2. At locations further away from the main road links, along the route of the Scheme (LT1, LT3, LT4 and ST1), ambient daytime sound levels range between 42-47 dB LAeq,T. During the night-time, ambient sound levels range between 40-43 dB LAeq, T.

FUTURE BASELINE

7.4.3. Future baseline noise levels have been modelled in accordance with DMRB LA111 for the opening year (2023) and future year (2038). The non-project change (DMFY compared to the DMOY) is presented in **Table 7-15**.

Table 7-15 - Do–minimum (Years 2023 and 2038) Traffic Noise Reporting Table

Impact; Change in noise level			Daytime $L_{A10, 18h}$ dB (0600 – 2400h)	
			Number of Dwellings	Number of other sensitive receptors
Adverse; Increase in noise level, dB	Negligible	< 3	1,745	13
	Minor	3 – 4.9	1	0
	Moderate	5 – 9.9	0	0
	Major	10 +	0	0
No Change		0	1	0
Beneficial; Decrease in noise level, dB	Negligible	< 3	45	2
	Minor	3 – 4.9	0	0
	Moderate	5 – 9.9	0	0
	Major	10 +	0	0
Totals			1,792	15

7.4.4. In the long term, the noise modelling results show that approximately 97% of residential properties within the study area would experience a negligible increase in noise level (less than 3 dB) during the daytime in the DMFY scenario in comparison to the DMOY. Properties subject to either no change or a decrease in noise level would equate to approximately 3% of the total number of dwellings studied. One dwelling would be subject to a minor increase in noise level without the Scheme in the DMFY. All other noise-sensitive receptors would experience a negligible change in noise level.

7.4.5. The predicted noise levels are based on the traffic data provided. The traffic modelling includes the trip generation resulting from committed developments in the area (refer to Traffic Forecasting Report' for details). These forecasts include growth in traffic as a result of future developments, and forecasts have been produced in line with DfT guidance. These are described in more detail in the Transport Assessment (**Appendix 8.1**).

7.4.6. The predicted future baseline noise levels in 2023 have been used to determine the ambient baseline noise level (LAeq) for the day (07:00 – 19:00) calculated using Method 3 for non-motorway roads set out in Transport Research Laboratory (TRL) report for converting traffic noise (Ref 7.16). These noise levels have been used to establish the LOAEL at representative receptors using the assessment of construction noise and are provided in **Appendix 7.2**.

7.5. SENSITIVE RECEPTORS

7.5.1. The following definitions taken from guidance within DMRB LA111 (Ref 7.8), have been used to identify sensitive receptors within the study to include within the assessment:

- Noise sensitive receptors including dwellings, hospitals, healthcare facilities, education facilities, community facilities, Environmental Noise Directive (END) quiet areas, international and national or statutorily designated sites, public rights of way and cultural heritage assets; and
- Vibration sensitive receptors including dwellings, hospitals, healthcare facilities, education facilities, community facilities, buildings containing vibrations sensitive equipment and cultural heritage.

7.5.2. All key sensitive receptor locations are shown on **Figure 7-1: Noise Assessment Study Area**, Sensitive Receptors and Noise Survey Locations.

7.5.3. A request for a Scoping Opinion has been made to Arun District Council in respect of a residential development with up to 500 dwellings, a care home and public open space on land adjacent to the Scheme between Eastergate Lane and Barnham Road (planning ref BN/122/19/EIS) (known as 'the Adjacent Proposed Development'). A Scoping Opinion was issued by Arun District Council in April 2020 (Ref 7.18). The Scoping Opinion requires any planning application for the site to be supported by a noise and vibration report which considers 'the proposed A29 with regard to traffic flow, noise and vibration' (i.e. the Scheme). As the Scheme would be constructed before, or in parallel with, any new development, it is not appropriate to determine a 'before' Scheme noise level and therefore to assess the change in noise level at these locations as required in the DMRB guidance.

7.5.4. There is also a recommendation in the Scoping Opinion that 'the design of dwellings will feature glazing and façade treatments to meet the relevant standards, taking into account the proposed highway'. As the requirement to achieve acceptable levels of noise at new dwellings from road traffic noise, including that generated by the Scheme, will be with the developer, the noise impact at these future receptors has been scoped out of this assessment.

7.5.5. However, as part of the iterative design process for the Scheme, discussions have been held with the developer and the proposed outline site layout has been reviewed. As part of the iterative design process for the noise mitigation feature which forms part of the Scheme design, the use of an absorptive material is proposed for the north section (approximately 280m) which faces the site of the potential new residential development. This is to reduce the potential for the reflection of noise from the noise mitigation barrier positioned on the eastern side of the Scheme to any new dwellings on the western side of the Scheme.

7.6. ASSESSMENT OF EFFECTS, MITIGATION AND RESIDUAL EFFECTS

CONSTRUCTION PHASE

7.6.1. During the construction phase, the contractor will apply Best Practicable Means (BPM) as defined under Section 72 of the CoPA (Ref 7.1) to minimise noise and vibration impact. As set out in **Chapter 3: Description of the Scheme**, the normal site working (construction) hours are proposed to be the following which are in keeping with the LPA guidelines:

- Monday to Friday 7:00 to 18:00 (please note, Noise Generating Activities (as defined by BS 5228) will be limited to an 8:00 start); and
- Saturdays 8:00 to 13:00.

7.6.2. Normal site operations are expected to be limited to the hours above. However, should works outside the hours specified above (including night-time working) be required then prior consent would need to be sought from the LPA under Section 61 of the Control of Pollution Act 1974

7.6.3. The anticipated duration of construction works is 12 months.

Noise

7.6.4. Construction activity inevitably leads to some degree of noise disturbance at locations in close proximity to the construction activities. It is, however, a temporary source of noise. The noise levels generated by construction activities would have the potential to impact upon nearby noise sensitive receptors. Noise levels at any one location will vary as different combinations of plant and machinery are used and throughout the construction of the Scheme as the construction activities and locations change.

7.6.5. The LOAEL and SOAEL used in the assessment of construction noise for representative receptors, as determined by the predicted ambient day-time noise level (LAeq, 12h) and the BS 5228 guidance (Table 7) respectively. These are provided in **Appendix 7.2**.

The assessment of likely impacts from noise during construction is summarised in **Table 7-16** and further details presented in **Appendix 7.2**.

Table 7-16 - Noise (Construction)

Assessment Component	Commentary
Disturbance to sensitive receptors from the generation of noise from on-site activities during the construction phase of the Scheme	The predicted construction noise levels at the representative noise sensitive receptors closest to the construction works are presented in Appendix 7.2. These are worst-case predicted noise levels based on all plant working at the closest approach. During setup of the three site compounds, it is unlikely that noise levels generated would exceed the relevant LOAEL or SOAEL at the representative receptors. During other phases of the constructions works, there is the potential risk that the SOAEL would be exceeded at times during the construction works when working at the closest approach to receptors. Guidance in BS 5228-1 and DMRB LA111 states that a significant impact is deemed to occur if the duration of construction noise exceeds 10 or more days or nights in any consecutive days or nights, or more than 40 days (or nights) in any 6 consecutive months. The scheduling of construction works will be determined by the contractor. However, it is anticipated that construction activities, working at the closest approach to receptors, and generating noise which exceed the durations specified, is unlikely. The sensitivity of receptors is considered to be high, and the magnitude of change prior to mitigation, is considered to be major. Therefore, there is likely to be a temporary, short-term major adverse effect on receptors (significant) prior to the implementation of mitigation measures.

Secondary Mitigation	During the construction phase, the contractor will apply Best Practicable Means (BPM) as defined under Section 72 of the CoPA (Ref 7.1) to minimise noise and vibration impact. General methods of control will include: The appropriate selection of plant, construction methods and programming: Only plant conforming with or better than relevant national or international standards, directives or recommendations on noise or vibration emissions will be used. Construction plant will be maintained in good condition with regards to minimising noise output and workers exposed to harmful noise and vibration; Construction plant will be operated and maintained appropriately, having regard to the manufacturer's written recommendations or using other appropriate operation and maintenance programmes which reduce noise and vibration emissions. All vehicles and plant will be switched off when not in use; Design and use of site hoardings and screens, where necessary, to provide acoustic screening at the earliest practicable opportunity. Where practicable, gates will not be located opposite buildings containing NSRs; Choice of routes and programming for the transport of construction materials, spoil and personnel to reduce the risk of increased noise and vibration impacts due to the construction of the junction; Vehicle and mechanical plant used for the purpose of the works will be fitted with effective exhaust silencers, be maintained in good working order and operated in such a manner as to minimise noise emissions. Plant items that comply with the relevant EU/UK noise limits applicable to that equipment will be used; Construction plant and activities will be positioned to minimise noise at sensitive locations; Equipment that breaks concrete by munching or similar, rather than by percussion, will be used as far as is practicable; and Mufflers will be used on pneumatic tools. The localised use of temporary site hoardings or noise barriers has not been included in the assessment of construction noise in order to represent a worst-case scenario. BS 5228 advises that noise barriers can provide a reduction in noise levels of 5dB when the top of the plant is just visible over the noise barrier, and 10dB when the plant is completely screened from a receptor. The effectiveness of a noise barrier depends upon its length, effective height, position relative to the noise source and to the receptors, and the material from which it is constructed.
Residual Effects and Monitoring	The sensitivity of receptors is high and the magnitude of change, following mitigation, is moderate. Therefore, there is likely to be a direct, temporary, short-term moderate adverse residual effect on receptors (significant) following the implementation of mitigation measures.

Vibration

7.6.6. The activities likely to generate potentially significant vibration levels during construction are earthworks including landscaping, road construction (pavement) and other works using vibratory rollers or compactors. Vibration levels have been calculated in accordance with the

procedures set out in BS 5228-2 (Table E.1). Source data for vibratory rollers and compactors have been taken from TRL Report 429 'Groundborne vibration caused by mechanised construction works' (Ref 7.19). Predicted maximum PPV levels at receptors are provided in **Appendix 7.2**.

7.6.7. For human receptors the LOAEL is defined as a PPV of 0.3mms-1, this being the point at which construction vibration is likely to become perceptible. The SOAEL is defined as a PPV of 1.0mms-1, this being the level at which construction vibration can be tolerated with prior warning.

7.6.8. The assessment of likely impacts from vibration during construction is summarised in **Table 7-17**.

Table 7-17 - Vibration (Construction)

Assessment Component	Commentary
Disturbance to sensitive receptors from the generation of vibration from on-site activities during the construction phase of the Scheme	The predicted maximum PPV levels at the representative receptors closest to the construction works are presented in Appendix 7.2 for activities using vibratory rollers or compactors. There is a risk of the SOAEL being exceeded during works undertaken using vibratory compactors or rollers when working at the Barnham Road and Footwell Avenue roundabouts/junction, when in close proximity to receptors. For building damage, BS 7385-2 guidance indicates that for levels of continuous vibrations below 6.0mms-1, the risk of building damage is negligible. The predicted levels do not exceed this level of vibration at any receptor location. Therefore, the risk for potential building damage during construction is considered negligible. The sensitivity of receptors is considered to be high, and the magnitude of change prior to mitigation, is considered to be major. Therefore, there is likely to be a direct, temporary, short-term major adverse effect on receptors (significant) prior to the implementation of mitigation measures.
Secondary Mitigation	During the construction phase, the contractor will apply Best Practicable Means (BPM) as defined under Section 72 of the CoPA (Ref 7.1) to minimise noise and vibration impact. Specific methods of control for vibration will include: ▪ Selection of low vibratory equipment and methodologies; ▪ Contact details for nominated site contact for local residents to deal with complaints and engaging with local residents; and ▪ No start-up or shut down of vibratory plant e.g. rollers or compactors, within 50m of receptors so as to prevent exceedance of the SOAEL.
Residual Effects and Monitoring	The sensitivity of receptors is high and the magnitude of change, following mitigation, is minor/moderate. Therefore, there is likely to be a direct, temporary, short-term minor/moderate adverse residual effect on receptors (not significant) following the implementation of mitigation measures.

OPERATIONAL PHASE

7.6.9. The Scheme design includes a 3m high noise mitigation feature with a length of approximately 440m. As part of the iterative design process, the height and extent of the noise mitigation feature has been optimised within the engineering constraints of the Scheme, namely:

- Off-set from the carriageway edge by 3m to allow for drainage and road signs;
- A maximum overall height of 3m due to land constraints and limited width available at the southern end of the Scheme; and
- Location of attenuation pond constrained due to the vertical alignment of the road in order to provide a suitable drainage solution.

7.6.10. Due to the speed limit of the Scheme (30 mph), the use of a thin surfacing or 'low noise' material would provide a negligible reduction in road traffic noise levels and is therefore not proposed as part of the Scheme.

Operational Road Traffic Noise

7.6.11. The magnitude of change has been derived by comparing the do-minimum scenario in the opening year (DMOY) against the do-something scenario the opening year (DSOY) (short term change) and the future year (DSFY) (long term change). This provides an initial assessment for establishing potential significant noise effects. The Scheme design includes a noise mitigation feature with a height of 3m, the location of which is shown in **Figure 7-5** and **Figure 7-6**.

7.6.12. The number of dwellings with the potential to qualify under the Noise Insulation Regulations 1975 (amended 1988) (Ref 7.3), have been identified.

7.6.13. Figures have been prepared from the results of the noise model to support the assessment focus on the magnitude of impacts (change) and location of dwellings between the LOAEL and SOAEL. The following figures have been prepared:

- Magnitude of impact DMRB noise change contours: The noise impact in accordance with DMRB LA111 (Ref 7.8) for short term and long term. Noise contours have been plotted at a height of 4 metres; and
- Location of dwellings exceeding the LOAEL, where a moderate or major magnitude of change (increase), in the short term and long term has been plotted.

7.6.14. The results of the DMRB assessment are presented in the tables in **Appendix 7.3** along with the figures described above. The results are summarised in **Table 7-18** below. The following bullet points provide a summary for the key indicators supporting the assessment:

- No dwellings are predicted to experience a significant change in noise level and be exposed to noise levels above the relevant SOAEL in any scenario;
- The total number of dwellings exposed to noise levels above the SOAEL decreases in all scenarios (day and night) with the Scheme compared to the do-minimum year opening (DMOY);
- In the short term (day-time), four dwellings are predicted to experience a major increase in noise level (greater than 5 dB). Three are below the LOAEL, and one is between the LOAEL and SOAEL (see **Figure 7-5**);

- In the short term (night-time), two dwellings are predicted to experience a major increase in noise level (greater than 5 dB). The predicted absolute noise level at one property is equal to the LOAEL and only marginally exceeds the LOAEL (by less than 0.5 dB) at the other property. Assuming a reduction of 15 dB through a partially open window, night-time noise levels within bedrooms would be below the recommended internal noise limits for sleeping as set out in BS 8223 (Ref 7.20);
- In the long term, no receptors (dwellings or OSRs) are predicted to experience a major increase in noise levels. A moderate increase in noise level (3-5 dB) is shown at 45 dwellings during the day-time, 23 of which are between the LOAEL and SOAEL, the remaining 22 are below the LOAEL. During the night-time, 38 dwellings show a moderate increase in noise level, 36 of which are between the LOAEL and SOAEL. The remaining 2 are below the LOAEL (see **Figure 7-6**);
- In all scenarios, more dwellings are predicted to experience a minor, moderate or major beneficial (decrease) change in noise level than are predicted to experience an adverse (increase) change;
- No changes (either increase or decrease) greater than minor magnitude are predicted at OSRs in any scenario;
- 10 dwellings have been identified as having the potential to qualify under the Noise Insulation Regulations 1975 (as amended 1988); and
- The final significance has been determined based on guidance contained within DMRB LA111 including the absolute noise level in relation to the LOAEL and SOAEL, acoustic context and different magnitude of impact in the long term compared to the short term.

Table 7-18 - Road Traffic Noise (Operation)

Assessment Component	Commentary
Operational Road Traffic Noise	Dwellings In the short term day-time period, 97 dwellings would experience a minor increase in noise level (less than 3 dB). 28 dwellings would experience a moderate increase in noise levels (between 3-5 dB). Four dwellings would experience a major increase (more than 5 dB). 902 dwellings would experience a decrease in noise level, 250 of these would be a minor decrease and six would experience a moderate decrease. Of the four dwellings predicted to experience a major increase, three are below the LOAEL, and one is between the LOAEL and SOAEL. None are above the day-time SOAEL. For dwellings with a moderate increase in day-time noise levels, none are above the SOAEL. Seven are between the LOAEL and SOAEL with the remaining 21 subject to noise levels below the LOAEL. During the night-time (short term), 76 dwellings would experience a minor increase in noise levels, 21 dwellings would experience a moderate increase and two a major increase. 927 dwellings would experience a decrease in noise level, of which 226 would be minor and five would be moderate. The two dwellings with a major increase in night-time noise are exposed to absolute levels between the LOAEL and SOAEL.

	In the long term (day-time), 80 dwellings would experience a minor increase in noise level (less than 5 dB). 45 dwellings would experience a moderate increase in noise levels (between 5-10 dB). 1,068 dwellings would experience a decrease in noise level, 122 of which would be a minor decrease and 15 would experience a moderate decrease. For dwellings with a moderate increase in day-time noise level, 22 are below the LOAEL, the remaining 23 are between the LOAEL and SOAEL. During the night-time (long term), 59 dwellings would experience a minor increase in noise levels and 38 dwellings which would experience a moderate increase. 1,068 dwellings would experience a decrease in noise level, 70 of which would be a minor decrease and 10 a moderate decrease. For dwellings with a moderate increase in night-time noise levels, two are below the LOAEL and the remaining 36 are between the LOAEL and SOAEL. Other Noise Sensitive Receptors (OSRs) In the short term, the number of OSRs predicted to experience a minor increase in noise level is five during both the day-time and night-time periods. Nine OSRs would experience a minor decrease in noise level in the long-term during both the day and night periods. In the long term, negligible increases (less than 3dB) are predicted at six OSRs in both the day and night periods. Two OSRs are subject to a minor decrease in noise levels in both the day and night periods. Seven show a negligible decrease. No changes (either increase or decrease) greater than minor are predicted in any scenario. The final significance has been determined based on guidance contained within DMRB LA111 and has considered the following: A small number of dwellings (three) within close proximity of the Scheme are predicted to experience a major change in the day-time noise level in the short term. In the long term, the predicted change is of moderate magnitude and therefore less than in the short term. The predicted absolute noise levels are below the LOAEL. Two dwellings within close proximity of the Scheme are predicted to experience a major change in the night-time noise level in the short term. In the long term, the predicted change is of moderate magnitude and therefore less than in the short term. The predicted absolute noise levels are equal to, or marginally above (less than 0.5 dB) the LOAEL. In all scenarios, more dwellings are predicted to experience a minor, moderate or major beneficial (decrease) change in noise level than are predicted to experience an adverse (increase) change. The number of dwellings within the study area exposed to noise level above the SOAEL during both the day and night time periods is reduced with the Scheme. A minor, or lower, magnitude of change in noise level is predicted at all OSRs. The sensitivity of dwellings is considered to be high, and the magnitude of change prior to mitigation, is considered to be moderate. Therefore, there is likely to be a direct, long-term minor adverse effect on dwellings (not significant) prior to the implementation of secondary mitigation measures. The sensitivity of OSRs is considered to be high, and the magnitude of change prior to mitigation, is considered to be minor. Therefore, there is likely to be a direct, long-term minor adverse effect on dwellings (not-significant) prior to the implementation of secondary mitigation measures.

Secondary Mitigation	No additional noise mitigation for operational road traffic noise is proposed.
Residual effects and monitoring	The sensitivity of dwellings is considered to be high, and the magnitude of change prior to mitigation, is considered to be moderate. Therefore, there is likely to be a direct, long-term minor adverse effect on dwellings (not significant). The sensitivity of OSRs is considered to be high, and the magnitude of change prior to mitigation, is considered to be minor. Therefore, there is likely to be a direct, long-term minor adverse effect on dwellings (not significant).

Substation Noise

7.6.15. The Scheme involves the relocation of a substation at the western end of the Scheme, close to the junction with the existing A29/Fontwell Avenue. Sound power data for the substation has been provided by Scottish and Southern Electricity Networks (SSEN). This indicates that the sound power is 61 dB at 100 Hz. The predicted noise level from the substation at the closest noise sensitive receptor to the relocated substation has been calculated and compared to the background sound level at night. The background sound level has been taken from data measured during the noise survey at a representative location, namely LT2 on Barnham Road (see **Table 7-19**).

Table 7-19 - Predicted noise levels from substation

Receptor	Predicted Noise Level from substation, dB LAeq	Rating Noise Level* from substation, dB LA,r	Typical Background Sound Level, LA90 dB (23:00 – 07:00)	Comparison with Background Sound Level
Lyndhurst	15	18	23	-5

* 3dB penalty applied due to potential for tonal element of noise at 100 Hz generated by substation in line with BS 4142 guidance

7.6.16. **Table 7-19** shows that the predicted Rating Level is below the existing background sound level at the closest noise sensitive receptor to the Scheme. It is noted that minor increases in road traffic noise levels as a result of the Scheme are predicted at this location. During the night-time, the background sound level (LA90) is largely unaffected by noise from road traffic and therefore the existing ambient background sound level is considered representative of the future baseline with the Scheme operational.

The results of the assessment of noise from the related substation summarised in **Table 7-20** below.

Table 7-20 - Noise from substation (Operation)

Assessment Component	Commentary

Noise from relocated substation	The predicted rating noise level from the relocated substation at the closest noise sensitive receptor (a dwelling) has been compared to the background sound level at night-time and is shown to be lower. In line with guidance in BS 4142 (Ref 7.10) this is an indication of low impact, depending on context. The assessment has considered a worst-case scenario by comparing the noise from the substation to night-time background sound levels which are lower than those during the day-time. Therefore the predicted noise level is below the LOAEL set for fixed plant. The sensitivity of dwellings is considered to be high, and the magnitude of change prior to mitigation, is considered to be negligible Therefore, there is likely to be a direct, long-term negligible effect on dwellings (not significant) prior to the implementation of mitigation measures.
Secondary Mitigation	No further noise mitigation is proposed
Residual effects and monitoring	The sensitivity of dwellings is considered to be high, and the magnitude of change prior to mitigation, is considered to be negligible. Therefore, there is likely to be a direct, long-term negligible effect on dwellings (not significant).

7.7. LIMITATIONS AND ASSUMPTIONS

7.7.1. The assumptions and limitations which apply to this assessment are set out in detail within this chapter. These are summarised below:

- Information on construction activities and plant has been provided by a contractor appointed to provide reasonable assumptions on the likely works;
- The operational road traffic noise assessment has used traffic flows provided. The details of which, including any limitations and assumptions are contained within the Traffic Forecasting Report (see **Appendix 8.1**);
- The parameters used within the operational road traffic noise model are listed in Section 7.3.28, and
- Noise data for the relocated substation has been provided by SSEN.

7.8. SUMMARY

7.8.1. **Table 7-21** provides a summary of the findings of the assessment.

Table 7-21 - Summary of Effects Table for Noise and Vibration

Description of Effects	Receptor	Significance and Nature of Effects Prior to Secondary Mitigation	Summary of Secondary Mitigation	Significance and Nature of Residual Effects
Construction Phase				
Noise	Residential dwellings	Major - / T / D / ST	Use of BPM, specifically: All vehicles and plant will be switched off when not in use; Design and use of site hoardings and screens, where necessary, to provide acoustic screening at the earliest practicable opportunity. Where practicable, gates will not be located opposite buildings containing NSRs; Vehicle and mechanical plant fitted with effective exhaust silencers; Positioning of construction plant and activities to minimise noise at sensitive locations; Equipment that breaks concrete by munching or similar, rather than by percussion, and The use of mufflers on pneumatic tools.	Moderate - / T / D / ST

Description of Effects	Receptor	Significance and Nature of Effects Prior to Secondary Mitigation	Summary of Secondary Mitigation	Significance and Nature of Residual Effects
Vibration	Residential dwellings	Major - / T / D / ST	Use of BPM, specifically: selection of low vibratory equipment and methodologies; contact details for nominated site contact for local residents to deal with complaints and engaging with local residents; and no start-up or shut down of vibratory plant e.g. rollers or compactors, within 50m of receptors.	Minor/Moderate - / T / D / ST
Operational Phase				
Road traffic noise	Dwellings	Minor - / P / D / LT	N/A	Minor - / P / D / LT
Road traffic noise	Other Sensitive Receptors	Minor - / P / D / LT	N/A	Minor - / P / D / LT
Noise from relocated substation	Dwellings	Negligible N/A / P / D / LT	N/A	Negligible N/A / P / D / LT

Key to table:

+ / - = Beneficial or Adverse P / T = Permanent or Temporary, D / I = Direct or Indirect, ST / MT / LT = Short Term, Medium Term or Long Term, N/A = Not Applicable

7.9. REFERENCES

- Reference 7.1: Control of Pollution Act 1974.
- Reference 7.2: Environmental Noise (England) Regulations 2006.
- Reference 7.3: Noise Insulation Regulations 1975, as amended 1988.
- Reference 7.4: National Planning Policy Frameworks (NPPF).
- Reference 7.5: Noise Policy Statement for England (NPSE).
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- Reference 7.7: British Standard (BS) 5228 Code of practice for noise and vibration control on construction and open sites. Part 1 – Noise, Part 2 – Vibration.
- Reference 7.8: Highways England, (2020), Design Manual for Roads and Bridges. LA111 (Revision 2) – Noise and Vibration. https://www.standardsforhighways.co.uk/prod/attachments/cc8cfcf7-c235-4052-8d32-d5398796b364 [Accessed June 2020].
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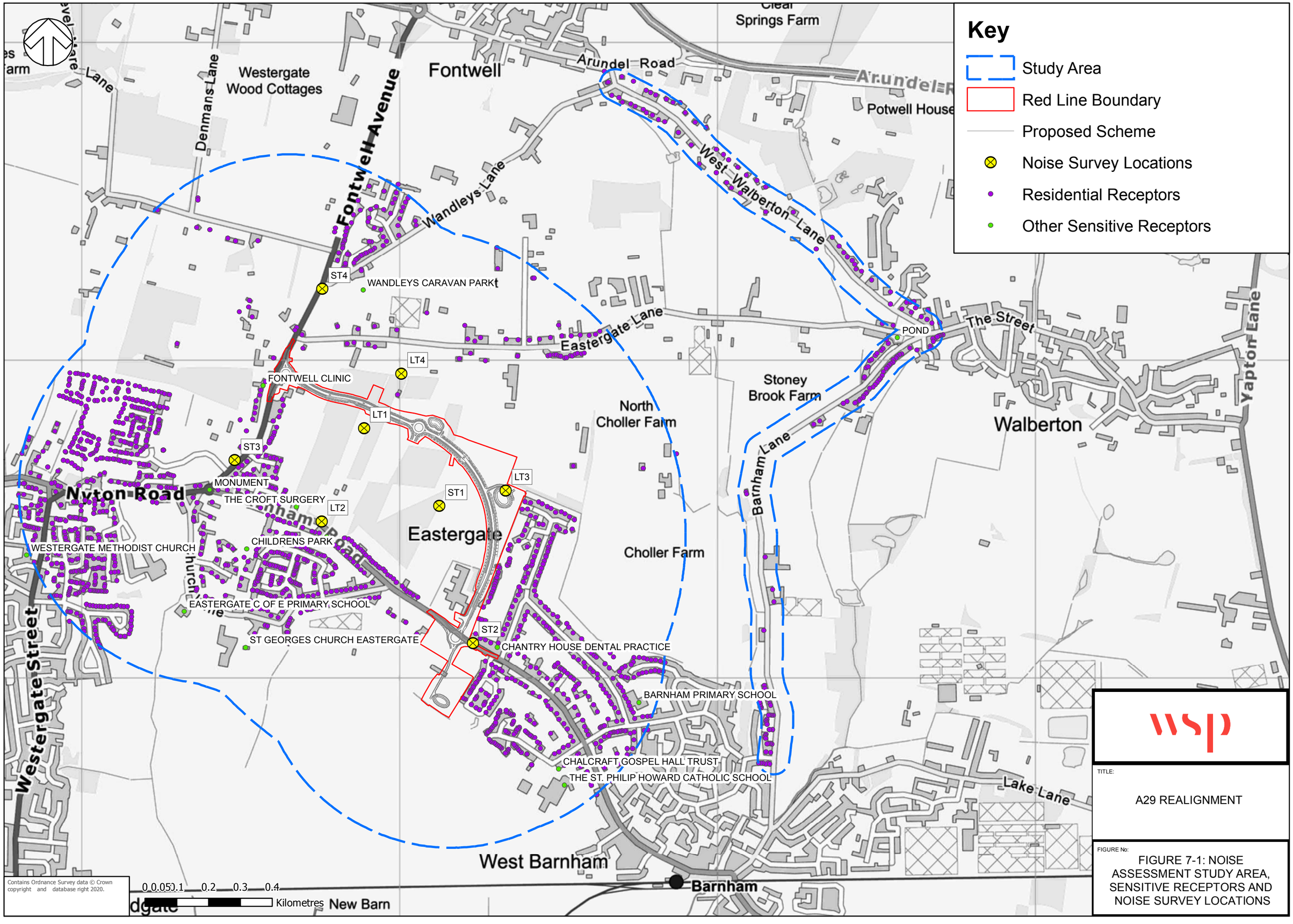
- Reference 7.20: BS 8233 (2014) Guidance on Sound Insulation and Noise Reduction for Buildings.



wsp

TITLE:

A29 REALIGNMENT

FIGURE No:

FIGURE 7-1: NOISE ASSESSMENT STUDY AREA, SENSITIVE RECEPTORS AND NOISE SURVEY LOCATIONS

Key

- Study Area
- Red Line Boundary
- Proposed Scheme
- Noise mitigation feature (absorptive)
- Noise mitigation feature (reflective)
- Residential Receptors
- Other Sensitive Receptors

Short Term Noise Impact

LA10,18hr, dB

- Major Beneficial
- Moderate Beneficial
- Minor Beneficial
- Negligible / No Change
- Minor Adverse
- Moderate Adverse
- Major Adverse

0 0.05 0.1 0.2 0.3 0.4 Kilometres

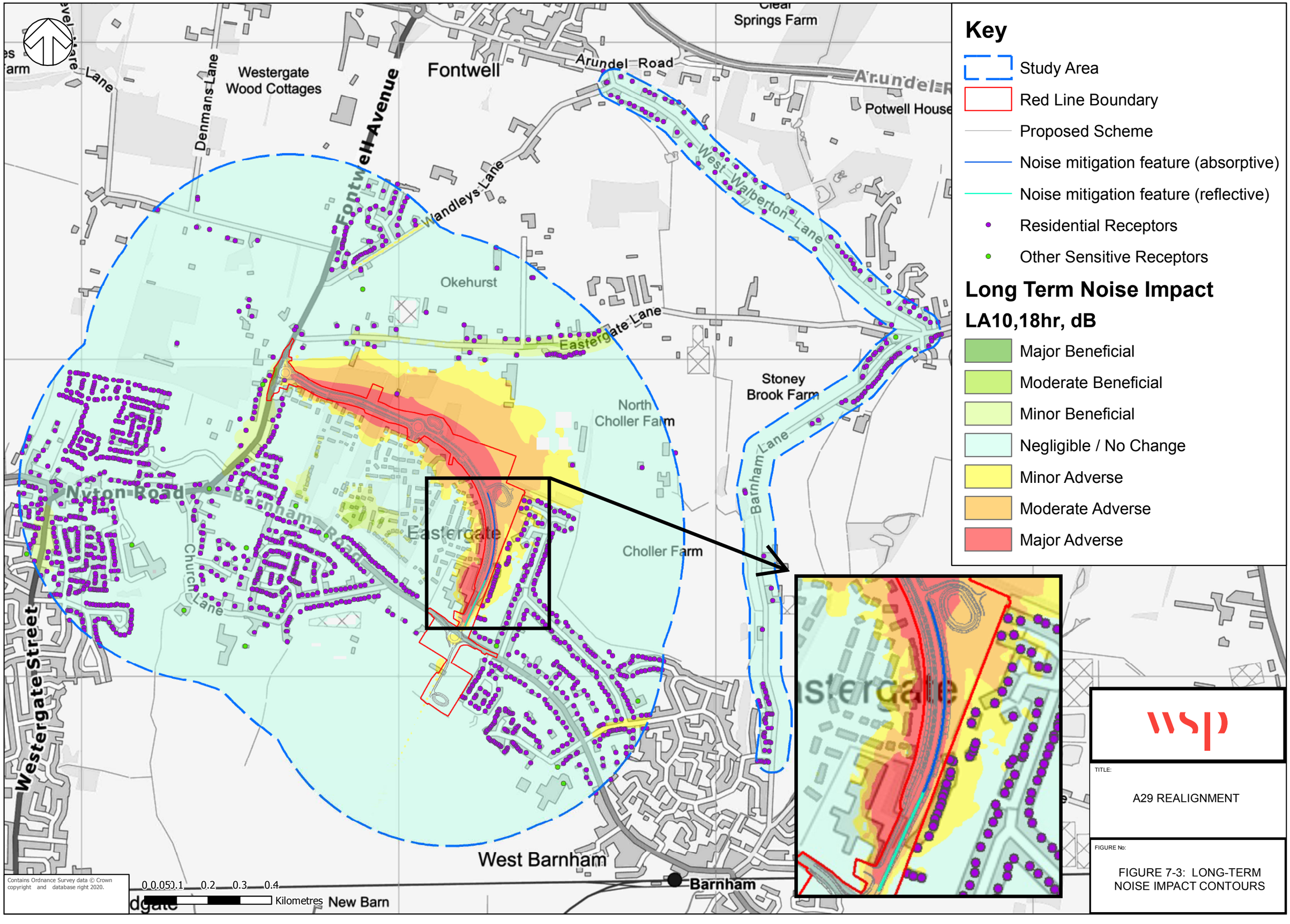
wsp

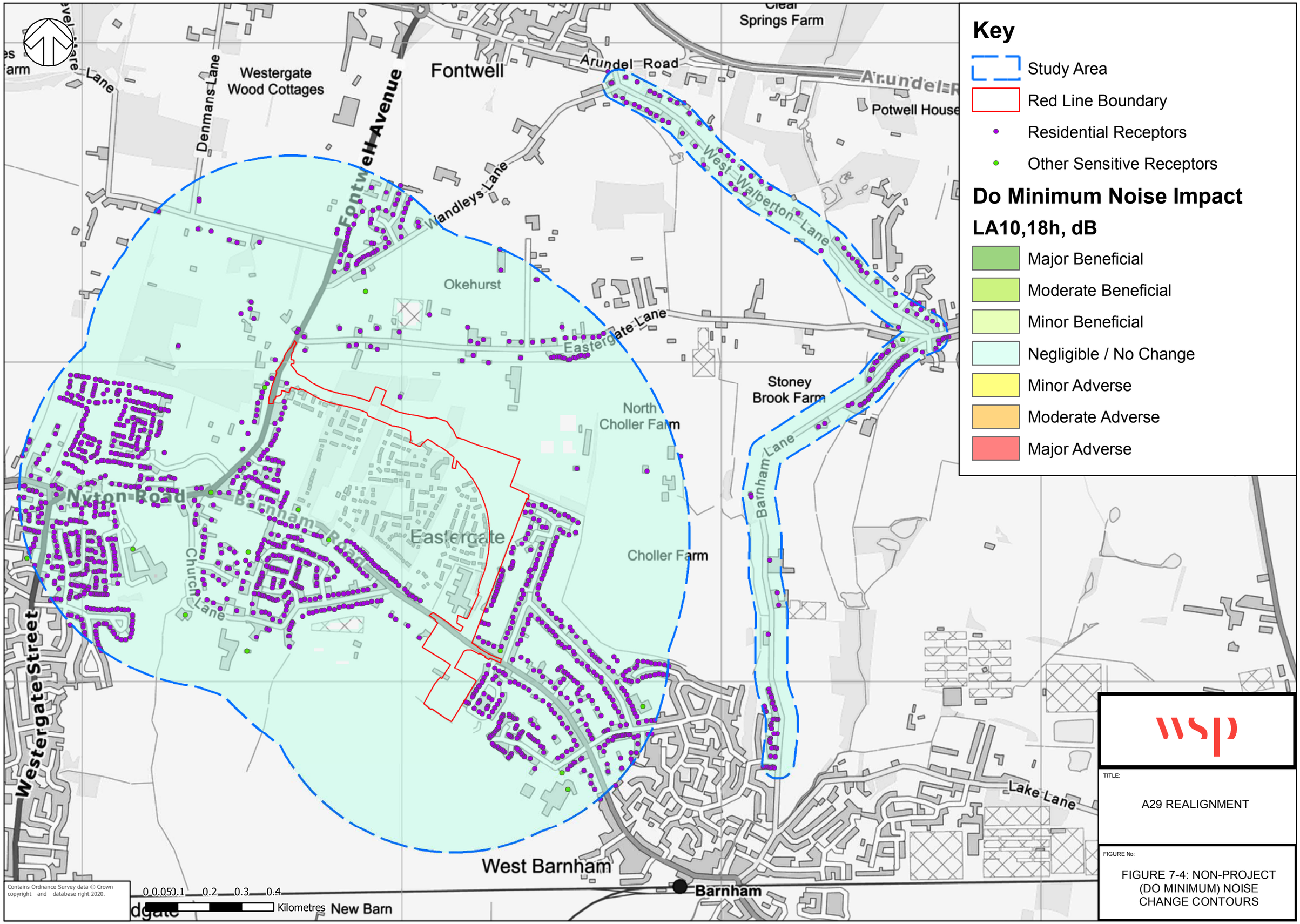
TITLE:

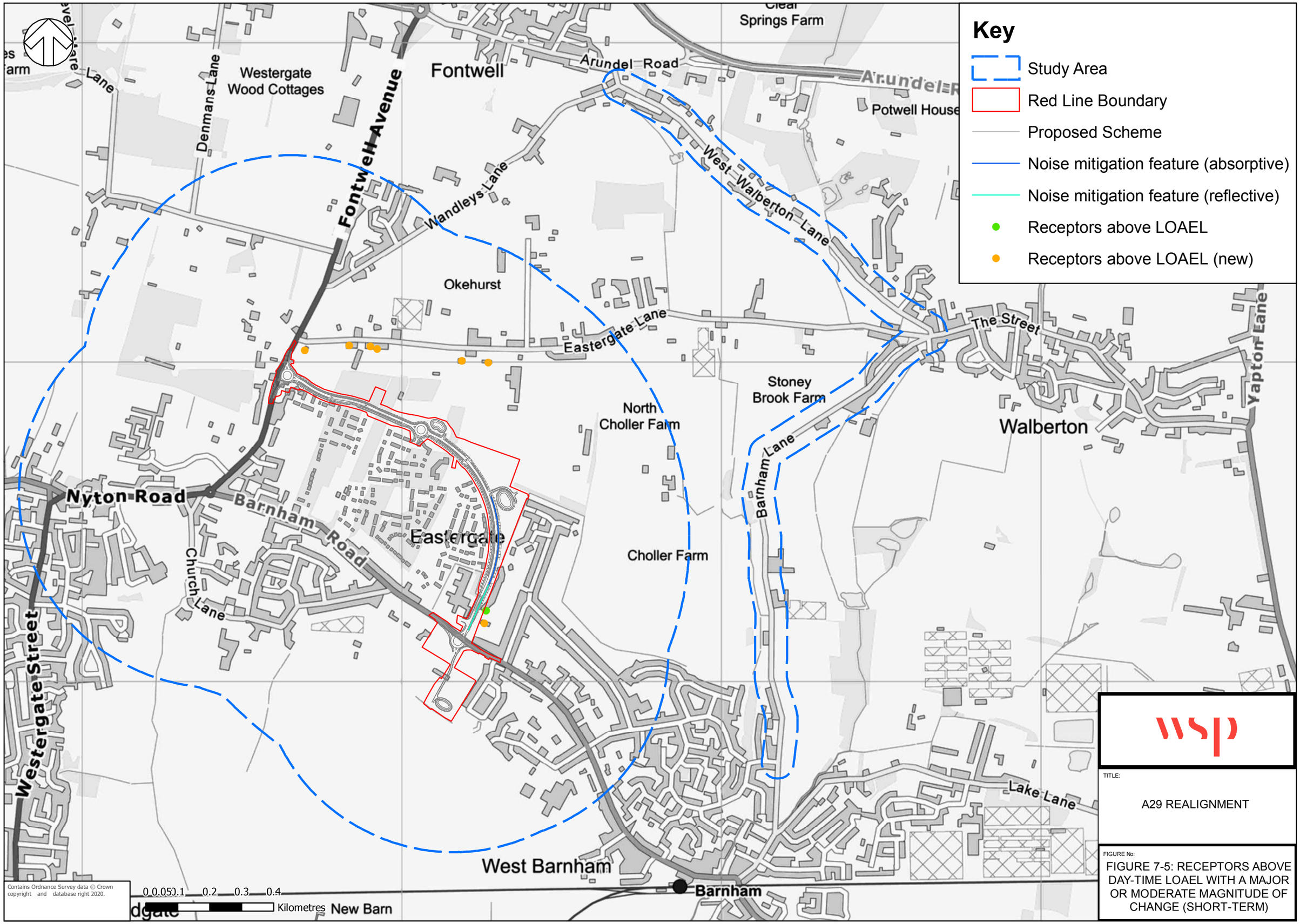
A29 REALIGNMENT

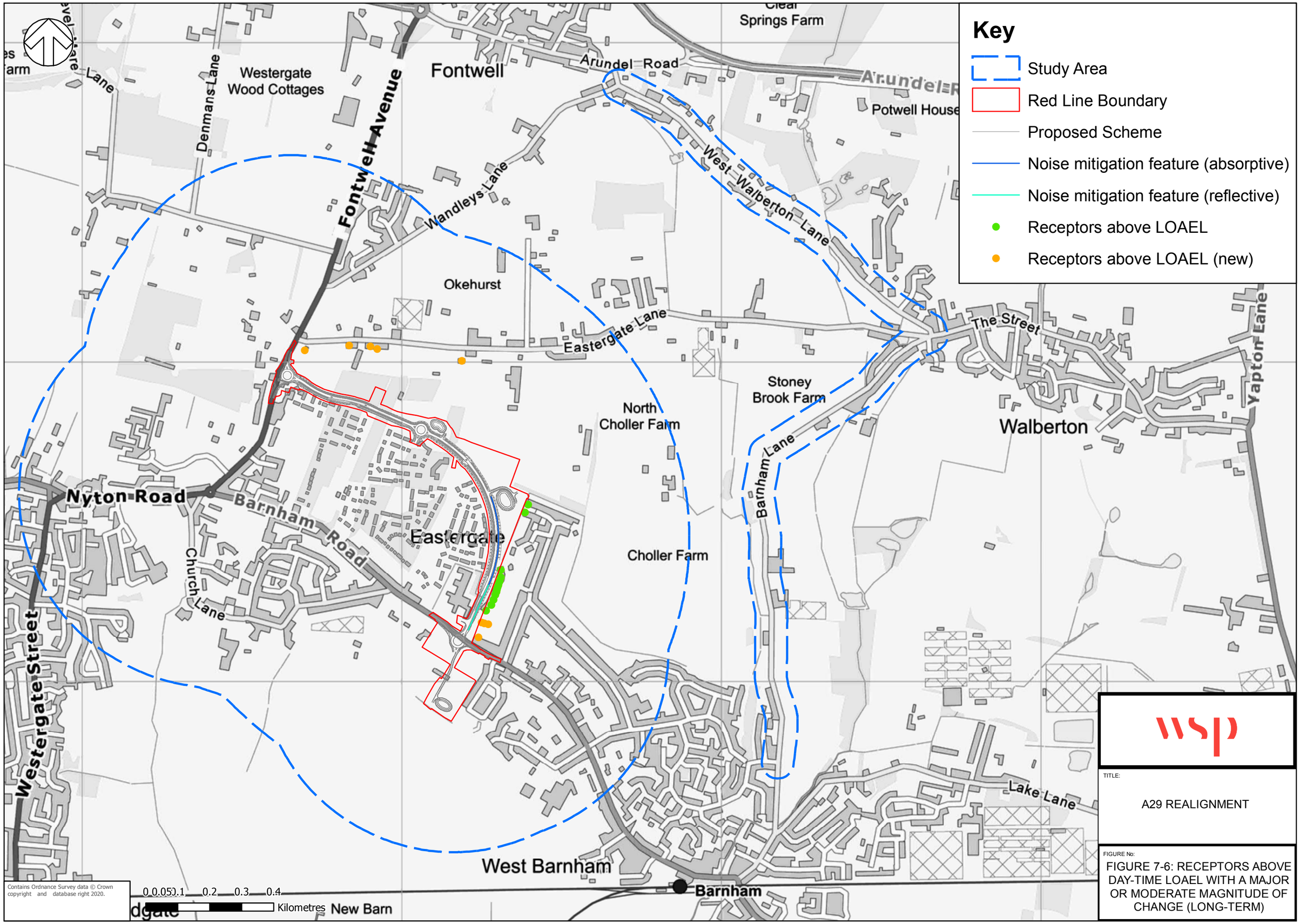
FIGURE No:

FIGURE 7-2: SHORT-TERM NOISE IMPACT CONTOURS


Key
Study Area
Red Line Boundary
Proposed Scheme
Noise mitigation feature (absorptive)
Noise mitigation feature (reflective)
Residential Receptors
Other Sensitive Receptors
Long Term Noise Impact
LA10,18hr, dB
Major Beneficial
Moderate Beneficial
Minor Beneficial
Negligible / No Change
Minor Adverse
Moderate Adverse
Major Adverse
Fontwell
Westergate Wood Cottages
Denmans Lane
Fontwell Avenue
Arundel Road
Clear Springs Farm
Potwell House
Wandleys Lane
West Walberton Lane
Okehurst
Eastergate Lane
Stoney Brook Farm
North Choller Farm
Nyton Road
Bognor Road
Bognor Road
Church Lane
Eastergate
Choller Farm
Barnham Lane
Westergate Street
West Barnham
Barnham
New Barn
Contains Ordnance Survey data © Crown copyright and database right 2020.
0 0.05 0.1 0.2 0.3 0.4
Kilometres
wsp
TITLE:
A29 REALIGNMENT
FIGURE No:
FIGURE 7-3: LONG-TERM NOISE IMPACT CONTOURS


Key
Study Area
Red Line Boundary
Residential Receptors
Other Sensitive Receptors
Do Minimum Noise Impact
LA10,18h, dB
Major Beneficial
Moderate Beneficial
Minor Beneficial
Negligible / No Change
Minor Adverse
Moderate Adverse
Major Adverse
Fontwell
Westergate Wood Cottages
Fontwell Avenue
Denmans Lane
Arundel Road
Clear Springs Farm
Potwell House
West Walberton Lane
Wandleys Lane
Okehurst
Eastergate Lane
Stoney Brook Farm
North Choller Farm
Barnham Lane
Nyton Road
Barnham Road
Church Lane
Eastergate
Choller Farm
Westergate Street
West Barnham
Barnham
Lake Lane
New Barn
0 0.05 0.1 0.2 0.3 0.4
Kilometres
Contains Ordnance Survey data © Crown copyright and database right 2020.
wsp
TITLE:
A29 REALIGNMENT
FIGURE No:
FIGURE 7-4: NON-PROJECT (DO MINIMUM) NOISE CHANGE CONTOURS


Key
Study Area
Red Line Boundary
Proposed Scheme
Noise mitigation feature (absorptive)
Noise mitigation feature (reflective)
Receptors above LOAEL
Receptors above LOAEL (new)
Fontwell
Westergate
Wood Cottages
Denmans Lane
Fontwell Avenue
Arundel Road
Clear
Springs Farm
Potwell House
Wandleys Lane
West Walberton Lane
Okehurst
Eastergate Lane
The Street
Yapton Lane
Stoney
Brook Farm
North
Choller Farm
Walberton
Barnham Lane
Nyton Road
Barnham Road
Eastergate
Church Lane
Choller Farm
Westergate Street
Lake Lane
West Barnham
Barnham
New Barn
0 0.05 0.1 0.2 0.3 0.4
Kilometres
Contains Ordnance Survey data © Crown copyright and database right 2020.
wsp
TITLE:
A29 REALIGNMENT
FIGURE No:
FIGURE 7-5: RECEPTORS ABOVE DAY-TIME LOAEL WITH A MAJOR OR MODERATE MAGNITUDE OF CHANGE (SHORT-TERM)


Key
Study Area
Red Line Boundary
Proposed Scheme
Noise mitigation feature (absorptive)
Noise mitigation feature (reflective)
Receptors above LOAEL
Receptors above LOAEL (new)
Fontwell
Westergate
Wood Cottages
Denmans Lane
Fontwell Avenue
Arundel Road
Clear
Springs Farm
Potwell House
Wandleys Lane
West Walberton Lane
Okehurst
Eastergate Lane
The Street
Yapton Lane
Stoney
Brook Farm
North
Choller Farm
Walberton
Barnham Lane
Nyton Road
Barnham Road
Eastergate
Church Lane
Choller Farm
Westergate Street
Lake Lane
West Barnham
Barnham
New Barn
0 0.05 0.1 0.2 0.3 0.4
Kilometres
Contains Ordnance Survey data © Crown copyright and database right 2020.
wsp
TITLE:
A29 REALIGNMENT
FIGURE No:
FIGURE 7-6: RECEPTORS ABOVE DAY-TIME LOAEL WITH A MAJOR OR MODERATE MAGNITUDE OF CHANGE (LONG-TERM)

8. TRANSPORT AND ACCESS

8.1. INTRODUCTION

8.1.1. This chapter provides a summary of the Transport Assessment prepared in response to the Scheme. This chapter (and its associated figures and appendices) is intended to be read as part of the wider ES.

8.1.2. This chapter is supported by the Transport Assessment (**Appendix 8.1**), Walking Cycling Horse Riding Assessment and Review (WCHAR) **(Appendix 8.2**) and Road Safety Audit (**Appendix 8.3**).

8.2. POLICY AND GUIDANCE

POLICY

8.2.1. The applicable policy framework is summarised in **Table 8-1** below.

Table 8-1 - Transport and Access: Summary of Policy

Policy	Summary
Strategic Transport Investment Programme (June 2014) – Ref. 8.1	The A29 Realignment scheme was identified as a priority for investment in the County Council's Strategic Transport Investment Programme (STIP) in June 2014 (HT07 (14-15)). This investment supports the delivery of strategic growth in Arun District which is a priority in Arun Growth Deal that identifies the A29 road improvements as a key infrastructure project for delivery as early as possible.
West Sussex Local Transport Plan (2011-2026) – Ref 8.2	The West Sussex Transport Plan 2011-2026 (WSTP) states that transport issues are a deterrent to visitors and businesses locating in Arun District. Bognor Regis currently suffers from relatively poor connectivity by road and rail which has discouraged businesses from investing and has contributed to poor economic performance relative to the rest of West Sussex and the wider region. The aims for Arun include exploring opportunities through new development to improve access along the A29, including the potential to provide a bridge over the railway line avoiding the Woodgate level crossing.
Arun Local Plan (2011-2031) – Ref 8.3	The adopted Arun Local Plan 2011-2031 (ALP) identifies Bognor Regis as a strategic location where new development is expected to help deliver much needed regeneration during the lifetime of the Plan. The ALP also allocates land at Barnham, Eastergate and Westergate (BEW) for strategic housing and commercial development and associated community infrastructure. The site allocation also includes an indicative route for the A29 Realignment to provide access to the site as part of a strategic infrastructure package to mitigate the cumulative impacts of development over the plan period. There is also potential within the strategic site allocation for further development to be delivered beyond the end of the plan period, subject to all relevant planning decisions.
Moving Britain Ahead – the Government's	The scheme will reduce congestion and will help create a better connected, more reliable transport network for those who depend on it.

Transport Investment Strategy (TIS) – Ref 8.4	It will also help to support local economic growth, development and connectivity, making Bognor Regis more attractive to investment, and will connect planned employment and housing development to markets and jobs.
Creating Growth, Cutting Carbon – Making Sustainable Local Transport Happen – Ref 8.5	The scheme will support local economic growth and development, by reducing congestion, and improving the capacity and efficiency of the local road network.
The Road Investment Strategy (RIS) 2015/16 to 2019/20 – Ref 8.6	The scheme will complement the RIS by increasing capacity, reducing congestion, supporting economic growth, and improving connectivity between the Strategic Road Network (SRN) and Bognor Regis.
National Planning Policy Framework (NPPF, 2012 and 2018 update) – Ref 8.7	The scheme will support sustainable development by improving access to new housing and employment developments. It will incorporate improved facilities for pedestrians and cyclists, and is a good fit with a wider strategy to encourage sustainable access to new development.

8.2.2. Based on the above review it is considered that the Scheme is consistent with the policies and objectives set out in relevant policy frameworks at a national and local level.

8.2.3. The Scheme will aid local and regional policies to unlock economic growth and employment in the Arun area. The policies accept that it will take sustained investment in cycling and walking infrastructure for people to make the transition to this being their normal transportation mode. It is largely accepted people will continue to travel by car and that accordingly, the effects of car travel on local communities needs to be minimised by providing new infrastructure away from existing settlements.

8.3. CONSULTATION, SCOPE, METHODOLOGY AND SIGNIFICANCE CRITERIA

CONSULTATION UNDERTAKEN TO DATE

8.3.1. **Table 8-2** provides a summary of the consultation activities undertaken in support of the preparation of this chapter.

Table 8-2 - Summary of Consultation Undertaken

Body / organisation	Individual / stat body / organisation	Meeting dates and other forms of consultation	Summary of outcome of discussions
WSCC	Guy Parfect	Written response to EIA scoping report.	Agreement of methodology to be used for TA

SCOPE OF THE ASSESSMENT

8.3.2. The scope of this chapter has been established through an ongoing scoping process. Further information can be found in **Chapter 5: Approach to EIA**.

8.3.3. This section provides an update on the scope of the assessment and re-iterates the evidence base for significant effects. The assessment of effects on vehicles, pedestrians, cyclists and equestrians will be assessed and will cover users of the Proposed Bypass and users of the existing public rights of way (PRoW) which are likely to be affected by changes in traffic flow as a result of the Proposed Bypass.

8.3.4. The Scheme will lead to changes in traffic patterns in the future, expressed by increases and decreases in traffic levels on some roads. This Chapter will specify if and where this is the case, with reference to the different scenarios.

EXTENT OF THE STUDY AREA

8.3.5. The extent of the study area has been defined by the route of the Scheme, the existing and anticipated future traffic conditions and Guidelines on the Environmental Impact of Road Traffic.

8.3.6. As a starting point, the study area has been defined by identifying all local roads which are susceptible to changes in traffic as a result of the Scheme; which due to its proposed alignment, are primarily the A29 (between Bognor Regis and A27) and the B2233. These links and the traffic flows associated with them will be directly influenced from the Scheme, and therefore have been focused on. From model outputs comparing traffic volumes with and without the Scheme in future years, it was observed that roads outside of this initial area, for example did not experience substantial changes in traffic volumes. These locations were shown to not experience changes in traffic flows by more than 30%, which is the threshold provided by the IEA Guidelines for the Environmental Assessments of Road Traffic.

8.4. METHODOLOGY

SURVEYS

In order to determine the existing traffic flow conditions in the vicinity of the proposed A29 realignment scheme, 8 Manual Classified Turning Counts (MCTC), and 7 Automatic Traffic Counts (ATC) were commissioned at various locations in the near vicinity of the Scheme in June 2017. The survey locations are listed below for the ATC and MCTC data respectively:

ATC Link Count Locations

- Brittens Lane North of A27
- B2132 Yapton Lane (between the street and the lake house)
- B2233 Nyton Road East of A29
- B2233 Barnham Road East of A29
- A29 South of Eastergate Lane
- B2233 Nyton Road West of A29
- A29 South of Woodgate

MCTC Survey Locations

- A27 / The Street Junction
- A27 / B2233 Nyton Road
- A27 / A29 Fontwell Roundabout
- A27 / A29 Slindon Common Roundabout
- A29 / B2233 Junction
- A29 / Westergate Street / B2233 Nyton Road Junction
- A29 / A259 Junction
- A259 Rowan Way / A29 Shripney Road Junction

8.4.1. The MCTC surveys were undertaken over a 12-hour survey period (0700 to 1900). The surveys were carried out using video recording devices attached to street lighting columns near the sites. All movements at the junctions and roundabouts were captured, with the results providing full vehicle classification in 15 minute intervals.

8.4.2. The ATC two-way daily traffic flow data was collected continuously over a two-week period using cameras. This recorded bi-directional vehicle volume and vehicle classification at the sites identified above.

ASSESSMENT METHODOLOGY

8.4.3. The assessment presented in **Appendix 8.1** has been undertaken using best practice and is consistent with the guidance set out in the following documents:

- Department of Communities and Local Government (DCLG) Travel Plans, Transport Assessments and Statements in Decision-Taking guidance, Department of Communities and Local Government (DCLG) published 2014 (Ref 8.8); and
- The Design Manual for Roads and Bridges (DMRB) (Ref 8.9).

8.4.4. The scope of the assessment has been agreed with WSCC as Highway Authority for the Scheme.

8.4.5. The Scheme assessment has been undertaken using the strategic 2017 CATM model with operational junction assessment undertaken using LinSig and Junctions 9 software packages.

8.4.6. It has been agreed with WSCC that the CATM 2017 can be used as the basis for strategic assessment. The CATM model was updated for the modelling of the A29 realignment as it contained greater network and zone structure detail for the study area comparable to the SERTM model. The CATM 2017 was developed with a base year of 2017 and represents the typical weekday. The AM peak hour is 08:00-09:00 and PM peak hour modelled is 17:00-18:00. The methodology used to develop the model is described in more detail in the document ‘A29 Realignment - Local Model Validation Report’ (5th October 2018).

8.4.7. The assessment scope is based on the TA methodology agreed with WSCC. The CATM forecasts for this TA consist of:

- Without Scheme and With Scheme Opening Year Scenarios (2023); and
- Without Scheme and With Scheme Design Year (+15 year) Scenarios (2038).

8.4.8. The Do Minimum (DM) model scenario considered schemes that are to be 'near certain' or 'more than likely' as identified in the Uncertainty Log outlined in the ‘A29 Realignment – Traffic Forecasting Report – January 2019’.

8.4.9. The Do Something (DS) networks contain the committed infrastructure developments included in the Do Minimum network for the corresponding year as well as the changes to the network associated with the schemes under assessment.

8.4.10. For the purpose of the Transport Assessment, when considering the extent of theoretical capacity, it is recognised within the transport planning industry that a maximum Ratio of Flow to Capacity (RFC) value of 0.85 is desirable, since this allows for a standard error of prediction of the entry capacity formula and demands in the modelling, by 15% for any site. If the RFC is below 1.00 (100%), this suggests that the flow is below the calculated capacity, and the junction is working within capacity. The setting of the targeted maximum RFC at a value of 0.85 also ensures queuing will be generally avoided in the chosen design peak hour.

8.5. BASELINE CONDITIONS

EMPLOYMENT INFORMATION

8.5.1. The places of work for the residents of Arun have been summarised in **Table 8-3** from the 2011 Census 'WU03UK - Location of usual residence and place of work by method of travel to work'[1]. The data summarises that 51% of residents' work and live in Arun. This illustrates that the majority of the traffic will be local with an origin or destination with the local area. The remaining Arun residents work at locations along the south coast, with Chichester (21%) and Worthing (11%) as popular destinations. A smaller 4% travel north to Horsham.

Table 8-3 - Places of work for residents of Arun[2]

Place of work	Percentage
Arun	51%
Chichester	21%
Worthing	11%
Horsham	4%
Brighton and Hove	2%
Crawley	2%
Adur	2%
Portsmouth	1%
Havant	1%
Mid Sussex	1%

8.5.2. **Table 8-4** summarises the 2011 Census WP703EW method of travel to work (2001 specification)[3] as percentages for Arun compared against workplaces zones (E02006544 and E02006542). As would be expected from a rural location, the dominant method of travel to work (60%) is driving a car or van.

[1] Nomis Official Labour Market Statistics https://www.nomisweb.co.uk/census/2011
[2] The percentages do not sum to 100%, as a number of destinations with between 0% and 1% have been excluded. These are rounded percentages to the nearest whole number.
[3] Nomis Official Labour Market Statistics https://www.nomisweb.co.uk/census/2011

Table 8-4 - Method of Travel to Work

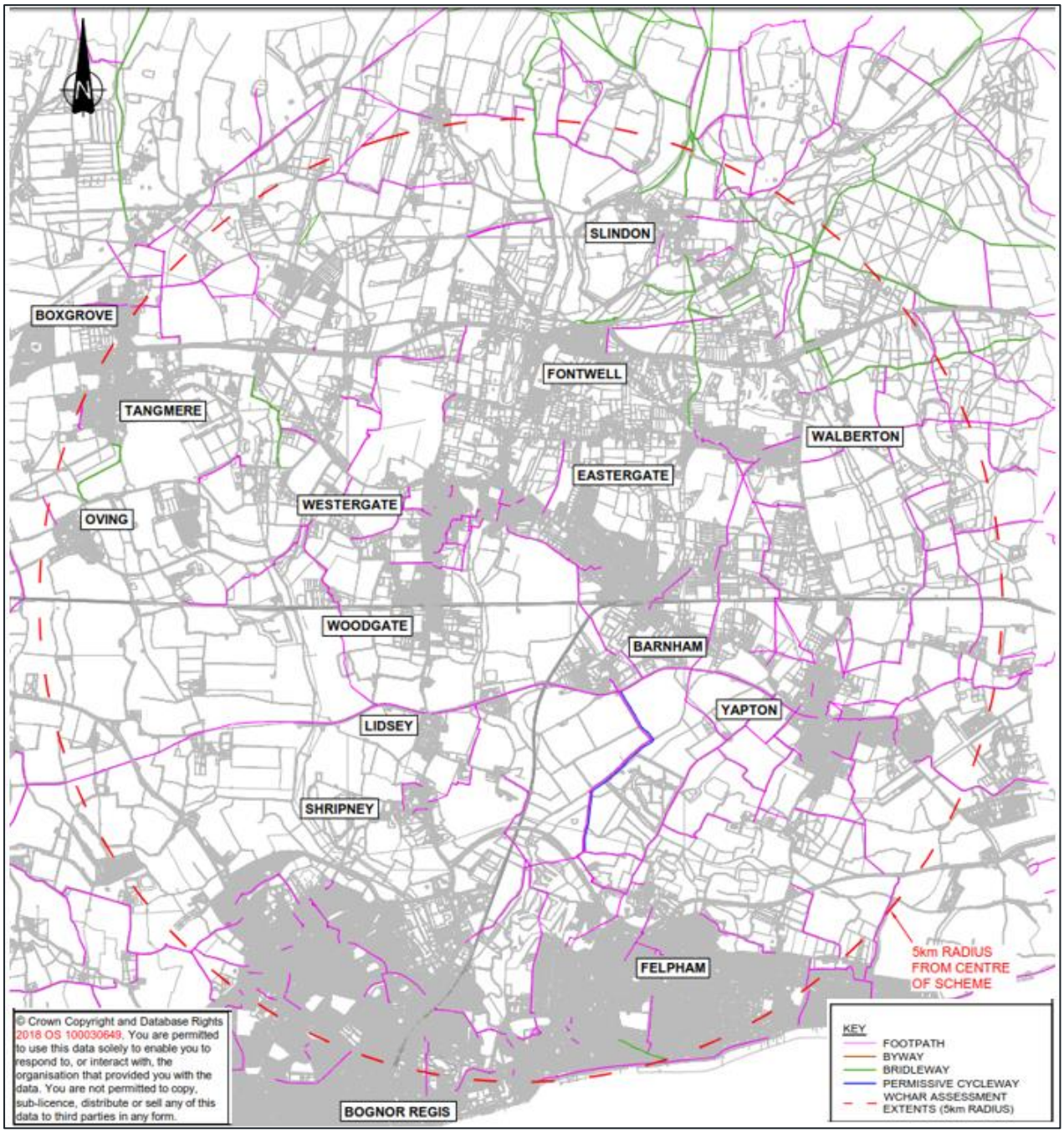
Destination	Arun	E02006544	E02006542	Average of E02006544 & E02006542
Driving a car or van	56%	58%	56%	57%
Work mainly at or from home	17%	21%	23%	22%
Passenger in a car or van	5%	5%	5%	5%
On foot	11%	6%	9%	7%
Bicycle	4%	3%	2%	3%
Train	2%	6%	2%	4%
Bus, minibus or coach	2%	1%	1%	1%
Motorcycle, scooter or moped	1%	1%	1%	1%
Taxi	0%	0%	0%	0%
Underground, metro, light rail or tram	0%	0%	0%	0%
Other method of travel to work	0%	0%	1%	1%

WALKING AND CYCLING APPRAISAL

Footpaths and Bridleways

8.5.3. West Sussex County Council PRoW map is displayed below in **Figure 8-1** to illustrate the PRoWs within 5km within the Scheme.

Figure 8-1 - PRoWs within 5km of the Scheme



8.5.4. The following footpaths are on and immediately adjacent to the Site:

- FP 318 (north to south from Eastergate Lane to the B2233 Barnham Road) – this path is crossed by the Scheme; and
- FP 321 (north west to south east from Church Lane to B2233 Barnham Road) – this path is located adjacent to the southern boundary of the Scheme.

8.5.5. At the location where the Scheme crosses the B2233 Barnham there is a footway on the northern side of the road.

Horse-Riding Facilities

8.5.6. There are no bridleways south of the scheme. To the north of the scheme the villages of Fontwell and Walberton have bridleways leading on to the South Downs National Park, a popular place for horse-riding. There are 1200km of bridleways spreading through the National Park for riders to enjoy including the 160km long South Downs Way.

Cycle Paths

8.5.7. Overall there is a lack of cycling infrastructure on the surrounding area of the Scheme, with limited connections between the BEW area and the surrounding villages.

8.5.8. There is a permissive cycle path that follows the route of Footpath No 146 between the A259 at Flansham and Barnham.

8.5.9. National Cycle Network (NCN) Route 2 is a long-distance cycle route approximately 4.3km south-east of the Scheme. When complete this route will link Dover in Kent to St. Austell in Cornwall.

PUBLIC TRANSPORT ASSESSMENT

Bus

8.5.10. The north-south public transport movements are presently served by the A29 Westergate Street/ Lidsey Road. The nearest bus stops to the Scheme are located on the A29 Fontwell Avenue / A29 Nyton Road and B2233 Barnham Road. At two of the stops, namely Barnett Close and School (Opposite petrol station), the facilities provided include a shelter, seating and a provisional timetable. The remaining bus stops do not have seating or shelters but do provide a timetable.

8.5.11. The 85-bus route serves the A29 Fontwell Avenue, connecting the BEW villages with Arundel and Chichester. The frequency of these services are collated in **Table 8-5** below, with a total of six services daily.

8.5.12. Stagecoach operates school buses at school times between Wick/ Chichester towards Westergate, these services are accessible to the general public.

Table 8-5 - Summary of bus services within the vicinity of the Scheme

Operator	Service Number	Route	Bus Stop Locations	Average Frequency (Mon – Sat)	Average Frequency (Sun)	Hours of Operation
Compass Travel	66A/ 66C	Bognor Regis – Yapton – Bognor Regis	Lidsey, adjacent Caravan Park/ Woodgate, opposite Willows Caravan park/ Westergate,	66A 4 times a day (07.24 service commences	---	07:26 – 17:40

			opposite Belle Meade Close/ Westergate, opposite Elmcroft Place/ Westergate, opposite Ivy Lane/ Westergate, o/s Ormistone six Villages Academy/ Westergate, adjacent Barnet Close/ Eastergate War Memorial/ Eastergate, opposite Church Lane Eastergate adjacent Church Lane/ Eastergate War Memorial/ Westergate o/s Ormiston Six Villages Academy/ Westergate, adjacent School/ Westergate, adjacent Ivy Lane/ Westergate, adjacent Elmcroft Place/ Westergate, adjacent Belle Meade Close/ Woodgate, adjacent Willows Caravan park/ Lidsey, opposite Caravan park	at Eastergate War Memorial bound and the final service of the day terminates Walberton the Green at 18:16) 66C Service runs full route 3 times a day.		08:15 – 16:35
	85/85A	Arundel – Fontwell – Chichester Chichester – Fontwell – Arundel	Eastergate, adjacent Collins Close/ Westergate, adjacent School Westergate, adjacent Barnett Close/ Eastergate, opposite Collins Close	3 times a day 3 times a day	----	06:55 – 15:55 09:05 – 16:34
Stagecoach Buses	658	Chichester - Westergate Westergate – Chichester	Eastergate, Collins Close/ Westergate, Barnett Close/ Westergate, Ormiston Six Villages Academy Westergate, Ormiston Six Villages Academy/ Westergate, Barnett	Once a day (available to general public). Once a day (available to general public)	---	07:30 14:48

			Close/ Eastergate, Collins Close			
	665	Wickbourne – Westergate Westergate – Wickbourne	Eastergate, Church Lane/ Eastergate War Memorial/ Westergate, Barnett Close/ Westergate, Ormiston Six Villages Academy Westergate, Ormiston Six Villages Academy/ Westergate, Barnett Close/ Eastergate War Memorial/ Eastergate, Church Lane	Once a day (available to general public). Once a day (available to general public)	---	07:10 14:50

Data sourced Compass from: https://www.compass-travel.co.uk/compass-timetables/bus-timetables/ Data sourced Stagecoach from: https://www.stagecoachbus.com/timetables

ROAD NETWORK

8.5.13. The main highway links identified in the vicinity of the Site are discussed below. Additional information on the junctions can be found in **Appendix 8.1.**

Links

Existing A29 Fontwell Avenue/ Nyton Road / Westergate Street

8.5.14. The A29 starts at the Fontwell West Roundabout in Fontwell and then proceeds south to cross the war memorial roundabout where it becomes the Nyton Road. The road then continues south with a bend in the alignment where it then becomes the A29 Westergate street, crossing the railway line in Woodgate where there is an automatic, full signal-controlled level crossing.

8.5.15. From the A29 Fontwell Avenue there is a footway on the eastern side of the carriageway, with national speed restrictions in place, with limited street lighting until the war memorial junction. In the absence of street lighting, cats-eyes are present.

8.5.16. The road is generally a good quality single carriageway road, with a general flat alignment. There are footways on either side of the carriageway, street lighting and houses between Woodgate and the Nyton road junction. The A29 between the war memorial roundabout and just south of Woodgate is subject to 30mph speed restrictions.

8.5.17. This route is prone to delays and unpredictable journey times caused from the closure of the level crossing, exacerbating traffic travelling south toward the strategic road network of the A29 towards Chichester and Arundel.

B2233 Barnham Road

8.5.18. The B2233 Barnham Road connects the traffic from the A29 Eastergate with the villages to the east in Barnham/ Climping area and the A259. This section of road is a 6.5km rural two-way single carriageway.

8.5.19. Where the B2233 travels through Eastergate with residential settlements there is a footway on both sides of the carriageway, street lighting and bus stops.

8.5.20. The majority of this section of road is subject to a 30mph speed limit in both directions. However, the final 1.5km of road near the A259 Climping junction is subject to 40mph restrictions. Street lighting and a footway of nearly 2m on at least one side of the carriageway is provided throughout the stretch of the B2233 where the 30mph speed restrictions are in place.

Eastergate Lane

8.5.21. Eastergate lane runs parallel to the B2233 and is a rural single carriageway road, with lack of lane markings separating the carriageway. The surroundings are rural with an absence of footway and streetlighting along the lane.

TRAFFIC FLOWS

8.5.22. A detailed review of the traffic flows in the vicinity of the Scheme is provided in Appendix 8.1 – Transport Assessment.

COLLISION ANALYSIS

8.5.23. Personal Injury Collision (PIC) information for the study area has been obtained for a 5-year period between January 2013 to December 2017. 'Damage only' collisions have not been included as they are not consistently reported to the Police and therefore could be misleading or possibly biased.

8.5.24. A total of 138 PICs were recorded within the study area during the 5-year period, four were fatal, 22 were serious and 112 were slight. Of the 138 collisions recorded, 3 occurred during the Weekday AM Peak (0800-0900) and 2 occurred during the Weekday PM peak (1700-1800). These five collisions occurring in the AM and PM peak account for 3.6% of all collisions over the study period.

8.5.25. Further analysis is provided in **Appendix 8.1**.

SENSITIVE RECEPTORS

8.5.26. The following sensitive receptors have been considered in this summary chapter:

- Users of Public Rights of Way; and
- Road Users (motorised vehicle users).

8.6. ASSESSMENT OF EFFECTS, MITIGATION AND RESIDUAL EFFECTS

SITE PREPARATION, EARTHWORKS AND CONSTRUCTION PHASE

Construction Traffic

8.6.1. The information included in this chapter relating to construction traffic has been provided from the Construction Management Plan (CMP).

8.6.2. Construction traffic movements will be generated from construction workers' cars and vans as well as larger HGV vehicles. The numbers of movements for both will have a largely incidental impact on the surrounding highway network.

8.6.3. The forecast construction traffic relating to the Proposed Bypass is shown in **Table 8-6.**

Table 8-6 - Envisaged Maximum Daily Vehicle Numbers to Site

Vehicle Type	Envisaged Maximum Daily Number to Site
Car / Delivery Van	40 Movements Daily
Heavy Earth Moving Vehicle	20 Movements Daily
HGV	75 Movements (envisaged 25% north, 75% south), but majority of time average of 20.

8.6.4. The effects of construction related activities are anticipated to be temporary, short term slight adverse prior to mitigation measures.

Mitigation

Deliveries

8.6.5. The Construction Management Plan has currently identified the following arrangements for deliveries to site in order to minimise disruption to the local community:

- The delivery route for all HGV vehicles shall be as per the Traffic Management Plan;
- Deliveries to and from the site shall only take place between the hours 07:30 to 17:30 Monday to Thursday, and 07:30 to 15:00 on Fridays. There shall be no demolition, clearance or construction work or deliveries to and from the site on Sundays or Bank Holidays;
- Deliveries will be booked where possible so not to be within the first or last hour of the day based on the above timings, with the aim of reducing the number of deliveries during peak AM and PM periods;
- Multiple deliveries, such as aggregate, shall be co-ordinated and staggered to avoid congestion at site entrances and on site;
- Delivery arrangements, including access routes and controls, shall be clearly communicated to plant and material providers so they can be briefed to delivery drivers well in advance of all deliveries;
- Positioning of advanced signage as required along access routes, guiding delivery vehicles to site, shall be agreed with the relevant approving authority and installed as such;
- A gate man shall be posted at site entrance and crossing points, as required; and
- A HGV booking management system shall be implemented, with HGV's told not to arrive early and park up in an agreed location so not to cause obstruction to the local road network.

8.6.6. A detailed Construction Traffic Management Plan (CTMP) will be prepared prior to the start of construction works to manage the impacts of construction traffic. This includes construction traffic volumes, delivery / construction routes and proposed lane closures (for any online construction activities). This will minimise the effects of the construction works on road users.

8.6.7. The levels of flow associated with construction therefore will have a negligible effect on the local highway network.

Specified Routes

8.6.8. The site manager along with the buying department shall coordinate deliveries to avoid causing congestion to the local residents/businesses and the surrounding road network. Delivery drivers will be requested to call ahead to ensure access is available and vehicle marshals will manage on site movements to ensure a smooth operation.

8.6.9. During the construction phase, construction access would be via a temporary track from the B2233 between Fordingbridge Industrial Estate (Halo) and Murrell Gardens. Construction access may also be taken from the A29, 100m south of Eastergate Lane. Fleurie Nursery, Springfield site will be closed prior to construction commencing. The main construction compound (A) will be located within Fleurie Nursery land, south of Barnham Road. Compound B will be located just off Fontwell Avenue, providing localised parking for site staff, welfare and some plant and materials. Compound C will be located halfway along the Scheme adjacent to Pond 3, offline from the new carriageway.

8.6.10. A plan showing the "Construction Traffic Route" on site will be displayed in the site offices, on hoardings and at entrances to the site. The plan shall identify the construction traffic route and anticipated swept path movements for differing types of vehicle likely to visit site. Any additional restrictions imposed on the movement of vehicles (together with the CMP) on site will be displayed in the construction traffic route plan.

Vehicle and Pedestrian Routes

8.6.11. Arrangements for managing traffic movements/pedestrian access on site shall comprise as a minimum the following:

- Establish a HGV booking system and discuss/agree with our suppliers so to control traffic flows - this will help manage vehicle movements to site so that these can be spaced / averaged out so to reduce peak numbers as much as possible. This may require stockpiling of materials;
- Establish controlled crossing points at interfaces with existing Barnham Road & Fontwell Avenue access points;
- Establish designated parking off-loading areas;
- Establish controlled haul road into main work area inclusive of designated crossing bays;
- All excavators on site and HGV's entering working areas will have a banksman supervising movements so to keep aware of any pedestrian movements in proximity, and take necessary action if required;
- A 10mph speed limit shall be implemented throughout site; and
- Pedestrian routes for operatives around site shall be segregated from plant where possible.

On-Site Parking Arrangements

8.6.12. The main site compound (A) shall be where all staff and visitors will be directed to each day for site inductions/signing in etc. It is here therefore that the majority of the site staff will be based.

8.6.13. All construction site vehicle parking (including contractor and employee parking) shall take place within the designated space within each site compound. Adequate contractor and site operative parking areas and space for delivery vehicles to park and turn shall be considered when planning the compounds and this shall be provided together with on-site loading / unloading areas.

8.6.14. It is anticipated that there will be no more than 50 persons working on site at any one time, and whilst car sharing/public transport/cycling to work will be encouraged, our proposed car parking arrangements cater for these expected vehicle numbers, with spare capacity within site compounds to increase this if necessary

Public Rights of Way

8.6.15. During the construction phase, PRoWs and footpaths which intersect with the Site and those in the surrounding area will either be temporarily closed or have restricted access to users as outlined in **Table 8-7**.

Table 8-7 – PRoW and Footpaths

Footpath	Interaction with the Scheme	Impact
FP 318	Bisected/ crossed by the Scheme	Temporary diversion during construction activities.
Pavement on the northern side of Barnham road	Bisected/ crossed by the Scheme	Temporary diversion during construction activities.

8.6.16. It is not expected that impacts to the wider PRoW network will occur due to the construction of the Scheme.

Mitigation

8.6.17. Temporary re-routing/ diversions of the PRoW will be discussed and agreed with the WSCC Public Rights of Way Officer prior to the start of construction activities and will be set out in the Construction Traffic Management Plan. All diversions will be publicised locally to ensure the local community are aware of what the changes will involve, how long they will be in place for and a map to show the new route. Heras fencing will be used along the boundary of the diverted PRoW during construction to ensure users do not stray onto the construction site.

Residual Effects

8.6.18. The package of mitigation measures will manage the residual effects of construction so that all related activities will lead to temporary, short term slight adverse to no significant effect on the following:

- Severance;
- Pedestrian and Cycle Amenity; and
- Fear and Intimidation

OPERATIONAL PHASE

Road Safety

8.6.19. The Road Safety Audit (**Appendix 8.3**) prepared for the Preliminary Design identified 10 road safety problems during the operational stage. The summary of the problems are as follows:

- **Problem 1:** Large or long vehicles turning to/from the service road resulting in shunts;
- **Problem 2:** Confusion over service lane adjacent to roundabout;
- **Problem 3:** Service road too narrow for two-way movements and collision may result;
- **Problem 4:** Vehicles overrunning the kerbs and central islands resulting in loss of control collisions, pedestrian trips and falls or collisions between vehicles and pedestrians/cyclists;
- **Problem 5:** Quick alignment change on the footway/cycleway may result in pedestrian/cycle conflict, or cyclists being hit by passing large vehicles;
- **Problem 6:** Planters obstructing visibility leading to collisions;
- **Problem 7:** Uncontrolled crossing may be unsafe to cross
- **Problem 8:** Fencing associated with corrals could cause serious injuries to errant drivers or be an obstruction to cyclists;
- **Problem 9:** Lack of crossing facilities in the desire line resulting in pedestrian and cycle collisions; and
- **Problem 10:** Drivers approaching the roundabout may be confused and travel the wrong side of the splitter island.

Mitigation

8.6.20. The outcome of the Road Safety Audit has been fed back into the design as part of the design process. A summary of the responses to the above problems are outlined below:

- **Problem 1:** All HGVs will be able to turn into and out of the access road, via the southern access, in a single uninterrupted manoeuvre. The critical manoeuvres have been checked;
- **Problem 2:** The service road access will be delineated by a dropped kerb; further guidance will be provided by road markings. It is proposed to close the northern access, consequently, turning movements will be concentrated at the quieter southern access;
- **Problem 3:** The service road will occupy the full width of the existing A29;
- **Problem 4:** 20% kerb tapers and transition kerbs are proposed and the minimum kerb to kerb width is 3.5m;
- **Problem 5:** There will be a 1m verge between the cycle path and the carriageway which provides adequate vehicular separation;
- **Problem 6:** Planters are relocated to areas where they cannot obstruct visibility to accesses, junctions or crossings;
- **Problem 7:** The proposed crossing serves a PRoW which is suitable for all NMU modes but the level of demand is currently unknown. The crossing type will be decided when demand is known but the PRoW is unlikely to be diverted by 100m. The central island is an integral part of the proposed traffic calming, intended to maintain a 30mph speed limit, and halves the amount of headway required for pedestrians to cross;
- **Problem 8:** This is a low speed setting. If retained, the corrals will be detailed so as not to impede passage of NMUs;
- **Problem 9:** Additional pedestrian destination signs are required to mitigate this problem;
- **Problem 10:** This is a low-speed setting, visibility standards are met.

Change in Traffic Flows

8.6.21. Link flows for a number of locations within the study area have been extracted from the traffic model for each scenario in the AM and PM peak periods in order to highlight the impact of the Scheme on the adjoining highway network. A summary of the changes in traffic flows on various links in the vicinity of the Scheme for AM and PM peak hours are shown in **Table 8-8** and **Table 8-9**.

Table 8-8 - Comparison of traffic flows on A29 (AM Peak)

Direction	Link Number	Link Description	%Difference to Do Minimum	
			2023	2038
Northbound	1	A29 south of Lidsey Bends	-1%	-1%
	2	A29 between Lidsey Bends and Hook Ln.	-1%	0%
	3	A29 between Hook Ln. and Nyton Rd.	-1%	0%

	4	A29 Nyton Rd.	-1%	0%
	5	A29 between Nyton Road and Realignment scheme	-24%	-28%
	6	A29 between Eastergate Ln. and A27	10%	6%
	7	A29 Realignment (northern section)	-	-
Southbound	7	A29 Realignment (northern section)	-	-
	6	A29 between Eastergate Ln. and A27	13%	8%
	5	A29 between Nyton Road and Realignment scheme	-23%	-27%
	4	A29 Nyton Rd.	-2%	1%
	3	A29 between Hook Ln. and Nyton Rd.	0%	1%
	2	A29 between Lidsey Bends and Hook Ln.	0%	1%
	1	A29 south of Lidsey Bends	0%	0%

Table 8-9 - Comparison of traffic flows on A29 (PM Peak)

Direction.	Link Number	Link Description	% Difference to Do Minimum	
			2023	2038
Northbound	1	A29 south of Lidsey Bends	0%	-1%
	2	A29 between Lidsey Bends and Hook Ln.	0%	-1%
	3	A29 between Hook Ln. and Nyton Rd.	-1%	-4%
	4	A29 Nyton Rd.	-2%	1%
	5	A29 between Nyton Road and Realignment scheme	-15%	-13%
	6	A29 between Eastergate Ln. and A27	15%	40%

	7	A29 Realignment (northern section)	-	-
Southbound	7	A29 Realignment (northern section)	-	-
	6	A29 between Eastergate Ln. and A27	13%	22%
	5	A29 between Nyton Road and Realignment scheme	-24%	-20%
	4	A29 Nyton Rd.	-1%	-5%
	3	A29 between Hook Ln. and Nyton Rd.	0%	8%
	2	A29 between Lidsey Bends and Hook Ln.	0%	0%
	1	A29 south of Lidsey Bends	0%	0%

A29 between Nyton Road and Realignment scheme (Link 5)

8.6.22. This link is positioned south of the northern tie-in of the proposed scheme.

8.6.23. There is a reduction of traffic flows on this link when comparing the Do Something scenario against the Do Minimum scenario. The northbound flow reduction ranges from -24% to -28% in the AM peak period for the 2023 and 2038 year respectively.

8.6.24. Southbound traffic flows in the AM peak see a smaller reduction when comparing the Do Something scenario against the Do Minimum scenario. The southbound flow reduction ranges from -23% to -27% for the 2023 and 2038 year respectively.

8.6.25. In the PM peak the largest flow decreases occur for the southbound direction with flow reductions of -24% to -20% for the 2023 and 2038 year respectively.

8.6.26. Northbound traffic flows in the PM peak see a smaller reduction when comparing the Do Something scenario against the Do Minimum scenario. The northbound flow reduction ranges from -15% to -13% for the 2023 and 2038 year respectively.

A29 between Eastergate Lane and A27 (Link 6)

8.6.27. This link is positioned north of the northern tie-in of the proposed scheme.

8.6.28. There is an increase in traffic flow on this link when comparing the Do Something scenario against the Do Minimum scenario. The northbound flow increase ranges from 10% to 6% in the AM peak period for the 2023 and 2038 year respectively.

8.6.29. Southbound traffic flows in the AM peak also show an increase when comparing the Do Something scenario against the Do Minimum scenario. The southbound flow increase ranges from 13% to 8% for the 2023 and 2038 year respectively.

8.6.30. In the PM peak the northbound direction shows flow increases of 15% to 40% for the 2023 and 2038 year respectively.

8.6.31. Southbound traffic flows in the PM peak also indicate flow increases when comparing the Do Something scenario against the Do Minimum scenario. The southbound flow reduction ranges from 13% to 22% for the 2023 and 2038 year respectively.

Mitigation

8.6.32. No mitigation is proposed as the Scheme will have an overall benefit to the wider road network.

Modification of Public Right of Way (PRoW)

8.6.33. The Scheme will permanently modify a short section of FP 318. The path crosses the Scheme to the at approximately chainage mark 590. Due to safety reasons, there is a dog-leg proposed the risk of PRoW users walking straight across the road. Barriers will be in place and users will cross the Scheme at via an informal crossing at approximately chainage mark 605. This modification is not considered to adversely affect users of the PRoW and there will be an overall benefit for non-motorised users due to the shared use footway/ cycleway.

Table 8-10 - Summary of Effects - Transport and Access

Description of Effects	Receptor	Significance and Nature of Effects Prior to Secondary Mitigation	Summary of Secondary Mitigation	Significance and Nature of Residual Effects
Construction Phase				
Construction Traffic	Local Road Users	Slight Adverse	Construction Traffic Management Plan	Slight Adverse / Not Significant
Diversions of Public Rights of Way	Public Rights of Way Users	Slight Adverse	Construction Traffic Management Plan	Slight Adverse / Not Significant
Operational Phase				
Road Safety	Local Road Users	Not Significant	Road Safety Audit – designers response	Not Significant
Change in Traffic Flows	Local Road Users	Beneficial but Not Significant	N/A	Not Significant
Modification of Public Right of Way	Public Rights of Way Users	Not Significant	N/A	Not Significant

REFERENCES

8.1 Strategic Transport Investment Programme (June 2014)

8.2 West Sussex Local Transport Plan (2011-2026)

8.3 Arun Local Plan (2011-2031)

8.4 Moving Britain Ahead – the Government's Transport Investment Strategy (TIS)

8.5 Creating Growth, Cutting Carbon – Making Sustainable Local Transport Happen

8.6 The Road Investment Strategy (RIS) 2015/16 to 2019/20

8.7 National Planning Policy Framework (NPPF, 2012 and 2018 update)

8.8 Department of Communities and Local Government (DCLG) Travel Plans, Transport Assessments and Statements in Decision-Taking guidance, Department of Communities and Local Government (DCLG) published 2014

8.9 The Design Manual for Roads and Bridges

9. ECOLOGY AND NATURE CONSERVATION

9.1. INTRODUCTION

9.1.1. This chapter reports the outcome of the assessment of likely significant effects arising from the Scheme upon Ecology and Nature Conservation.

9.1.2. The remainder of the chapter describes the assessment methodology and the baseline conditions relevant to the assessment, which have been used to reach these conclusions, as well as a summary of the likely significant effects leading to the secondary mitigation measures required to avoid, prevent, reduce or, if possible, offset any likely significant adverse effects, and the likely residual effects and any required monitoring after these measures have been employed.

9.1.3. This chapter (and its associated figures and appendices) is intended to be read as part of the wider ES, including introductory chapters (**Chapters 1 - 5**) and with particular reference to **Chapters 6 Air Quality, Chapter 10 Landscape and Visual, Chapter 14 – Cumulative Effects** as well as the Habitats Regulations Assessment (HRA) Stage 1 - Habitats Regulations Screening Assessment (HRSA) (**Appendix 9.9**), Biodiversity Net Gain assessment (**Appendix 9.10)** and Arboricultural Report (**Appendix 3.4**).

9.2. LEGISLATIVE FRAMEWORK, POLICY AND GUIDANCE

LEGISLATIVE FRAMEWORK

9.2.1. The applicable legislative framework is summarised in **Table 9-1** below.

Table 9-1 – Ecology: Summary of Legislation

Legislation	Summary
The Conservation of Habitats and Species Regulations 2017 (as amended) (Ref. 9.1).	The Conservation of Habitats and Species Regulations (Habitats Regulations) came into force on 30 November 2017 and extend to England and Wales (including the adjacent territorial sea). These Regulations provide for the designation and protection of 'European sites', the protection of 'European protected species', and the adaptation of planning and other controls for the protection of European Sites.
The Wildlife and Countryside Act 1981 (as amended) (WCA) (Ref. 9.2)	The Wildlife and Countryside Act 1981 is the primary legislation in Great Britain for the protection of flora, fauna and the countryside. It covers four key areas; ▪ Wildlife protection, including protection of wild birds, their eggs and nests. ▪ Protection of other animal and protection of plants. Nature Conservation, Countryside and National Parks, Public Rights of Way.
Countryside Rights of Way Act 2000 (Ref. 9.3)	The Countryside and Rights of Way Act 2000 places a duty on Government Departments to have regard for the conservation of biodiversity and maintain lists of species and habitats for which conservation steps should be taken or promoted, in accordance with the Convention on Biological Diversity.

Legislation	Summary
The Protection of Badgers Act 1992 (Ref. 9.4)	The Protection of Badgers Act 1992 applies to England and Wales making it an offence to kill, injure or take a badger, or to damage or interfere with a set unless a license is obtained from a statutory authority allowing the badgers to be carefully excluded, making them move elsewhere in their territory. Badgers are protected and so are the setts (burrows) they live in.
The Natural Environment and Rural Communities (NERC) Act 2006 (England) (Ref. 9.5)	The Natural Environment and Rural Communities Act 2006 established Natural England by merging English Nature, the Rural Development Agency and the Countryside Agency. The Act makes provision in respect of biodiversity, pesticides harmful to wildlife and the protection of birds, and in respect of invasive non-native species. Section 40 of the Act imposes a biodiversity duty on public bodies to have regard to the purpose of conserving biodiversity. Under Section 41 of the Act the Secretary of State must publish a list of habitats and species of principal importance for the purpose of conserving biodiversity.
The Hedgerow Regulations 1997 (Ref. 9.6)	The Hedgerow Regulations 1997 protect important hedgerows in England and Wales. These Regulations cover hedgerows that have a continuous length of at least 20m, or if less than 20m, meets another hedgerow at each end. These Regulations also cover hedgerows that grow in, or adjacent to any common land, local nature reserve, Site of Special Scientific Interest, or land used for agriculture, forestry of the breeding or keeping of horses, ponies or donkeys. Anyone proposing to remove a hedgerow, or part of a hedgerow, covered by these regulations, must first notify the local planning authority by submitting a Hedgerow Removal Notice.

POLICY

9.2.2. The applicable policy framework is summarised in **Table 9-2** below.

Table 9-2 – Ecology: Summary of Policy

Policy	Summary
The National Planning Policy Framework (NPPF) 2019 (Ministry of Housing Communities & Local Government, February 2019) (Ref. 9.7)	The National Planning Policy Framework highlights that the planning system should contribute to and enhance the natural and local environment by minimising impacts on biodiversity and providing net gains in biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures.
Adoption Arun Local Plan 2011-2031 (Ref. 9.8)	The Arun Local Plan covers the period of 2011-2031 for the area of Arun District (excluding the area covered by the South Downs National Park Authority) and was adopted on the 18th July 2018. Relevant Core Strategy policies include: ▪ Policy ENV SP1 Natural Environment. ▪ Policy ENV DM1 Designated Sites of biodiversity (or geological) importance.

Policy	Summary
	▪ Policy ENV DM3 Biodiversity Opportunity Areas. ▪ Policy ENV DM4 Protection of trees. ▪ Policy ENV DM5 Development and biodiversity.

GUIDANCE

9.2.3. This chapter has been prepared in accordance with guidance set out with the Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal (Ref 9.9).

9.3. CONSULTATION, SCOPE, METHODOLOGY AND SIGNIFICANCE CRITERIA

CONSULTATION UNDERTAKEN TO DATE

9.3.1. **Table 9-3** provides a summary of the consultation activities undertaken in support of the preparation of this chapter.

Table 9-3 – Ecology and Biodiversity: Summary of Consultation Undertaken

Body / organisation	Individual / stat body / organisation	Meeting dates and other forms of consultation	Summary of outcome of discussions
Natural England	Nicky Britton-Williams	2nd March 2020, meeting at WSCC. Subsequent written advice provided on 11th March 2020	Advice was sought via Natural England's discretionary advice service (DAS) regarding the required badger mitigation for the Scheme. It was confirmed by Natural England that an artificial sett will be required as a replacement for the main badger sett to be lost. The location of the artificial badger sett was agreed.
WSCC	Graham Roberts, County Ecologist	18th April 2019, written response to EIA scoping report.	There is no ecological objection to the EIA progressing as proposed subject to consideration of potential impacts on harvest mice.

SCOPE OF THE ASSESSMENT

9.3.2. The scope of this chapter has been established through a scoping process. Further information can be found in **Chapter 5: Approach to EIA**.

9.3.3. This section provides an update to the scope of the assessment and re-iterates the evidence base for scoping out elements of the topic following further assessment.

9.3.4. The EIA scoping opinion received from West Sussex County Council supported the progression of the EIA, subject to consideration of potential impacts on harvest mice.

ELEMENTS SCOPED OUT OF THE ASSESSMENT

9.3.5. The elements shown in **Table 9-4** are not considered to give rise to likely significant effects as a result of the Scheme and have therefore not been considered within the ES.

Table 9-4 - Elements Scoped Out of the Assessment

Element scoped out	Justification
Internationally designed sites	
Pagham Harbour Ramsar	A Habitats Regulations Screening Assessment (HRSA) was undertaken to establish if the Scheme will have a likely significant effect (LSE) upon all five European or international sites (Appendix 9.9). The HRSA concluded that there will be no LSEs on the five designated sites. Additionally, as set out in **Chapter 6 – Air Quality,** air quality impacts at designated habitat sites (construction and operational) have been scoped out of the assessment.
Pagham Harbour Special Protection Area (SPA)	
Ducton to Bignor Escarpment Special Area of Conservation (SAC)	
Chichester to Langstone Harbours Ramsar	
Solent and Dorset Coast SPA	
European Designated Sites designated for bats: Singleton and Cocking Tunnels SAC, The Mens SAC and Ebernoe Common SAC.	All three SAC's are considered unlikely to be affected due to the lack of potential significant effect pathways.
UK statutory designated sites	The South Downs National Park lies 1.4km north-west of the Scheme, but is considered sufficiently distant to be adversely affected by the construction or operation phase.
UK non-statutory designated sites	Fontwell Park Racecourse LNR and Slindon Bottom LNR are located 0.4km and 1.3km north of the Scheme respectively. Neither site is likely to be adversely affected by the construction or operation phase of the Scheme as Slindon Bottom is sufficiently distant from the Scheme, beyond existing housing, and Fontwell Racecourse's habitats are enclosed within the race track and its surrounding buildings and access tracks.
Notable Road Verge (NRV)	Two NRV's are located within 2km of the Scheme; Barnham Road at Eastergate (0.4km south) and Brittens Lane (1.4km north east). Both these NRV's already tolerate high disturbance from their adjacent roads and therefore will not be

Element scoped out	Justification
	adversely affect during the construction or operational phase of the Scheme.
Ancient woodland	The closest parcel of ancient woodland is located 0.8km north of the Scheme. As parcels of ancient woodland are sufficiently distant from the Scheme they will not be adversely affected during the construction or operational phase of the Scheme.
Veteran trees	Four veteran, or potential veteran trees were identified during the arboricultural survey. During the detailed design stage, the road alignment was adjusted where necessary, to ensure these trees could be retained and protected as part of the Scheme, as detailed in the Arboricultural Report (Appendix 3-4).
Habitats (on-site) excluding HPI e.g. hedgerows and traditional orchard	With the exception of HPI, the habitats within the Scheme are dominated by semi-improved neutral grassland, with scrub, amenity grassland, buildings and arable also present. Whilst these habitats will provide some ecological value to protected species, they are considered to be of less than local conservation value and will therefore be scoped out of the ES. Habitats present within the Scheme that are considered to qualify as HPI will remain scoped-in. It should be noted that a BNG Assessment (Appendix 9.10) has been undertaken which takes into account the loss and gain of all habitat types within the Scheme and has influenced the landscape design, in addition to the EIA mitigation requirements.
Hazel dormouse	Surveys confirmed the likely absence of this species and therefore will be scoped out of this assessment.
Great crested newt	Surveys confirmed the likely absence of this species and therefore will be scoped out of this assessment.

ELEMENTS SCOPED INTO THE ASSESSMENT

Construction Phase

9.3.6. The following elements are considered to have the potential to give rise to likely significant effects during construction of the Scheme and have therefore been considered within the ES:

- Permanent and temporary land-take within the footprint of the Scheme;
- Permanent manipulation of habitats such as landscaping;
- Temporary storage of construction materials within / adjacent to ecological resources with associated habitat contamination and compaction;
- Habitat loss and fragmentation disrupting connectivity, species movement and dispersal, causing expenditure of extra energy and genetic isolation;
- Direct injury/mortality during site clearance and construction;
- Disturbance from construction activities including visual, noise, vibration and lighting;

- Degradation through airborne pollution; and
- Pollution caused by use of hazardous materials and incidental release of dust, chemicals, fuels or waste materials.

Operation Phase

9.3.7. The following elements are considered to have the potential to give rise to likely significant effects during operation of the Scheme and have therefore been considered within the ES:

- Direct mortality during operational use;
- Displacement, species loss and isolation;
- Habitat fragmentation disrupting connectivity, species movement and dispersal, causing expenditure of extra energy and genetic isolation;
- Direct disturbance from operational use visual, noise, vibration and lighting; and
- Degradation through airborne and waterborne pollution.

EXTENT OF THE STUDY AREA

9.3.8. At the outset of the project, baseline survey coverage included the indicative Scheme alignment, with a 250m buffer. This has been refined as the design has progressed, with the extent of the study area varying depending upon the type of survey. In all instances, surveys have incorporated all areas within the red line boundary, which includes the footprint of the Scheme, lighting requirements and all landscaping.

9.3.9. Larger study areas were utilised to search for features such as designated sites and notable habitats during the desk study, as detailed below.

METHOD OF BASELINE DATA COLLATION

DESK STUDY

9.3.10. An ecological desk study was completed in 2018, and updated in 2020, for the purposes of this assessment. (**Appendix 9-1**) The desk study collated and reviewed existing information available in the public domain and information held by relevant third parties. The desk study focused primarily on obtaining records of legally protected species and habitats, species and habitats of conservation concern, and habitat designated for its nature conservation value.

9.3.11. **Table 9-5** sets out the following search radii from the Scheme that were used for desk study records.

Table 9-5 – Search Area and data sources for Potential Ecological Features

Potential Ecological Feature	Search Area from Scheme	Data source
Designated Sites and Habitats		
European Designated Sites (Special Area of Conservation (SAC) designated for bats	30km	Natural England corporate datasets, citations and data held by the Joint Nature Conservation Committee (JNCC).
European Designated Sites SAC, Special Protection Area (SPA) and Ramsar sites).	10km	Natural England corporate datasets, citations and data held by the Joint

Potential Ecological Feature	Search Area from Scheme	Data source
		Nature Conservation Committee (JNCC).
UK statutory Designated Sites (Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR) and Local Nature Reserves (LNR)).	2km	Natural England corporate datasets, citations and data held by the JNCC.
Non-statutory Designated Sites (Local Wildlife Sites (LWS)).	2km	Sussex Biological Records Centre.
Ancient Woodland	2km	Natural England corporate datasets.
Habitats of Principal Importance (HPI)	2km	Natural England corporate datasets.
Species		
Protected and notable species records	2km	Sussex Biological Records Centre.
Bat records	5km	Sussex Biological Records Centre.

PROTECTED SPECIES SURVEYS

9.3.12. A summary of the ecological surveys and associated study areas undertaken to inform this assessment is provided below, with further detail provided in **Appendix 9.1**. Detailed information including survey conditions, surveyors, methodologies and limitations is included in the dedicated reports (**Appendices 9.1 - 9.8**).

Table 9-6 – Search Area and data sources for Potential Ecological Features

Survey type	Survey Area	Date of survey	Relevant guidance / methodology	Relevant Appendix / Reference
Extended Phase 1 habitat survey	250m buffer of the Site	July 2018	CIEEM, (2017a and 2017b) (Ref 9.10 – 9.11) JNCC, (2010) (Ref 9.12) British Standards Institute, (2013) (Ref 9.13)	Appendix 9-1
Bat	Survey dependent. Up to 30m buffer from the Site.	April-October 2019	Collins (ed.), (2016) (Ref 9.14)	Appendix 9-2
Badger	Bespoke survey area, covering large areas of land connected to the	April 2019 September/October 2019	Harris et al. (1989) (Ref 9.15) Roper, (2010) (Ref 9.16)	Appendix 9-3 (Restricted)

Survey type	Survey Area	Date of survey	Relevant guidance / methodology	Relevant Appendix / Reference
	Site (where access is possible).		Delahay et al. (2000) (Ref 9.17)	
Hazel dormouse	Up to a 50m buffer from the Site	April-September 2019	English Nature, (2006) (Ref 9.18)	Appendix 9-4
Breeding bird	Up to 250m buffer from the Site	March – June 2019	Bibby et al. (2000) (Ref 9.19)	Appendix 9-5
Wintering bird	Up to 250m buffer from the Site	November 2018-Februsry 2019	Bibby et al. (2000) (Ref 9.20)	Appendix 9-6
Reptile	Site	April-July 2019	Gent, A and Gibson, S. (1998). (Ref 9.21) Froglife (1999) (Ref 9.22)	Appendix 9-7
Great crested newt	500m buffer of the Site	April 2019	ARG UK (2010) (Ref 9.23) Oldham et al. (2000) (Ref 9.24) Freshwater Habitats Trust. (2015) (Ref 9.24) Biggs et al. (2014) (Ref 9.25)	Appendix 9-8
Invertebrate	Site	May-August 2019	Drake et al. (2007) (Ref 9.26)	Hopkins Ecology, 2019

OTHER STUDIES

9.3.13. In addition to the above surveys, a Biodiversity Net Gain (BNG) assessment was undertaken of the Scheme to inform and quantify the change in biodiversity value of the Scheme before and after development. This assessment has captured scoped-out habitats present within the Scheme, and the landscaping plan is the result of the EIA mitigation requirements and the BNG requirements which aims for a 10% gain in both area based and linear based habitats. The final BNG assessment reported a significant net gain in area based habitats (+44%), but only resulted in no net loss of linear habitat (+3%) and as such the Scheme itself does not achieve overall BNG. It has been recommended however that a further 50m of hedgerow planting would achieve a 10% BNG in linear habitats and therefore, if this can be incorporated into the detailed landscape design, the Scheme overall would achieve BNG providing the habitats are appropriately managed. The BNG calculation was based on the Phase 1 habitat survey data collected, the final landscape proposals (see **Appendix 3.3**) and uses the Natural England 2.0 Biodiversity Net Gain metric for calculations (Ref 9.27 and 9.28). Further details on the methodology are included at **Appendix 9.10**.

ASSESSMENT METHODOLOGY

9.3.14. The assessment of significant effects has been undertaken in line with CIEEM Ecological Impact Assessment (EcIA) guidelines (Ref 9.9).

9.3.15. In order to assess the potential significance of effects resulting from the Scheme, the value of important ecological features is first determined with reference to a defined geographical scale (recommended in good practice (Ref. 9.9), and extended to include the Scheme**:**

- International (i.e. Europe);
- National (i.e. the UK);
- Regional (i.e. South-East England);
- County (i.e. West Sussex);
- District (i.e. Arun District);
- Local (i.e. Chichester); and
- Site (i.e. within the Scheme Boundary).

9.3.16. In addition, to distinguish between habitats and species that are of value and/or relevance at the Site scale and those that have negligible value at any scale (i.e. of conservation value at a scale below Site), the latter have been assigned to be of negligible value.

9.3.17. A number of characteristics are considered to contribute to the importance of ecological features, including for example (but not exclusively) the rarity of a species or habitat, habitat diversity, whether the species population size is notable in a wider context, rich assemblages of plants and animals and species on the edge of their range, particularly where their distribution is changing as a result of global trends and climate change.

SIGNIFICANCE CRITERIA

9.3.18. The significance level attributed to each effect has been assessed based on the sensitivity/value of the affected receptor(s) and the magnitude of change arising from the Scheme, as well as a number of other factors that are outlined in more detail in **Chapter 5: Approach to EIA**. The sensitivity of the affected receptor is assessed on a scale of very high, high, medium, low and negligible, and the magnitude of change is assessed on a scale of major, moderate, minor, negligible and no change, as set out in **Chapter 5: Approach to EIA**. Magnitude refers to the 'size' or 'amount' of an effect determined on a quantitative basis e.g. total or partial.

9.3.19. For the purposes of this assessment, the assigned sensitivity of each receptor was determined in accordance with the assigned value at the geographic scale as described in 9.3.15. In particular, the following criteria were used when determining sensitivity:

- Receptors of International or National value were considered to be of High sensitivity;
- Receptors of Regional or County value were considered to be of Medium sensitivity;
- Receptors of District or Local value were considered to be of Low sensitivity; and
- Receptors of Site or less-than-Site value were considered to be of Negligible sensitivity.

EFFECT SIGNIFICANCE

9.3.20. The following terms have been used to define the significance of the effects identified and apply to both beneficial and adverse effects and are based on good practice guidelines (Ref 9.9) and professional judgement:

- **Major effect**: where the Scheme could be expected to have a substantial improvement or deterioration on receptors;
- **Moderate effect**: where the Scheme could be expected to have a noticeable improvement or deterioration on receptors;
- **Minor effect**: where the Scheme could be expected to result in a perceptible improvement or deterioration on receptors; and
- **Negligible**: where no discernible improvement or deterioration is expected as a result of the Scheme on receptors, including instances where no change is confirmed.

9.3.21. Effects that are classified as **minor or above** are considered to be **significant**. Effects classified as below minor are considered to be **not significant**.

9.4. BASELINE CONDITIONS

9.4.1. A summary of the baseline conditions identified during the desk study and Phase 1 habitat survey is outlined below. Full details are provided within the PEA report in **Appendix 9.1**.

Site Description

The Scheme is located within a semi-rural location. The northern areas contain a mixture of woody habitats including traditional orchard, woodland and scrub, with a small residential plot, whilst the centre and south feature predominantly semi-improved grassland and industrial buildings associated with a plant nursery.

Notable habitats

9.4.2. As shown on **Figure 6** in **Appendix 9.1**, the following HPI are present within 2km of the Site:

- Coastal and floodplain grazing marsh – two parcels;
- Lowland meadows – two parcels;
- Lowland fens – one parcel;
- Deciduous woodland – 79 parcels; and
- Traditional orchard – 12 parcels, some of which fall within the Scheme itself[4].

9.4.3. Within the Site itself, there are a number of habitats that qualify as HPI, including:

- Three species-poor hedgerows, which from an ecological perspective are considered unlikely to meet the criteria for important hedgerows; and
- One parcel of plantation broadleaved woodland that is likely to qualify as traditional orchard HPI.

9.4.4. Given the widespread nature of hedgerow HPI within the local area, it is considered to be of value at up to Local conservation value. Within the local area, traditional orchard occurs less frequently, with areas previously identified as traditional orchard HPI becoming scrubbed over such that they no

[4] although the desk study shows several parcels of traditional orchard HPI falling within the Scheme, the Phase 1 habitat survey confirmed only one parcel present within the Scheme itself.

longer meet the criteria for HPI. As such, traditional orchard is considered to be of up to District conservation value.

Protected and Notable Species

9.4.1. The following information set out in **Table 9-7** regarding protected and notable species is summarised from the protected species surveys that were undertaken (**Appendices 9-1 – 9-8**), unless stated otherwise.

Table 9-7 – Protected and Notable Species identified within the Site.

Ecological feature	Baseline summary	Valuation
Bats – roosting	The PBRA identified a number of buildings / trees with the potential to support roosting bats: ▪ Three buildings with bat roosting potential, including one with low potential (B2) and two with moderate (B5 and B7). ▪ Forty-four trees with bat roosting potential, including eight with low potential (T5, T7, T11-12, T14, T29, T31 and T43), 26 with moderate potential (T1, T4, T6, T8-10, T13, T15-16, T18, T21, T23-24, T27-28, T20, T32-33, T35-40, T42, T44), nine with high potential (T2, T17, T19, T20, T22, T25-26, T34, T41) and one confirmed bat roost (T3) (via the presence of droppings). For the buildings, subsequent dusk emergence and dawn re-entry surveys were undertaken. During which, B5 was confirmed as a roost for soprano pipistrelle *Pipistrellus pygmaeus* and serotine *Eptesicus serotinus.* The likely absence of roosting bats was confirmed at buildings B2 and B7. For trees with moderate or high potential, at-height inspections were conducted, during which five trees were assessed as negligible (T3[5], T15, T16, T33 and T41), eight trees with low potential (T1, T6, T9, T13, T27, T32, T36 and T42), 18 trees with moderate potential (T2, T4, T8, T10, T18-19, T21-26, T30, T35, T37-38 and T40) and one confirmed roost (T20) (via the presence of droppings). One tree, T44 could not be climbed due to health and safety reasons. Instead, this tree was subject to a dusk emergence and dawn re-entry survey. The likely absence of roosting bats was confirmed during this survey. Overall, the Site is regarded to be conservation importance at up to a Local level for roosting bats.	Up to Local

[5] T3 was confirmed as a roost during the PBRA survey but was subsequently downgraded to negligible during the at-height surveys. This is due to branch damage that was sustained between the PBRA and at-height survey, exposing the features where the droppings had previously been recorded, and no longer provided the same protection and shelter for bats.

Ecological feature	Baseline summary	Valuation
Bats – foraging and commuting	Habitats within the Site include orchard, semi-improved neutral grassland, scrub and hedgerows. Bat activity surveys focussed on linear features within the Site, such as hedgerows, with four static detectors deployed monthly between April and October. At least eight species of bat were recorded, however common and soprano pipistrelle *Pipistrellus pipistrellus and Pipistrellus pygmaeus* which are widespread and common bat species[67] accounted for over 75% of all bat activity recorded. Ecobat analysis revealed these were the only two species that recorded high activity levels. The remaining recordings were made by a range of species, including the rarer greater horseshoe bat *Rhinolophus ferrumequinum,* Barbastelle bat *Barbastella barbastellus* and Leisler's bat *Nyctalus leisleri.* Other species recorded included noctule *Nyctalus noctule,* serotine *Eptesicus serotinus* and Nathusius' pipistrelle *Pipistrellus nathusii.* other genus, that could not be identified to species level included *Plecotus* sp. and *Myotis* sp. Location 3 alongside a row of hornbeam trees recorded the highest activity levels, with Location 2, alongside the footpath that bisects the Site considered to be important for Barbastelle bats. Overall, the Site is regarded to be of conservation importance at up to a District level for its assemblage of bats.	Up to District
Badger *Meles meles*	A badger survey, undertaken in April 2019, identified a number of setts within the Site and surrounding area, including a main sett located within the alignment of the Scheme. A second potential main sett was subsequently identified though an extension of the survey area. A badger bait marking survey was undertaken in September / October 2019 to identify whether multiple clans were present within the area. The results of the surveys identified one badger clan residing within the Badger Bait Marking Survey Area. At the time of the survey, this clan had three very active setts (Sett 1-3) likely comprising a main, annex and subsidiary. Several outlier setts were also identified within the Site. Badgers are widespread within Sussex and southern England and are afforded legal protection for reasons of animal cruelty, not rarity. However, given the presence of a main, annex, subsidiary and outlier setts, the Site and surrounding area is considered to be of Local importance for badgers.	Local

[6] Bat Conservation Trust (2017a). National Bat Monitoring Programme Population Trends | The state of the UK's bats 2017.
[7] Bat Conservation Trust (2017b). National Bat Monitoring | Annual report 2017.

Ecological feature	Baseline summary	Valuation
Birds – wintering	A total of 40 species were recorded during the wintering bird surveys, of these 16[8] receive additional legal protection, including: ▪ three Wildlife and Countryside Act Schedule 1 species; ▪ eight Species of Principal Importance (SPI) listed under the Natural Environment and Rural Communities (NERC) Act 2006; ▪ eight Birds of Conservation Concern (BoCC) red list species; and ▪ seven BoCC amber species. No SPA qualifying species / assemblages (gulls) were recorded foraging in significant numbers, as such the wintering bird assemblage is considered to be of Local conservation importance.	Local
Birds – breeding	A total of 44 species were recorded during the breeding bird surveys, of these, 15[9] receive additional legal protection including: ▪ three Wildlife and Countryside Act Schedule 1 species; ▪ eight Species of Principal Importance (SPI) listed under the Natural Environment and Rural Communities (NERC) Act 2006; ▪ six Birds of Conservation Concern (BoCC) red list species; and ▪ seven BoCC amber species. No specific barn owl surveys have been undertaken; however, a barn owl was recorded incidentally during a bat survey foraging within the Site and therefore may have a breeding site locally. Given the species records and the habitats present, the breeding bird community within the Site is considered to be of District conservation importance.	District
Reptiles	The reptile survey confirmed the presence of two reptile species within the Site; slow worm *Anguis fragilis* and common lizard *Zootoca vivipara,* with low populations of both species present. Additionally, records of grass snake *Natrix helvetica* were returned in the desk study as present within 150m of the Site. Due to the close proximity of these records and also the suitability of the habitats on Site, it is considered that a low population of grass snake may also be present. Overall, the population of reptiles within the Survey Area is considered to be of importance at a Local level. This is because of widespread habitat within the local area and the low population size recorded of a relatively widespread species within West Sussex.	Local

[8] It should be noted that these categories are not exclusive, and a species can be listed in more than one conservation category (for example listed as both a SPI and BoCC red list species).

[9] It should be noted that these categories are not exclusive, and a species can be listed in more than one conservation category (for example listed as both a SPI and BoCC red list species).

Ecological feature	Baseline summary	Valuation
Invertebrates	Due to the presence of orchard habitat within the Site, invertebrate surveys were undertaken, with a particular focus on noble chafer *Gnorimus nobilis* found in traditional orchards. During the surveys, noble chafer was not identified so their likely absence from the Site is assumed. The surveys recorded six species of conservation concern including: ▪ three nationally scarce species (an ant *Lasius brunneus,* longhorn beetle *Prionus coriarius* and flower beetle *Mordellistena humeralis*); ▪ three SPI (small heath butterfly *Coenonympha pamphilus*, ghost moth *Hepialus humuli* and cinnabar moth *Tyria jacobaea*). Additionally, stag beetle *Lucanus cervus,* a SPI which are of high conservation concern, and also protected under the Wildlife and Countryside Act (1981, as amended) were recorded incidentally on Site, with suitable habitat present, and are considered of importance at up to a Local level.	Up to Local
Other Species of Principal Importance (SPI)	As detailed in the PEA (Appendix 9.1), records of other SPI were returned in the desk study, including hedgehog *Erinaceus europaeus* and polecat *Mustela putorius*, with suitable habitat for these species present within the Scheme. Further, although not identified within desk study records, the open grassland habitat has the potential to support brown hare *Lepus europaeus* and areas of hedgerow and unmanaged grassland have the potential to support harvest mice *Micromys minutus.* SPI are considered of importance at up to a Local level.	Up to Local

FUTURE BASELINE

9.4.2. No change in land use or management is anticipated prior to clearance for construction of the Scheme. As such, the future baseline is considered likely to be closely similar to that of the current baseline. Habitats immediately adjacent to the Site (offsite habitats) will likely be subject to change, given that the land immediately to the south of the Scheme is within the Arun Local Plan 2011-2031 and has been allocated for residential development (Phase 2).

9.5. SENSITIVE RECEPTORS

9.5.1. **Table 9-8** below lists the sensitive ecological receptors identified during the baseline assessment.

Table 9-8 – Sensitive receptors and potential pathways of effect

Sensitive Receptor	Nature Conservation Value	Potential pathways of Effect
On-site HPI (Hedgerows)	Local	**Construction Phase** ▪ Permanent and temporary land-take within the Scheme footprint. ▪ Permanent manipulation of habitats, such as landscaping and 'tidying-up' of areas not within the footprint, felling of trees for Health and Safety reasons.

Sensitive Receptor	Nature Conservation Value	Potential pathways of Effect
		▪ Temporary storage of construction materials within / adjacent to ecological resources with associated habitat contamination and compaction. ▪ Degradation through airborne pollution. ▪ Pollution caused by use of hazardous materials and incidental release of dust, chemicals, fuels or waste materials. **Operation Phase** ▪ Degradation through airborne pollution.
On-site HPI (Traditional Orchard)	District	**Construction Phase** ▪ Permanent and temporary land-take within the Scheme footprint. ▪ Permanent manipulation of habitats, such as landscaping and 'tidying-up' of areas not within the footprint, felling of trees for Health and Safety reasons. ▪ Temporary storage of construction materials within / adjacent to ecological resources with associated habitat contamination and compaction. ▪ Degradation through airborne pollution. ▪ Pollution caused by use of hazardous materials and incidental release of dust, chemicals, fuels or waste materials. **Operation Phase** ▪ Degradation through airborne pollution.
Bats – roosting	Local	**Construction Phase** ▪ Habitat loss and fragmentation. ▪ Direct mortality during site clearance and construction. ▪ Disturbance from construction activities including visual, noise, vibration and lighting. **Operation Phase** ▪ Direct injury/mortality during operation. ▪ Direct disturbance from operational use, visual, noise, vibration and lighting.
Bats – foraging and commuting	District	**Construction Phase** ▪ Habitat loss and fragmentation. ▪ Disturbance from construction activities including visual, noise, vibration and lighting. **Operation Phase** ▪ Direct disturbance from operational use, visual, noise, vibration and lighting.
Badger *Meles meles*	Local	**Construction Phase**

Sensitive Receptor	Nature Conservation Value	Potential pathways of Effect
		▪ Habitat loss and fragmentation. ▪ Direct mortality during site clearance and construction. ▪ Disturbance from construction activities including visual, noise, vibration and lighting. **Operation Phase** ▪ Direct injury/mortality during operation. ▪ Direct disturbance from operational use visual, noise, vibration and lighting.
Birds – wintering	Local	**Construction Phase** ▪ Habitat loss and fragmentation. ▪ Disturbance from construction activities including visual, noise, vibration and lighting. **Operation Phase** ▪ Direct injury/mortality during operation. ▪ Direct disturbance from operational use, visual, noise, vibration and lighting.
Birds – breeding	District	**Construction Phase** ▪ Habitat loss and fragmentation. ▪ Direct mortality during site clearance and construction. ▪ Disturbance from construction activities including visual, noise, vibration and lighting. **Operation Phase** ▪ Direct injury/mortality during operation. ▪ Direct disturbance from operational use, visual, noise, vibration and lighting.
Reptiles	Local	**Construction Phase** ▪ Habitat loss and fragmentation. ▪ Direct mortality during site clearance and construction. ▪ Disturbance from construction activities including visual, noise, vibration and lighting. **Operation Phase** ▪ Direct disturbance from operational use, visual, noise, vibration and lighting.
Invertebrates	Local	**Construction Phase** ▪ Habitat loss and fragmentation. ▪ Direct mortality during site clearance and construction. ▪ Disturbance from construction activities including visual, noise, vibration and lighting. **Operation Phase**

Sensitive Receptor	Nature Conservation Value	Potential pathways of Effect
		▪ Direct disturbance from operational use, visual, noise, vibration and lighting.
Other SPI	Local	**Construction Phase** ▪ Habitat loss and fragmentation. ▪ Direct mortality during site clearance and construction. ▪ Disturbance from construction activities including visual, noise, vibration and lighting. **Operation Phase** ▪ Direct disturbance from operational use, visual, noise, vibration and lighting.

9.6. ASSESSMENT OF EFFECTS, MITIGATION AND RESIDUAL EFFECTS

CONSTRUCTION PHASE

9.6.1. Construction of the Scheme is anticipated to commence in February 2021 and continue for a period of nine months until November 2021.

9.6.2. It is understood that construction activity will be mainly confined to daylight hours, during weekdays only (Monday to Thursday 07:30-17:30 and Friday 07:30-15:30). Final details on construction methods are not yet available, however it is considered that noise-generating methods including piling, compressing and breaking will be required. There is currently no lighting strategy in place for the construction phase, however the principles set out in Section 9.6.21 with regards to operational lighting will be adhered to.

Habitat Creation

9.6.1. An area predominately to the north of the Scheme has been allocated to landscaped habitat creation. The layout of these areas has been informed by iterative Biodiversity Net Gain assessment (see **Appendix 9.10**) in collaboration with the design team. Further details are included in **Chapter 10: Landscape and Visual Impact.**

9.6.2. The layout of habitats is shown in the landscape general arrangement plans (**Appendix 3.3**). The planting schedules (**Appendix 10.3**) have been designed to include locally native species, and those with a benefit to wildlife, e.g. berry- bearing shrubs providing a value food source. The following habitat creation forms part of the proposed landscaping:

- Species-rich hedgerow (828m);
- Specimen trees (16 trees);
- Amenity grassland (14,170m^2);
- Wildflower meadow (18,956m^2) of which 13,700m^2 comprises orchard habitat;
- Wetland grassland (7,992m^2);
- Scrub (4,734m^2); and
- Woodland edge habitat (9,240m^2)

9.6.3. As the habitats created will take time to establish, their effect has been accounted for in the operational phase effects. Specific detail of habitat management (e.g. grassland mowing regime etc.) is also provided in the Landscape Maintenance and Management Plan (LMMP) (**Appendix 10.4**).

9.6.4. The assessment of effects during the construction phase is provided in **Table 9-9** to **Table 9-19** below.

Table 9-9 – Assessment of construction effects for offsite HPI

Assessment Component	Commentary
Offsite HPI	Hedgerows, deciduous woodland and traditional orchard habitat are located immediately outside of the Site and could be affected indirectly by dust, airborne pollution and degradation through temporary storage of construction materials during the construction phase. All habitats are sensitive to changes in soil pH or toxicity from deposition of chemicals, to light blocking from dust in the air or on leaves, and to changes in drainage regime which may increase or decrease available water and its quality. Pollution may occur at chronic levels from day-to-day construction activities, or at acute levels from a pollution event such as a fire or chemical spill. A pollution event could therefore cause loss of habitat. The sensitivity of offsite HPI is considered to be Low, and the magnitude of change prior to mitigation, is considered to be Small (chronic pollution event) or Medium (acute pollution event). Therefore, there is likely to be an indirect, temporary, short-term or permanent long-term **Minor adverse** effect on offsite HPI (**significant**) prior to the implementation of mitigation measures.
Secondary Mitigation	A CEMP will be produced for the Scheme in advance of the construction phase. The CEMP will include best practice construction measures minimise the effects of noise pollution, dust and air pollution and visual intrusion during construction. Measures to avoid temporary storage of construction materials adjacent to offsite HPI will also be included within the CEMP. Fencing will be installed around all construction works to protect the surrounding retained habitats.
Residual Effects and Monitoring	The sensitivity of offsite HPI is Low, and the magnitude of change, following mitigation, is Negligible Therefore, there will be a **negligible adverse** residual effect on offsite HPI (**not significant**) following the implementation of mitigation measures.

Table 9-10 – Assessment of construction effects for onsite HPI (Hedgerow)

Assessment Component	Commentary
Onsite HPI (Hedgerow)	The construction phase of the Scheme will result in the removal of 410m of hedgerow, likely to meet the criteria of HPI, and a further 410m loss of line of trees, 50m of which is from a line of trees that is considered to be ecological valuable. Whilst hedgerows / line of trees within the Scheme are considered to be of Local level importance, the loss of up to 820m is not likely to significantly affect the distribution of hedgerows at the Local level.

Assessment Component	Commentary
	Sections of retained hedgerow within the Scheme could be affected indirectly by dust, airborne pollution and degradation through temporary storage of construction materials during the construction phase. As set out above for offsite HPI, pollution may occur at chronic or acute levels. The sensitivity of onsite hedgerow HPI is considered to be Low, and the magnitude of change prior to mitigation, is considered to be Medium. Therefore, there is likely to be both direct and indirect, permanent and temporary, long and short-term **Minor adverse** effects on hedgerow HPI (**significant**) prior to the implementation of mitigation measures.
Secondary Mitigation	All retained hedgerows will be protected in accordance with British Standard BS5837:2012 Trees in Relation to Construction, including the erection of robust protective fencing encompassing root protection areas. A CEMP will be produced for the Scheme in advance of the construction phase. The CEMP will include best practice construction measures minimise the effects of noise pollution, dust and air pollution and visual intrusion during construction. Measures to avoid temporary storage of construction materials adjacent to retained hedgerows will also be included within the CEMP. Where it is not feasible to retain all or part of hedgerows, they will be replaced with higher quality species-rich hedgerow. In the current landscaping plans, a total of 828m of hedgerow planting has been included, however this won't be available until the operational phase and therefore is not considered further here.
Residual Effects and Monitoring	Implementation of the above mitigation measures will significantly reduce the likelihood of habitat degradation associated with construction phase pollution. Due to the unavoidable loss of small areas of valuable habitats, and the delay for compensation areas to establish, the sensitivity of hedgerow HPI is Low, and the magnitude of change, following mitigation, is Small. Therefore, there is likely to be a temporary, direct, short-term **Minor adverse** residual effect on hedgerow HPI (**significant**) following the implementation of mitigation measures.

Table 9-11 – Assessment of construction effects for onsite HPI (Traditional Orchard)

Assessment Component	Commentary
Onsite HPI (Traditional Orchard)	The construction phase of the Scheme will result in the loss of traditional orchard HPI, totalling an area of approximately 4,200m^2. The sensitivity of traditional orchard HPI is considered to be of District level importance, and the loss of up to 4,200m^2 will affect the distribution of traditional orchard HPI at the District level. Parcels of retained orchard habitat within the Scheme and immediately outside of the Scheme could be affected indirectly by dust, airborne pollution and degradation through temporary storage of construction materials during the construction phase, and as set out for offsite HPI and hedgerow HPI, pollution may occur at chronic or acute levels. The sensitivity of onsite traditional orchard HPI is considered to be Low, and the magnitude of change prior to mitigation, is considered to be Large. Therefore, there is likely to be a both direct and indirect, permanent and temporary, long and short-term

Assessment Component	Commentary
	Minor-Moderate adverse effects on hedgerow HPI (**significant**) prior to the implementation of mitigation measures.
Secondary Mitigation	All retained trees within the orchard will be protected in accordance with British Standard BS5837:2012 Trees in Relation to Construction, including the erection of robust protective fencing encompassing root protection areas. A CEMP will be produced for the Scheme in advance of the construction phase. The CEMP will include best practice construction measures minimise the effects of noise pollution, dust and air pollution and visual intrusion during construction. Measures to avoid temporary storage of construction materials adjacent to retained trees will also be included within the CEMP. In the current landscape plans, 13,700m^2 of orchard planting is included, however as this won't be available until the operational phase, it is not considered further here.
Residual Effects and Monitoring	Due to the unavoidable loss of areas of valuable habitat, and the delay for compensation areas to establish, the sensitivity of hedgerow HPI is Low, and the magnitude of change, following mitigation, is Small. Therefore, there will be a direct, temporary, short-term **Minor adverse** residual effect on orchard HPI (**significant**) following the implementation of mitigation measures.

Table 9-12 – Assessment of construction effects for Bats – roosting

Assessment Component	Commentary
Bats (Roosting)	Habitat removal required to facilitate construction will result in the loss of six trees assessed to have moderate or high potential to support roosting bats, including: ▪ T34-35, T37-38 and T40 with moderate potential ▪ T39 with high potential Although the trees listed above have been subject to at-height tree climbing surveys (during which no evidence of bats was identified), bats may use Potential Roost Features (PRFs) on a transient basis, and as such, it is not possible to rule out the presence of bats roosting within these trees. If bats are present at the time of works, there is a risk of direct loss of individuals through injury/mortality. Even if bats are not using the trees for roosting purposes, the removal of trees will result in a loss of roosting resource within the Site. Additionally, although the Scheme will not result in the removal of Building B5, which supports a transitional roost for soprano pipistrelle and Serotine, the construction works themselves will be within close proximity (less than 5m) and noisy construction activities (e.g. piling/ compressing, drilling) may deter bats from using this building as a roost. During the construction phase, in addition to the tree removals, there will also be habitat degradation over a wider area both in terms of disturbance to retained trees and habitat fragmentation. There will be limited after dark lighting during the construction phase, however there will be noise and vibration that may affect roosting opportunities in retained trees and buildings with potential to support roosting bats. The sensitivity of roosting bats is considered to be Low, and the magnitude of change prior to mitigation, is considered to be Medium. Therefore, there is likely to be a direct

Assessment Component	Commentary
	and indirect, temporary and permanent and short and long-term **Minor adverse** effect on roosting bats (**significant**) prior to the implementation of mitigation measures.
Secondary Mitigation	All retained trees will be protected in accordance with British Standard BS5837:2012 Trees in Relation to Construction, including the erection of robust protective fencing encompassing root protection areas. To avoid disturbance to retained trees and buildings with suitability to support roosting bats, a CEMP will be produced for the Scheme in advance of the construction phase. The CEMP will include best practice construction measures to minimise the effects of noise pollution, dust and air pollution and visual intrusion during construction. Measures to avoid temporary storage of construction materials adjacent to retained trees will also be included within the CEMP. Prior to tree removal, as bats may use PRFs on a transient basis and there will be at least a 12-month time lapse between the most recent surveys (2019) and construction commencing, an updated ground-level inspection will be completed to confirm the level of suitability for bat roosts to be present. This is to ensure that mitigation is appropriate and based on information current at the time of works. The following approach will then be taken: ▪ Trees assessed as having low suitability to support bat roosts will be soft-felled by suitably qualified arborists, following an at-height inspection of any potential roost features to confirm the absence of roosting bats (and evidence of roosting bats). ▪ Trees assessed as having moderate or high suitability to support bat roosts will be subject to a climbing inspection to enable a thorough assessment of suitability and to search for evidence indicating the presence of roosting bats. If at this stage the suitability is downgraded to low, the trees will be soft felled by suitably qualified arborists as above. ▪ In the event that the presence of a bat roost is highlighted at this stage, the requirement for works affecting the roost would be reconsidered to identify whether adverse effects can be avoided. Where possible, in this scenario proposals would be updated to enable retention and protection of the bat roost. In the event that retention is not possible, a licence would be sought from Natural England to permit works to proceed, the licence application would be subject to a detailed method statement. If it is not possible to avoid disturbance effects to Building B5 via careful timing of works, then it may be necessary to obtain a licence from Natural England to permit works to proceed, which would be subject to a detailed method statement. As Building B5 has been assessed as having negligible potential to support hibernating bats, avoidance of impacts would include timing the works to take place between November – February (weather dependent) when bats are likely absent from the roost. To mitigate for the loss of roosting opportunities across the Scheme, and to enable future monitoring, new roosting opportunities in the form of bat boxes will be installed on retained mature trees in suitable locations, either within the Site itself, or within nearby land under the ownership of WSCC, prior to any trees being felled. The number of bat boxes installed will at least replicate the number of PRFs lost from the six moderate/high suitability trees (12 PRFs in total), with another five additional PRFs provided as an enhancement measure. These boxes will be sited in appropriate locations, at least 4m high and close to foraging and commuting habitat (e.g. hedgerow) under the guidance of an ecologist.
Residual Effects and Monitoring	With the adoption of the mitigation measures, they will minimise the risk of increased injury and/or mortality of bats associated with construction activities and ensure that

Assessment Component	Commentary
	PRFs are maintained within the Scheme or at a suitable nearby location. However, there will remain unavoidable habitat degradation associated with roosting bats. As such, the sensitivity of roosting bats is Low, and the magnitude of change, following mitigation, is Small. Therefore, there will be a direct, temporary short-term **Minor adverse** residual effect on roosting bats (**significant**) following the implementation of mitigation measures.

Table 9-13 – Assessment of construction effects for Bats – foraging and commuting

Assessment Component	Commentary
Bats (foraging and commuting)	The Scheme will result in the removal of habitat providing suitable commuting and foraging habitat for bats. The construction phase will result in the severance of several commuting routes, including the severance of hedgerows and tree lines. This will result habitat degradation through the loss of areas of foraging and commuting habitat for bats. A reduction in the available foraging resource could ultimately contribute to reduced populations of bats in the local area and negatively affect the conservation status of bats. Temporary lighting associated with the construction phase which spills onto retained ecological features (e.g. retained hedgerows) or noisy construction activities (e.g. piling, compressing and drilling) during any night-time works may also deter bats from using established commuting routes or foraging resources within the Scheme. The sensitivity of commuting and foraging bats within the Scheme is considered to be Low, and the magnitude of change in the absence of mitigation is considered to be Medium. Therefore, there is likely to be direct and indirect, temporary and permanent short and long-term **Minor adverse** effects on commuting and foraging bats within the Proposed Scheme **(significant)** prior to the implementation of mitigation measures.
Secondary Mitigation	Landscaping as part of the Scheme which aims to provide replacement habitat for that lost will not be functional during the construction phase, as the area will be in use for construction activities until the landscaping is installed on completion. Therefore, the effects of new landscaping are considered under the operational phase assessment. Lighting during the construction phase will be kept to a minimum to avoid light spillage on retained habitat that bats will use for foraging and commuting purposes. In addition, measures will be taken to conserve and protect retained trees and hedgerow habitat which provides a foraging/commuting resource for bats. This will include the installation of protective fencing in line with BS5837:2012.
Residual Effects and Monitoring	There remains an unavoidable loss of foraging and commuting habitat for bats during the construction phase and therefore following the implementation of the mitigation measures, the sensitivity of foraging and commuting bats is Low, and the magnitude of change, following mitigation, remains Medium. Therefore, there will be a direct, temporary, short-term **Minor adverse** residual effect on foraging and commuting bats (**significant**) following the implementation of mitigation measures.

Table 9-14 – Assessment of construction effects for Badgers

Assessment Component	Commentary
Badgers	The Scheme will result in the loss of one main sett, one subsidiary sett and a number of outlier setts. All setts identified at risk or potentially at risk are in use by the same badger clan, as evidenced during the badger bait marking surveys. The site preparation, earthworks and construction phase of the Scheme has the potential to bring about negative effects on badgers though sett loss, habitat loss / fragmentation and potential injury / harm to individuals both within their setts and commuting and foraging across the Site. The sensitivity of badgers within the Scheme is considered to be Low, and the magnitude of change in the absence of mitigation is considered to be Large. Therefore, there is likely to be direct and indirect, temporary, short-term **Minor-Moderate adverse** effects on badgers within the Scheme **(significant)** prior to the implementation of mitigation measures.
Secondary Mitigation	As the use of the Site by badgers changes over time, with some setts becoming inactive and new setts being created, a walkover survey will be undertaken prior to commencement of works, and the licence application being submitted, as detailed below. It will be necessary to close the setts under a licence from Natural England. These licences are typically only issued for activities affecting setts to occur between 1st July and 30th November inclusive, in order to avoid the badger breeding season. A suitable mitigation strategy will need to be in place to obtain the licence and is likely to include the installation of one-way badger gates, kept in place for a minimum of 21 days, monitoring of the setts for signs of badgers entering of leaving the sett and destruction of the sett once badgers are excluded to reduce the risk of badgers re-occupying the sett. The area will also be secured against re-entry by badgers by using heavy-gauge chain link fencing. As one of the setts to be lost is a main sett, it will be necessary to install an artificial sett, which will need to be proven to have been occupied by badgers, prior to the closure of their main sett. This artificial sett should be installed at least six months prior to sett closure. Badgers use the wider area for foraging and commuting purposes and therefore measures need to be put in place during the construction phase to minimise effects upon badger movement and foraging activity. These will be detailed within the CEMP and include measures such as fencing dangerous areas of the construction site (e.g. deep excavations) or providing a means of egress from shallow excavations, whilst ensuring other construction fencing is raised 180mm above ground level to enable badgers to pass beneath. Storage of plant and materials on areas of potential foraging habitat (e.g. retained grassland) will be avoided. In addition, appropriate good practice measures will be implemented to reduce noise during construction and there will be no night works unless specifically needed, to avoid disturbance by artificial lighting. Where the use of lighting is unavoidable, hoods, cowls or shields will be used to avoid light spill onto setts or badger paths. For setts that are located outside the Scheme extent, to ensure they are not affected by the works, a 30m buffer around each sett in which no construction activities can take place will be clearly marked.
Residual Effects and Monitoring	The creation of the artificial sett will ensure that the local badger population will have an alternative main sett during the construction phase, but there remains an unavoidable loss of commuting and foraging habitat, and therefore following the implementation of the mitigation measures, the sensitivity of badgers is Low, and the magnitude of

Assessment Component	Commentary
	change, following mitigation, is Small. Therefore, there will be an indirect, temporary, short-term **Minor adverse** residual effect on badgers (**significant**) following the implementation of mitigation measures.

Table 9-15 – Assessment of construction effects for Wintering birds

Assessment Component	Commentary
Wintering birds	The construction phase of the Scheme will result in the loss of habitat suitable for supporting a wintering bird community of up to Local level value, and therefore result in a reduction in the habitat available. Temporary lighting associated with the construction phase which spills onto retained ecological features (e.g. retained hedgerows) or noisy construction activities (e.g. piling, compressing and drilling) may also have a negative effect on wintering birds. The sensitivity of wintering birds within the Scheme is considered to be Low, and the magnitude of change in the absence of mitigation is considered to be Small. Therefore, there is likely to be direct, temporary short-term **Minor adverse** effects on wintering bird within the Scheme **(significant)** prior to the implementation of mitigation measures.
Secondary Mitigation	A CEMP will be produced for the Scheme in advance of the construction phase. The CEMP will include best practice construction measures minimise the effects of noise pollution, dust and air pollution and visual intrusion during construction The current landscaping proposals include for a range of different habitats that will provide a foraging resource for wintering birds. This includes the creation of wet swales, woodland, orchard and scrub habitat. Plant species will include berry-bearing shrubs and trees to provide suitable foraging resource.
Residual Effects and Monitoring	The proposed mitigation will ensure that there is sufficient foraging resource and habitat for wintering birds, however there will be a delay for compensation areas to establish. Following the implementation of mitigation, the sensitivity of wintering birds is Low, and the magnitude of change, following mitigation, remains Small. Therefore, there will be a **Minor adverse** residual effect on wintering birds (**significant**) following the implementation of mitigation measures.

Table 9-16 – Assessment of construction effects for Breeding birds

Assessment Component	Commentary
Breeding birds	The Scheme will result in the loss of suitable habitat for breeding birds, including hedgerow, trees, broadleaved and plantation woodland and scrub. The construction phase of the Scheme will result in the loss of suitable habitat for breeding birds, including hedgerow, broadleaved and plantation woodland and scrub. This will result in habitat loss and degradation. A reduction in the available suitable nesting habitat could ultimately contribute to reduced populations of breeding birds in the local area and negatively affect the conservation status of an assemblage of species considered to be of up to District level value. The sensitivity of breeding birds will increase immediately before and during the breeding period (March – August inclusive for most species). If construction activity occurs during the primary bird nesting season (March to August inclusive) there is a risk that active birds' nests would be damaged or destroyed and probable young would be injured or killed during the removal of vegetation. Noisy construction works (e.g. compressing/ breaking) has the potential to cause a disturbance effect on breeding birds, which could result in nest abandonment. There will also be a loss of habitat suitable for foraging barn owl during the construction phase.

Assessment Component	Commentary
	The sensitivity of breeding birds within the Scheme is considered to be Low, and the magnitude of change in the absence of mitigation is considered to be Medium. Therefore, there is likely to be direct, temporary, short-term **Minor adverse** effects on breeding birds within the Scheme **(significant)** prior to the implementation of mitigation measures.
Secondary Mitigation	To avoid adverse effects on nesting birds during the construction phase, where practicable Site clearance works will be undertaken outside of the bird nesting season which generally runs from March to August inclusive. If this is not possible, site clearance will proceed under the supervision of a suitably qualified ecologist in accordance with a precautionary working method statement. Such methods can be successfully implemented for localised activity but are generally not suitable for large-scale site clearance. As noted above with respect to bats, measures will be taken to conserve and protect retained trees, shrub and hedgerow habitat which provide a nesting resource for birds. This will include the installation of protective fencing in line with BS5837:2012. Appropriate good practice measures will be set out in the CEMP and be implemented to reduce noise, dust and vibration during construction. To mitigate for the loss of nesting opportunities across the Scheme, at least six bird boxes will be installed in suitable locations within retained habitat. Landscaping as part of the Scheme which aims to provide replacement habitat for that lost will not be functional during the construction phase, as the area will be in use for construction activities until the landscaping is installed on completion.
Residual Effects and Monitoring	The proposed mitigation will reduce the risk of increased injury and/or mortality of nesting birds associated with construction activities, and levels of disturbance of adjacent retained habitat. There will still be an unavoidable reduction in suitable nesting habitat during the construction phase. Following the implementation of mitigation, the sensitivity of breeding birds is Low, and the magnitude of change, following mitigation, is Small. Therefore, there will be a direct, temporary, short-term **Minor adverse** residual effect on breeding birds (**significant**) following the implementation of mitigation measures.

Table 9-17 – Assessment of construction effects for Reptiles

Assessment Component	Commentary
Reptiles	Suitable reptile habitat exists within the Scheme, with slow worm and common lizard recorded during the surveys. The construction phase will result in the removal of suitable habitat and therefore it is possible that there will be direct loss of animals from the population as a result of mortality and/or injury during construction works to facilitate construction. In addition, habitat removal required during the construction phase will reduce the area of habitat available to support the reptile population present and fragment retained areas of suitable habitat; inhibiting population movement. The sensitivity of reptiles within the Scheme is considered to be Low, and the magnitude of change in the absence of mitigation is considered to be Small. Therefore, there is likely to be direct, temporary short-term **Minor adverse** effects on reptiles within the Scheme **(significant)** prior to the implementation of mitigation measures.

Assessment Component	Commentary
Secondary Mitigation	Where feasible, all suitable reptile habitat within or immediately adjacent to the Scheme will be retained. Where it is not feasible to retain habitat, the landscaping proposals will include for creation of habitats suitable for reptiles, including the installation of log piles to act as natural refugia and hibernation opportunities. A CEMP will be produced for the Scheme in advance of the construction phase. It is advised that all areas of suitable habitat will be treated as potentially supporting reptiles. In all areas of suitable habitat, mitigation will entail the clearance of vegetation outside of the sensitive hibernation season (indicatively November-February inclusive, but weather dependent). Where tall herbaceous vegetation is cleared during the active season for reptiles, then it will be undertaken in two stages over at least two consecutive days and include an initial cut down to 150mm, with the second cut reducing vegetation as close as possible down to ground level in order to progressively render habitat unsuitable for reptiles. Any refugia will be dismantled by hand with all works undertaken under the supervision of a suitably qualified ecologist to minimise the risk of killing or injury to reptiles.
Residual Effects and Monitoring	The proposed mitigation will reduce the risk of increased injury and/or mortality of reptiles, however, there still remains an unavoidable loss of habitat during the construction phase. As such, following the implementation of mitigation, the sensitivity of reptiles is Low, and the magnitude of change, following mitigation, remains Small. Therefore, there will be a direct, temporary, short-term **Minor adverse** residual effect on reptiles (**significant**) following the implementation of mitigation measures.

Table 9-18 – Assessment of construction effects for Invertebrates

Assessment Component	Commentary
Invertebrates	Suitable habitat in the form of standing and buried deadwood and hedgerows is present within the Site that could support notable or protected invertebrate species, particularly stag beetle. The construction phase could result in a direct loss of invertebrates, including stag beetle as a result of mortality and/or injury during enabling works to facilitate construction. In addition, habitat removal required during the construction phase will reduce the area of habitat available to support invertebrate species, including stag beetle. The sensitivity of invertebrates within the Scheme is considered to be Low, and the magnitude of change in the absence of mitigation is considered to be Small. Therefore, there is likely to be direct, temporary, short-term **Minor adverse** effects on invertebrates within the Scheme **(significant)** prior to the implementation of mitigation measures.
Secondary Mitigation	Mitigation will entail the careful clearance of suitable habitat. Where any deadwood habitat is removed, this will be retained and incorporated within the areas of proposed landscaping, Careful habitat removal will also include a check of the soil around the deadwood / hedgerows to check for stag beetle larvae. The landscaping proposals include areas of wildflower meadow, wet grassland, scrub, hedgerow and woodland providing suitable habitat for a range of invertebrate species, however this will not be functional during the construction phase, as the area will be in use for construction activities until the landscaping is installed on completion.

Assessment Component	Commentary
Residual Effects and Monitoring	The proposed mitigation will reduce the risk of increased injury and/or mortality of invertebrates, however, there still remains an unavoidable loss of habitat during the construction phase. Therefore, following the implementation of mitigation, the sensitivity of invertebrates is Low, and the magnitude of change, following mitigation, remains Small. Therefore, there will be a direct, temporary, short-term **Minor adverse** residual effect on invertebrates (**significant**) following the implementation of mitigation measures.

Table 9-19 – Assessment of construction effects for Other SPI

Assessment Component	Commentary
Other SPI	Suitable habitat within the Scheme is suitable for a number of SPI including harvest mouse, brown hare, polecat and hedgehog, with records of the latter two being returned in the desk study. The construction phase could result in a direct loss of SPI, as a result of mortality and/or injury during enabling works to facilitate construction. In addition, habitat removal required during the construction phase will reduce the area of habitat available to support invertebrate species. The sensitivity of SPI within the Scheme is considered to be Low, and the magnitude of change in the absence of mitigation is considered to be Small. Therefore, there is likely to be direct, temporary, short-term **Minor adverse** effects on invertebrates within the Scheme **(significant)** prior to the implementation of mitigation measures.
Secondary Mitigation	Mitigation will entail the careful clearance of suitable habitat. This will include the sensitive clearance of habitat, which will be carried out in a phase approach (as above for reptiles) and avoid the hibernation period. Where this is not possible, careful removal of log/brash piles that may support hedgehogs will be undertaken. The landscaping proposals include areas of wildflower meadow, scrub, hedgerow and woodland providing suitable habitat for SPI, however this will not be functional during the construction phase, as the area will be in use for construction activities until the landscaping is installed on completion.
Residual Effects and Monitoring	The proposed mitigation will reduce the risk of increased injury and/or mortality of SPI, however, there still remains an unavoidable loss of habitat during the construction phase. Therefore, following the implementation of mitigation, the sensitivity of invertebrates is Low, and the magnitude of change, following mitigation, remains Small. Therefore, there will be a **Negligible adverse** residual effect on SPI (**significant**) following the implementation of mitigation measures.

OPERATIONAL PHASE

9.6.20. The Scheme will see the construction of a new road and associated landscaping. A lighting strategy has been developed, in which the road itself will be lit at the approaches to roundabouts, and the pedestrian / cycle path will be lit along the entire length, with the exception of a dark corridor towards the middle of the route, when it has been identified as a key commuting corridor for bats, including Barbastelle.

9.6.21. The lighting design strategy has taken into account ecologically sensitive receptors and includes the following elements. The lighting assessment is detailed in **Appendix 10.2**.

- The minimal necessary lighting required will be used;
- Directional cowls and louvres will be used to prevent backwards, upwards or other light spill onto retained or created habitats;
- Where possible, low-level luminaires will be used to light the Scheme;
- Warm white LEDs will be used (2700-3000 Kelvin) in order to minimise impacts upon nocturnal wildlife; and
- Lighting control will be used to minimise when the lighting is on, only delivering target illumination levels at peak use times. In low use times lighting will be dimmed back further.

9.6.22. The assessment of effects during the operational phase is provided in **Table 9-20** to **Table 9-30** below.

Table 9-20 – Assessment of operational effects for offsite HPI

Assessment Component	Commentary
Offsite HPI	Increased traffic flows as a result of the new road may cause low-level pollution or nitrogen deposition upon retained adjacent HPI which may affect factors such as growth rates and soil diversity. Traffic related effects are likely to be confined to the area around the roundabouts where vehicles will accelerate away, generating the most pollutants. However, a recent study has shown that land management practice greatly outweighs the impacts of air quality on habitats in close proximity to a road (Ref 9.29) The sensitivity of offsite HPI is considered to be Low, and the magnitude of change prior to mitigation, is considered to be Negligible. Therefore, there is likely to be an indirect, permanent long-term **negligible adverse** effect on offsite HPI (**not significant**) prior to the implementation of mitigation measures.
Secondary Mitigation	No specific mitigation measures in respect to off-site habitats are proposed.
Residual effects and monitoring	The sensitivity of offsite HPI is considered to be Low, and the magnitude of change following mitigation, is considered to be Negligible. Therefore, there is likely to be a **negligible adverse** effect on offsite HPI (**not significant**) prior to the implementation of mitigation measures.

Table 9-21 – Assessment of operational effects for onsite HPI (Hedgerows)

Assessment Component	Commentary
Onsite HPI (Hedgerow)	The landscape proposals currently include for 828m of hedgerow planting comprising seven native species. Whilst this will only provide a small increase to what is being lost to facilitate construction, as it is a species rich hedgerow, it is of higher quality than that to be lost within the Scheme, which predominately comprises species poor hedgerow. The BNG assessment has resulted in a no net loss of hedgerows across the Scheme. However, it has been advised that a further 50m of species-rich hedgerow planting be

Assessment Component	Commentary
	incorporated within the detailed landscape plans which would result in an overall net gain, providing appropriate long term landscape management is put in place. Whilst the Scheme will result in a permanent severance of hedgerows, therefore resulting in fragmentation and loss of connectivity, the landscaping design has aimed to achieve connectivity along the route, as set out in 9.6.15. There will however be operational lighting from the Scheme that may have adverse effects upon bat species utilising this habitat for foraging and commuting. As set out above, land management practice outweighs the impact of vehicle emissions on roadside transects, as such negative effects on HPI are not anticipated as a result of an increase of traffic flows. The sensitivity of hedgerow HPI is considered to be Low, and the magnitude of change following mitigation, is considered to be Negligible. Therefore, there is likely to be an indirect, permanent long-term **negligible adverse** effect on hedgerow HPI (**not significant**') prior to the implementation of mitigation measures.
Secondary Mitigation	Whilst mitigation measures are not specifically required to mitigate against effects upon HPI, measures will be put in place to reduce negative effects that occur upon hedgerow HPI. A sensitive lighting strategy will be put in place during operation to reduce effects upon hedgerow habitat suitable to support foraging and commuting bats in line with best practice guidance (Ref 9.30). All newly created habitats to be managed in line with the LMMP which will effective in mitigating air quality impacts as a result of increased vehicle omissions on Hedgerow HPI as detailed in a recent study (Ref 9.29).
Residual effects and monitoring	As calculated by the BNG assessment (Appendix 9.10), whist the Scheme at present will not achieve a 10% net gain for biodiversity for linear units, with a further 50m of hedgerow planting is required to achieve this, providing it is subject to an appropriate long term management regime. The sensitivity of hedgerow HPI is considered to be Low, and the magnitude of change following mitigation, is considered to be Negligible. Therefore, there is likely to be a direct, long-term permanent **Negligible adverse** effect on hedgerow HPI (**not significant**) following the implementation of mitigation measures. If it is possible to incorporate an additional 50m of hedgerow in the landscaping to achieve 10% BNG on linear based habitats, there will be a long-term permanent **Minor beneficial** effect on hedgerow HPI**.**

Table 9-22 – Assessment of operational effects for onsite HPI (Traditional orchard)

Assessment Component	Commentary
Onsite HPI **(Traditional Orchard)**	Landscaping elements will focus on achieving 10% biodiversity net gain on area-based habitat creation. The landscape proposals currently include for the creation of orchard habitat, totalling an area of approximately 13,700m^2, providing an addition of approximately 9,500m^2 of orchard habitat than what will be lost to facilitate construction and therefore an increase in what is currently present within the Scheme. Further, the orchard habitat is considered to be in a poor condition, due to the current lack of management which has allowed it to become encroached by scrub vegetation. Although there will be increased traffic flows as a result of the new road which may cause low-level pollution or nitrogen deposition upon retained and new orchard habitat,

Assessment Component	Commentary
	as set out above for off-site HPI and hedgerow HPI land management practice outweighs the impact of vehicle emissions. The sensitivity of traditional orchard HPI is considered to be Low, and the magnitude of change prior to mitigation, is considered to be Negligible. Therefore, there is likely to be an indirect, permanent long-term **negligible adverse** effect on traditional orchard HPI (**not significant**') prior to the implementation of mitigation measures.
Secondary Mitigation	Whilst mitigation measures are not specifically required to mitigate against effects upon HPI, management of these habitats, as detailed within the respective landscape plans, for the Scheme will result in the new and the retained habitats achieving higher quality (condition) than currently recorded. All newly created habitats to be managed in line with the LMMP which will effective in mitigating air quality impacts as a result of increased vehicle omissions on orchard HPI.
Residual effects and monitoring	As calculated by the BNG assessment (Appendix 9.10), the Scheme will achieve a significant net gain for biodiversity (area based units only), including for orchard habitat, which will be subject to a management regime. The sensitivity of traditional orchard HPI is considered to be Low, and the magnitude of change following mitigation, is considered to be Small. Therefore, there is likely to be a **Minor beneficial** effect on traditional orchard HPI (**not significant**) following the implementation of mitigation measures.

Table 9-23 – Assessment of operational effects for bats – roosting

Assessment Component	Commentary
Bats **(Roosting)**	Light spill onto retained trees and buildings with roosting suitability / confirmed roosting status could result in direct negative effects upon certain species. In particular, barbastelle and bats of the *Myotis* genus are known to avoid illuminated habitat. Some other species of bat do readily forage in illuminated habitats (such as common/ soprano pipistrelles, frequently encountered during the surveys). However, lighting does have negative effects upon their invertebrate prey, which are drawn to illuminated habitats, potentially having long term negative effects on invertebrate populations. The number of bat boxes proposed will not only replace the number of PRFs lost as a result of the removal of six trees with moderate/high suitability but will also provide additional PRFs therefore increasing the number of roosting opportunities available to bats during the operational phase. The landscaping proposal include a range of habitats, including woodland, wildflower grassland, scrub and hedgerows that will providing supporting habitat for bat roosts. The sensitivity of roosting bats is considered to be Low, and the magnitude of change prior to mitigation, is considered to be Negligible. Therefore, there is likely to be an indirect, permanent long-term **negligible adverse** effect on roosting bats (**not significant**') prior to the implementation of mitigation measures.
Secondary Mitigation	Secondary mitigation will take the form of monitoring which will inform any further steps required. This will serve to protect the bat population in the long term. On at least one occasion in the first five years post-completion, an inspection of the bat boxes will be undertaken by a Natural England (NE) licensed ecologist to record evidence of use by bats and advise on any necessary repairs to be carried out. If a box

Assessment Component	Commentary
	has not been used for several years in succession, the installation of new alternative boxes (non-integral) shall be considered following the advice of a suitably qualified ecologist.
Residual effects and monitoring	Whilst there will be an increase in roosting opportunities, there will be increased permanent lighting. The sensitivity of roosting bats is considered to be Low, and the magnitude of change following mitigation, is considered to be Negligible. Therefore, there is likely to be a **negligible adverse** effect on roosting bats (**not significant**) following the implementation of mitigation measures.

Table 9-24 – Assessment of operational effects for bats – foraging and commuting

Assessment Component	Commentary
Bats (Foraging and commuting)	The new road will have a 30mph speed restriction, as such vehicle collision is not considered to be a significant risk to bats during the operational phase. During the operational phase, landscaping created during the construction phase will become established. The hedgerow breaches will result in a loss of connectivity north to south (or vice versa), however there is a significant amount of new hedgerow proposed (883m), which will provide connectivity in an east to west (or vice versa) direction, providing suitable foraging and commuting habitats for bats. The landscape proposals include a woodland edge mix, totalling an area of over 9,000m^2 which will provide suitable foraging and commuting habitat. There will be approximately 4,700m^2 of scrub planting with species mixes that will attract night-flying insects and are therefore of benefit to foraging bats (Ref 9.31). Additionally, the planting associated with the drainage ditches / attenuation basins (approximately 8,000m^2) to be sown with a wetland meadow mix is likely to attract an invertebrate assemblage and therefore in combination with the additional hedgerow, woodland and scrub planting will provide a higher quality foraging habitat upon establishment then what is currently present on the Site. A preliminary street lighting layout has been prepared, giving the location of the proposed lighting columns, as well as Lux contours, showing the level of light spill onto adjacent habitat (Drawing ref SSE281768-1300-002 to 006 Revision B). This shows that whilst the majority of the route is to be lit, light spill is greatest at the roundabouts. To that end, as part of the detailed design process, the central roundabout was moved 100m west, to avoid significant light spill along the public right of way (PRoW), which has been assessed as an important bat corridor, particularly for Barbastelle. Additionally, designs have also been adapted to move a pedestrian crossing (which must be lit for safety purposes) by 21m to the east to avoid light spill onto the PRoW and therefore there will be a dark corridor, 15m either side of the PRoW, as detailed in the lighting strategy (Appendix 10-2). Whilst this corridor will be as dark as possible, it is noted in the lighting strategy that it is not always possible to completely remove levels of spill light onto nearby sensitive features near to artificial lighting installations as low levels of spill light can be present at significant distances from the installation. Whilst lighting has been reduced from the most sensitive area for bats, it cannot be avoided across the whole extent of the Scheme due to safety considerations, as such, there will be light spill onto habitats that are in use by foraging and commuting bats. The sensitivity of foraging and roosting bats is considered to be Low, and the magnitude of change prior to mitigation, is considered to be Small. Therefore, there is likely to be an indirect, permanent long-term **Minor adverse** effect on commuting and

Assessment Component	Commentary
	foraging bats within the Scheme **(significant)** prior to the implementation of mitigation measures.
Secondary Mitigation	An appropriate lighting strategy will be created for the Scheme, informed by current best practice guidance with regards to bats and lighting (Ref. 9.13), and following guidance set out in 9.6.21. In particular, the lighting strategy will require that new permanent lighting is the minimum required and will avoid light spill directly onto retained and newly created ecological features (e.g. hedgerows and woodland) within the Scheme. Warm white LEDs will be used, and hoods and louvres will be used to prevent backwards, upwards or other light spill. The lighting strategy will also detail the careful timing of when the lighting will be operational to reduce the light spill further. This will be achieved through the use of Mayflower lighting in which it is possible to establish a site-specific switching regime, whereby each lighting unit fitted with a Mayflower external node can be controlled individually and set to dim at any time of day during operation. Furthermore, the dimming regime can be tweaked at any time and adjusted to suit seasons. By using this control, it will be possible to reduce the lighting at the times when bats are active. In line with the landscape strategy, retained, enhanced and newly created habitat will be maintained in line with the LMMP to ensure biodiversity continues to benefit during the lifetime of the Scheme.
Residual effects and monitoring	Whilst measures have been taken to reduce the lighting levels on the most sensitive areas for bats, there will be an overall increase in permanent lighting, as well as the severance of habitats currently used as commuting and foraging corridors. The sensitivity of roosting bats is considered to be Low, and the magnitude of change following mitigation, is considered to be Negligible. Therefore, there is likely to be a **Negligible adverse** effect on foraging and commuting bats (**not significant**) following the implementation of mitigation measures.

Table 9-25 – Assessment of operational effects for Badgers

Assessment Component	Commentary
Badgers	During the operation of the Scheme, new habitats will become established and provide foraging and commuting habitat for badgers, as well as sett-creation opportunities. The planting schedule includes species such as crab apple, wild cherry, rowan, blackthorn, dog rose and apple species that will provide a good food source for badgers. It was confirmed, via badger bait marking surveys that badgers are using the wider area, given the location of setts recorded and other signs e.g. latrines. As such, during the operational phase, there is a risk of road traffic collisions as badger continue to attempt to forage on both sides of the new road, however, as the speed limit of the road is 30mph, the risk of vehicle collision is considered reduced The design of the artificial sett is as such that it allows for the natural extension of the sett over time, due to the inclusion of open-ended tunnels. Additionally, only the section of the main sett that will be impacted by the construction will be destroyed, with the part that falls outside of the construction zone only subject to temporary closure and therefore can be re-opened during the operation phase, allowing badgers to re-occupy. As set out for bats, a preliminary street lighting layout has been prepared, giving the location of the proposed lighting columns, as well as Lux contours, showing the level of light spill onto adjacent habitat which will be in use by badgers for foraging and

Assessment Component	Commentary
	commuting purposes. No lighting is proposed close to the artificial sett, and with the exception of roundabouts and the pedestrian crossing, there is minimal light spill where the artificial badger sett is located. The sensitivity of badgers is considered to be Low, and the magnitude of change prior to mitigation, is considered to be Small. Therefore, there is likely to be indirect, permanent long-term **Minor adverse** effects on badgers within the Scheme **(significant)** prior to the implementation of mitigation measures.
Secondary Mitigation	An appropriate lighting strategy will be created for the Scheme and will require that new permanent lighting is the minimum required and will avoid light spill directly onto retained and newly created ecological features (e.g. hedgerows and woodland) within the Scheme. The lighting strategy will also detail the careful timing of when the lighting will be operational to reduce the effect of lighting further, as set out above for bats, and therefore lighting will be reduced during the time in which badgers are active. In line with the landscape strategy, retained, enhanced and newly created habitat will be maintained in line with the LMMP to ensure biodiversity continues to benefit during the lifetime of the Scheme. Permanent badger fencing will be installed either side of the new road, with an underpass located to the west of the Scheme, to allow badgers to forage on either side of the road and therefore reducing the risk of vehicle collision.
Residual effects and monitoring	Whilst measures have been taken to reduce the lighting levels, there will be an overall increase in permanent lighting, as well as the severance of habitats currently used as foraging habitat. The sensitivity of badgers is considered to be Low, and the magnitude of change following mitigation, is considered to be Negligible. Therefore, there is likely to be a **Negligible adverse** effect on badgers (**not significant**) following the implementation of mitigation measures.

Table 9-26 – Assessment of operational effects for Wintering birds

Assessment Component	Commentary
Wintering birds	The Scheme, once operational, will result in increased noise levels compared to the current baseline, however as it will be a 30mph road, the effect of this noise is unlikely to extend far from the carriageway. Killing and/or injury to wintering birds is possible during the operation of Scheme, through collision with vehicles, however, as the speed limit of the road is 30mph, the risk of vehicle collision is considered reduced The landscaping will become established during the operational phase, which will include areas of wet swales, woodland, orchard and scrub habitat, providing suitable habitat and food source for wintering birds. The sensitivity of wintering birds is considered to be Low, and the magnitude of change prior to mitigation, is considered to be Negligible. Therefore, there is likely to be indirect, permanent, long-term **Negligible adverse** effects on wintering birds within the Scheme **(not significant)** prior to the implementation of mitigation measures.
Secondary Mitigation	In line with the landscape strategy, retained, enhanced and newly created habitat will be maintained in line with the LMMP to ensure biodiversity continues to benefit during the lifetime of the Scheme.

Assessment Component	Commentary
Residual effects and monitoring	The sensitivity of wintering birds is considered to be Low, and the magnitude of change following mitigation, is considered to be Negligible. Therefore, there is likely to be a **Negligible adverse** effect on wintering birds within the Scheme **(not significant)** following the implementation of mitigation measures.

Table 9-27 – Assessment of operational effects for Breeding birds

Assessment Component	Commentary
Breeding birds	The Scheme, once operational, will result in increased noise levels compared to the current baseline, however as it will be a 30mph road, the effect of this noise is unlikely to extend far from the carriageway. Killing and/or injury to breeding birds is possible during the operation of Scheme, either through collision with vehicles (particularly barn owl due to their hunting behaviour and poor peripheral vision) or through active landscape management. However, as the speed limit of the road is 30mph, the risk of vehicle collision is considered reduced. The landscaping will become established during the operational phase, which will include areas of hedgerows, woodland, orchard and scrub habitat, providing suitable nesting habitat for breeding birds, as well as foraging habitat for barn owl. The sensitivity of breeding birds is considered to be Low, and the magnitude of change prior to mitigation, is considered to be Negligible. Therefore, there is likely to be indirect, permanent, long-term **Negligible adverse** effects on breeding birds within the Scheme **(not significant)** prior to the implementation of mitigation measures.
Secondary Mitigation	In line with the landscape strategy, retained, enhanced and newly created habitat will be maintained in line with the LMMP to ensure biodiversity continues to benefit during the lifetime of the Scheme.
Residual effects and monitoring	The sensitivity of breeding birds is considered to be Low, and the magnitude of change following mitigation, is considered to be Negligible. Therefore, there is likely to be a **Negligible adverse** effect on breeding birds within the Scheme **(not significant)** following the implementation of mitigation measures.

Table 9-28 – Assessment of operational effects for Reptiles

Assessment Component	Commentary
Reptiles	The landscaping will become established during the operational phase, which will include areas of hedgerows, grassland, orchard and scrub habitat, providing suitable habitat for reptiles. Killing and/or injury to reptiles is possible during the operation of Scheme, either through collision with vehicles or through active landscape management. The sensitivity of reptiles is considered to be Low, and the magnitude of change prior to mitigation, is considered to be Negligible. Therefore, there is likely to a **Negligible adverse** effect on reptiles within the Scheme **(not significant)** prior to the implementation of mitigation measures.

Assessment Component	Commentary
Secondary Mitigation	In line with the landscape strategy, retained, enhanced and newly created habitat will be maintained in line with the LMMP to ensure biodiversity continues to benefit during the lifetime of the Scheme.
Residual effects and monitoring	The sensitivity of reptiles is considered to be Low, and the magnitude of change following mitigation, is considered to be Negligible. Therefore, there is likely to be a **Negligible adverse** effect on reptiles within the Scheme **(not significant)** following the implementation of mitigation measures.

Table 9-29 – Assessment of operational effects for Invertebrates

Assessment Component	Commentary
Invertebrates	As set out for bats, during the operational phase, permanent artificial lighting will be required alongside the pedestrian / cycle path (including crossings) and on the approaches to roundabouts for safety reasons. Lighting could attract insects from further afield, resulting in adjacent habitat supporting reduced numbers of insects, and disruptions to natural behaviours reducing survival rates. As part of the landscaping plans, areas of wildflower meadow, wetland grass mix, woodland, orchard and scrub habitat will become established providing suitable habitat for a range of invertebrates. Where trees are to be felled, log piles will be created within the proposed landscaping to provide suitable habitat for stag beetle. Once established these will provide a higher quality habitat for invertebrate species and are likely to lead to an increased invertebrate diversity utilising the local area. The sensitivity of invertebrates within the Scheme is considered to be Low, and the magnitude of change in the absence of mitigation is considered to be Negligible. Therefore, there is likely to be indirect, permanent, long-term **Negligible adverse** effects on invertebrates within the Scheme **(significant)** prior to the implementation of mitigation measures.
Secondary Mitigation	In line with the landscape strategy, retained, enhanced and newly created habitat will be maintained in line with the LMMP to ensure biodiversity continues to benefit during the lifetime of the Scheme.
Residual Effects and Monitoring	Following the implementation of mitigation, the sensitivity of invertebrates is Low, and the magnitude of change, following mitigation, is Negligible. Therefore, there will be a **Negligible adverse** residual effect on invertebrates (**not significant**) following the implementation of mitigation measures.

Table 9-30 – Assessment of operational effects for Other SPI

Assessment Component	Commentary
Other SPI	The landscaping will become established during the operational phase, which will include areas of hedgerows, grassland, orchard and scrub habitat, providing suitable habitat for SPI.

Assessment Component	Commentary
	Killing and/or injury to SPI is possible during the operation of Scheme, either through collision with vehicles (particularly hedgehog) or through active landscape management. The sensitivity of SPI is considered to be Low, and the magnitude of change prior to mitigation, is considered to be Negligible. Therefore, there is likely to a **Negligible adverse** effect on SPI within the Scheme **(not significant)** prior to the implementation of mitigation measures.
Secondary Mitigation	In line with the landscape strategy, retained, enhanced and newly created habitat will be maintained in line with the LMMP to ensure biodiversity continues to benefit during the lifetime of the Scheme. Measures set out within the CEMP.
Residual effects and monitoring	The sensitivity of SPI is considered to be Low, and the magnitude of change following mitigation, is considered to be Negligible. Therefore, there is likely to be a **Negligible adverse** effect on SPI within the Scheme **(not significant)** following the implementation of mitigation measures.

9.7. LIMITATIONS AND ASSUMPTIONS

9.7.1. This ES chapter has been prepared on the basis that where appropriate, the recommended ecological mitigation detailed will be designed into the Proposed Scheme during the detailed design stage. This may not be feasible for activities such as monitoring.

9.7.2. Any limitations applicable to individual technical surveys are documented within the relevant technical appendices. No limitations significant enough to influence the robustness of the results and analysis of these surveys were encountered, and all surveys undertaken to inform this Chapter are considered to be valid and a true representation of the current ecological conditions on the Site.

9.8. SUMMARY

9.8.1. The ecological baseline status has been established through desk studies and field surveys. A range of habitats and species were considered in the assessment including:

- On and off-site habitats of conservation importance;
- Bats;
- Badger;
- Birds;
- Reptiles;
- Invertebrates; and
- Other SPI

9.8.2. **Table 9-31** provides a summary of the findings of the assessment.

Table 9-31 - Summary of Effects Table for Ecology

Description of Effects	Receptor	Significance and Nature of Effects Prior to Secondary Mitigation	Summary of Secondary Mitigation	Significance and Nature of Residual Effects
Construction Phase				
Disturbance from construction activities including visual, noise, vibration and lighting.	Bats - roosting	Minor - / T / I / ST	– CEMP to detail and guarantee measures	Negligible N/A
	Bats – foraging and commuting	Minor - / T / I / ST	– CEMP to detail and guarantee measures – Sensitive lighting regime – Site fencing/ hoarding to protect retained habitat.	Negligible N/A
	Badgers	Minor-Moderate - / T / I&D / ST	– CEMP to detail and guarantee measures – Protection of retained setts	Minor - / T / I / ST
	Birds – wintering	Minor - / T / I / ST	– CEMP to detail and guarantee measures	Negligible N/A
	Birds – breeding	Minor - / T / D / ST	– CEMP to detail and guarantee measures. – Avoidance of site clearance during the breeding bird season (March-August, inclusive).	Minor - / T / D / ST

Description of Effects	Receptor	Significance and Nature of Effects Prior to Secondary Mitigation	Summary of Secondary Mitigation	Significance and Nature of Residual Effects
	Reptiles	Minor - / T / D / ST	– CEMP to detail and guarantee measures. – Sensitive vegetation clearance	Negligible N/A
	Invertebrates	Minor - / T / D / ST	– CEMP to detail and guarantee measures. – Sensitive vegetation clearance	Negligible N/A
	Other SPI	Minor - / T / D / ST	– CEMP to detail and guarantee measures. – Sensitive vegetation clearance	Negligible N/A
Degradation through airborne pollution Pollution caused by use of hazardous materials and incidental release of dust, chemicals, fuels or waste materials.	Off-site HPI	Minor - / T&P / I / LT&ST	– CEMP to detail and guarantee measures – Pollution prevention measures – Site fencing/ hoarding to protect retained habitat.	Negligible N/A
	On-site HPI (Hedgerows)	Minor - / T&P / D&I / LT&ST	– CEMP to detail and guarantee measures – Pollution prevention measures – Site fencing/ hoarding to protect retained habitat.	Negligible N/A

Description of Effects	Receptor	Significance and Nature of Effects Prior to Secondary Mitigation	Summary of Secondary Mitigation	Significance and Nature of Residual Effects
	On-site HPI (Traditional Orchard)	Minor-Moderate - / T&P / D&I / LT&ST	– CEMP to detail and guarantee measures – Pollution prevention measures – Site fencing/ hoarding to protect retained habitat.	Negligible N/A
Permanent and temporary land-take with the Scheme footprint Permanent manipulation of habitats, such as landscaping and 'tidying-up' of areas not within the footprint, felling of trees for Health and Safety reasons	On-site HPI (Hedgerows)	Minor - / P / D / LT	– CEMP to detail and guarantee measures – Pollution prevention measures – Site fencing/ hoarding to protect retained habitat. – Habitat replacement	Minor - / T / D / ST
	On-site HPI (Traditional Orchard)	Minor-Moderate - / P / D / LT	– CEMP to detail and guarantee measures – Pollution prevention measures – Site fencing/ hoarding to protect retained habitat. – Habitat replacement	Minor - / T / D / ST
Temporary storage of construction materials within / adjacent to ecological resources with associated habitat contamination	Off-site HPI	Minor - / T / I / ST	– CEMP to detail and guarantee measures – Pollution prevention measures – Site fencing/ hoarding to protect retained habitat.	Negligible N/A

Description of Effects	Receptor	Significance and Nature of Effects Prior to Secondary Mitigation	Summary of Secondary Mitigation	Significance and Nature of Residual Effects
	On-site HPI (Hedgerows)	Minor - / T / I / ST	– CEMP to detail and guarantee measures – Pollution prevention measures – Site fencing/ hoarding to protect retained habitat.	Negligible N/A
	On-site HPI (Traditional Orchard)	Minor-Moderate - / T / I / ST	– CEMP to detail and guarantee measures – Pollution prevention measures – Site fencing/ hoarding to protect retained habitat.	Negligible N/A
Habitat loss and fragmentation disrupting species dispersal	Bats - roosting	Minor - / P / D / LT	– CEMP to detail and guarantee measures – Installation of bat boxes to replace lost PRFs prior to tree removal.	Minor - / T / D / ST
	Bats – foraging and commuting	Minor - / P / D / LT	– Site fencing/ hoarding to protect retained habitat.	Minor - / T / D / ST
	Badgers	Minor-Moderate - / T / I&D / ST	– Creation of artificial sett – CEMP to detail and guarantee measures – Protection of retained setts	Minor - / T / I / ST

Description of Effects	Receptor	Significance and Nature of Effects Prior to Secondary Mitigation	Summary of Secondary Mitigation	Significance and Nature of Residual Effects
	Birds – wintering	Minor - / T / D / ST	– CEMP to detail and guarantee measures	Minor - / T / D / ST
	Birds – breeding	Minor - / T / D / ST	– CEMP to detail and guarantee measures. – Avoidance of site clearance during the breeding bird season (March-August, inclusive). – Installation of bird boxes	Minor - / T / D / ST
	Reptiles	Minor - / T / D / ST	– CEMP to detail and guarantee measures. – Sensitive vegetation clearance	Minor - / T / D / ST
	Invertebrates	Minor - / T / D / ST	– CEMP to detail and guarantee measures. – Sensitive vegetation clearance	Minor - / T / D / ST
	Other SPI	Minor - / T / D / ST	– CEMP to detail and guarantee measures. – Sensitive vegetation clearance	Minor - / T / D / ST
Direct mortality during site clearance and construction	Bats - roosting	Minor - / P / D / LT	– CEMP to detail and guarantee measures	Negligible N/A

Description of Effects	Receptor	Significance and Nature of Effects Prior to Secondary Mitigation	Summary of Secondary Mitigation	Significance and Nature of Residual Effects
			– Updated surveys to establish any changes to baseline – Installation of bat boxes to replace lost PRFs	
	Badgers	Minor-Moderate - / T / I&D / ST	– CEMP to detail and guarantee measures – Creation of artificial sett and works completed under a Natural England licence – Protection of retained setts	Minor - / T / I / ST
	Birds – breeding	Minor - / T / D / ST	– CEMP to detail and guarantee measures. – Avoidance of site clearance during the breeding bird season (March-August, inclusive).	Minor - / T / D / ST
	Reptiles	Minor - / T / D / ST	– CEMP to detail and guarantee measures. – Sensitive vegetation clearance	Negligible N/A
	Invertebrates	Minor	– CEMP to detail and guarantee measures.	Negligible

Description of Effects	Receptor	Significance and Nature of Effects Prior to Secondary Mitigation	Summary of Secondary Mitigation	Significance and Nature of Residual Effects
		- / T / D / ST	– Sensitive vegetation clearance	N/A
	Other SPI	Minor - / T / D / ST	– CEMP to detail and guarantee measures. – Sensitive vegetation clearance	Negligible N/A
Operational Phase				
Direct disturbance from operational use including visual, noise, vibration and lighting.	Bats – roosting	Negligible - / P / I / LT	– Monitoring of bat boxes – Sensitive lighting strategy	Negligible N/A
	Bats – foraging and commuting	Minor - / P / I / LT	– Sensitive lighting strategy, to include timing of operational lighting	Negligible N/A
	Badgers	Minor - / P / I / LT	– Sensitive lighting strategy, to include timing of operational lighting	Minor N/A
	Birds – wintering	Negligible - / P / I / LT	– Careful habitat management	Negligible N/A
	Birds – breeding	Negligible - / P / I / LT	– Careful habitat management	Negligible N/A

Description of Effects	Receptor	Significance and Nature of Effects Prior to Secondary Mitigation	Summary of Secondary Mitigation	Significance and Nature of Residual Effects
	Reptiles	Negligible - / P / I / LT	– Careful habitat management	Negligible N/A
	Invertebrates	Negligible - / P / I / LT	– Careful habitat management	Negligible - / P / D / LT
Degradation through airborne pollution	Off-site HPI	Negligible - / P / I / LT	– No specific mitigation	Negligible N/A
	On-site HPI (Hedgerows)	Negligible - / P / I / LT	– Establishment of new habitats	Negligible - / P / D / LT
	On-site HPI (Traditional Orchard)	Negligible - / P / I / LT	– Establishment of new habitats	Minor + / P / D / LT
Direct injury / mortality during operation	Bats – foraging and commuting	Minor - / P / I / LT	– Establishment of new habitats – Sensitive lighting strategy, to include timing of operational lighting	Negligible N/A
	Badgers	Minor - / P / I / LT	– Establishment of new habitats – Sensitive lighting strategy, to include timing of operational lighting	Minor N/A

Description of Effects	Receptor	Significance and Nature of Effects Prior to Secondary Mitigation	Summary of Secondary Mitigation	Significance and Nature of Residual Effects
			– Wildlife underpass	
	Birds – wintering	Negligible - / P / I / LT	– Establishment of new habitats – Careful habitat management	Negligible N/A
	Birds – breeding	Negligible - / P / I / LT	– Establishment of new habitats – Careful habitat management	Negligible N/A
	Other SPI	Negligible - / P / I / LT	– Establishment of new habitats – Careful habitat management	Negligible N/A

Key to table: + / - = Beneficial or Adverse P / T = Permanent or Temporary, D / I = Direct or Indirect, ST / MT / LT = Short Term, Medium Term or Long Term, N/A = Not Applicable

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10. LANDSCAPE AND VISUAL

10.1. INTRODUCTION

10.1.1. This chapter reports the outcome of the assessment of likely significant effects arising from the Scheme upon the landscape character and sensitive visual receptors.

LANDSCAPE

10.1.2. Landscape assessment considers the effects of change and development on landscape as a resource.

10.1.3. The character of the landscape derives from a combination of physical factors, natural processes and human intervention. Landscape effects are a combination of the physical changes to the fabric of the landscape arising from the Scheme and perceptual changes – the way these physical changes alter how the landscape is perceived.

10.1.4. The landscape assessment considers the effect of the Scheme on the landscape as a whole, effects on significant individual elements of the landscape, and effects on characteristic combinations or patterns of elements and how these are seen to affect its character and quality.

VISUAL

10.1.5. Visual assessment is concerned with the views that are available to people who may be affected by the Scheme, and their perception and responses to changes in these views.

10.1.6. Visual effects arise from changes in the composition and character of views available in the area affected. The assessment considers the likely change that would be experienced, including the effects both on specific views and on general visual amenity – the pleasantness of the view or outlook – that the people affected enjoy.

10.1.7. For the purposes of assessment, whilst it is the people living, working, passing through or enjoying recreational activities in the area who actually see the views and enjoy the visual amenity, it is the places they may occupy that are mapped and described as the visual receptors.

10.2. LEGISLATIVE FRAMEWORK, POLICY AND GUIDANCE

LEGISLATIVE FRAMEWORK

10.2.1. The applicable legislative framework is summarised in **Table 10-1** below.

Table 10-1 – Landscape and Visual: Summary of Legislation

Legislation	Summary
The European Landscape Convention (ELC) 2007 (Ref. 10.1)	The European Landscape Convention (ELC) was ratified in the UK on 21 November 2006 and became binding on 1 March 2007. It provides a basis for closer co-operation on landscape issues across Europe. The Convention highlights the need to recognise landscape in law and encourages the integration of landscape into all relevant areas of policy, including cultural, economic and social policies. The ELC applies to natural, rural, urban and peri-urban areas including land, inland water and marine areas. Its purpose is to promote landscape protection, management and planning in relation to all

	landscapes regardless of whether their quality and condition is considered outstanding, ordinary or degraded.
National Parks and Access to the Countryside Act 1949 (Ref. 10.2)	The National Parks and Access to the Countryside Act 1949 provided the framework for the creation of National Parks and Areas of Outstanding Natural Beauty (AONBs). Section 11A outlines the duties of certain bodies and persons to have regard to the purposes for which National Parks are designated, including social and economic well-being of communities, but shall attach greater weight to conserving and enhancing the natural beauty of the area, which in this case, is the South Downs National Park (SDNP) to the north of the Scheme. Views to and from the SDNP are considered in the conservation of its natural beauty.

POLICY

10.2.2. The applicable policy framework is summarised in **Table 10-2** below.

Table 10-2 – Landscape and Visual: Summary of Policy

Policy	Summary
National	
National Policy Planning Framework 2019 (Ref. 10.3)	The NPPF sets out the government's planning policies for England and how these are expected to be applied. There is an overarching presumption in favour of sustainable development, and it states: "*the creation of high-quality buildings and places is fundamental to what the planning and development process should achieve"* (Ref. 10.4). The NPPF consolidates all the previous Planning Policy Statements (PPS) and Planning Policy Guidance Notes (PPG) into one document. The following paragraphs/ policies are considered relevant to this assessment: ▪ The NPPF states that *'Strategic policies should make sufficient provision for conservation and enhancement of the natural, built and historic environment including landscapes and green infrastructure'*. (Section 3, Paragraph 20, pp9); ▪ When adopting planning policies and making decisions, Local Planning Authorities (LPAs) should *'ensure that developments are sympathetic to local character and history, including the surrounding built environment and landscape setting, while not preventing or discouraging appropriate innovation or change'.* (Section 12, Paragraph 127, pp38); and ▪ The planning system should aim to conserve and enhance the natural and local environment, in part through the protection of valued landscapes. LPA's *'Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) [on] the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development'.* (Section 15, Paragraph 180, pp52).
Local Policy	
Arun District Local Plan 2011-31 (Ref. 10.5)	The Arun District Local Plan 2011 – 31 replaced the 2003 Arun District Local Plan. The relevant Local Plan policies include:

	▪ Policy LAN DM1: Protection of Landscape Character whereby developments shall only be permitted where they will not have a demonstrable visual impact on either the landscape character of Arun or the setting of and views into and out of the South Downs National Park; ▪ Policy SD SP3, preventing the coalescence of individual settlements and for retaining the separate identity and amenity of settlements. The policy states that "*development will only be permitted within the gaps if it would not undermine the physical and/or visual separation of settlements*". This includes the gaps between Bognor Regis/ Chichester/ Felpham and particularly Barnham to Walberton; and ▪ Policy QE SP1: Quality of the Environment. Requires developments to contribute positively to the quality of the environment and does not have a significantly adverse impact on residential amenity, the natural environment or leisure and recreational activities.
West Sussex Structure Plan 2001-2016 (Ref. 10.6) (saved policies)	The West Sussex Structure Plan 2001-2016 provides a broad planning framework for the West Sussex area. Although it does not hold any formal status in the current planning system it remains a strategic policy statement for future development and land use planning. The document acknowledges the exceptional character of West Sussex and contains a number of 'saved' strategic policies that provide for: ▪ Protecting and reinforcing the distinctiveness of the main National Character Areas (NCAs); ▪ Safeguarding the Area of Outstanding Natural Beauty; ▪ Protecting woodlands and forests; ▪ Protecting rivers, waterways and the coast; and ▪ Retaining the separate identity of towns and villages.

10.2.5. In addition to the above Local Plan and strategies, the following items of Supplementary Planning Guidance are relevant to the application:

- Arun Green Infrastructure Study 2012 (Ref. 10.7);
- Bognor Regis Green Infrastructure Framework (Ref. 10.8);
- Barnham and Eastergate Neighbourhood Plan 2014-2029 (Ref. 10.9);
- West Sussex County Council: Breathing Better (Ref. 10.10);
- West Sussex County Council: Adoptable Highway Drainage and SuDS, Guidance Note for Developers (Ref. 10.11);
- West Sussex County Council: Pollinator Action Plan 2019-2022 (December 2018) (Ref. 10.12);
- ADC Open Space Sport and Recreation Study (PMP, March 2009) (Ref. 10.13); and
- Water. People. Places. A Guide for Master Planning Sustainable Drainage into Developments (Ref. 10.14)
- West Sussex County Council – Landscape Character Assessment 2003 (Ref. 10.15).

10.2.6. In addition, this Chapter has been prepared in accordance with the Government's National Planning Practice Guidance.

GUIDANCE

10.2.7. The applicable guidance documents are summarised in **Table 10-3** below.

Table 10-3 – Landscape and Visual: Summary of Guidance

Policy	Summary

Design Manual for Roads and Bridges (DMRB) Volume 11 (1993) (Ref. 10.16)	This design manual provides guidance on the assessment of impacts that road projects may have on the landscape and visual resource and the overall principles and techniques for environmental assessment of road projects.
LA 104 Environmental Assessment and Monitoring, Highways England, 2019 (Ref. 10.17)	LA 104 replaces HA 205/08, HD 48/08, IAN 125/15, and IAN 133/10. The document sets out the requirements for environmental assessment of projects, including reporting and monitoring of significant adverse environmental effects.
LA 107 Landscape and Visual Effects, Highways England, 2019 (Revised February 2020) (Ref. 10.18)	This document supersedes DMRB Volume 11, Part 5 *Landscape Effects* and IAN 135/10 *Landscape and visual effects assessment* which are now withdrawn. LA107 provides guidance on the assessment of landscape and visual effects of highway projects under DMRB.
Guidelines for Landscape and Visual Impact Assessment, 3rd Edition 2013 (GLVIA3) (Ref. 10.19)	Landscape and Visual Impact Assessment guidance for landscape architects, and others, with substantial sections detailing approach to scope, definition, context, principles, processes, presentation and other topics, on a discipline specific basis.
Government's National Planning Practice Guidance	The National Planning Policy Framework and relevant planning practice guidance setting out the government's planning policies for England and how these are expected to be applied.

10.3. CONSULTATION, SCOPE, METHODOLOGY AND SIGNIFICANCE CRITERIA

CONSULTATION UNDERTAKEN TO DATE

10.3.1. **Table 10-4** provides a summary of the consultation activities undertaken in support of the preparation of this chapter.

Table 10-4 – Landscape and Visual: Summary of Consultation Undertaken

Body / organisation	Individual / stat body / organisation	Meeting dates and other forms of consultation	Summary of outcome of discussions
West Sussex County Council	*Elaine Martin (Engineering Project Manager - Major Projects)*	*Plan of proposed viewpoint locations issued to WSCC for approval on 20/02/20.*	*Long range viewpoints suggested from the SDNP due to its elevated located. It was considered the Scheme alone would not be perceptible from the SDNP and thus excluded from viewpoints. The proposed viewpoints were agreed.*

SCOPE OF THE ASSESSMENT

10.3.2. The scope of this chapter has been established through an ongoing scoping process. Further information can be found in **Chapter 5: Approach to EIA**.

10.3.3. This section provides an update to the scope of the assessment and re-iterates/ updates the evidence base for scoping out elements of the topic following further iterative assessment.

Elements Scoped Out of the Assessment

10.3.4. The elements shown in

10.3.5. **Table** 10-5 are not considered to give rise to likely significant effects as a result of the Scheme and have therefore not been considered within the ES.

Table 10-5 - Elements Scoped Out of the Assessment

Element scoped out	Justification
Views from the South Downs National Park	Views from the SDNP are likely to be further away than the start of the designation, potentially 2.5km. They will be affected by all strategic development in the local plan considered together, not this project alone, which is likely to not be perceptible from this distance. A viewpoint from the SDNP is therefore unlikely to be of value for this particular project.

Elements Scoped into the Assessment

10.3.6. Over time, views within the landscape change due to seasonal variation, changes in light level, human intervention and variation between night and day. When considering the impacts of the Scheme (magnitude of change) upon the perception of landscape character and respective views, the following scenarios have been scoped into assessment:

- Construction phase (2021-2021) – during the construction period, assuming a maximum perceived change situation (when construction activity is at its peak);
- Winter (year 1 of opening) – a winter's day in the year that the Scheme will open or be fully operational (with noise /visual screens and mounds in place but before any planted mitigation has begun to take effect); and
- Summer (year 15) – a summer's day in the fifteenth year after opening (i.e. when the planted mitigation measures can be assumed to be substantially effective).

10.3.7. The analysis assumes that the visual context applicable at the year of opening is that which will be experienced during winter months when the degree of visual exposure is potentially greatest due to a lack of foliage within the wider landscape and prior to the establishment of mitigation planting. The analysis at fifteen years into operation demonstrates the effectiveness following maturation of any mitigation planting proposals for the Scheme.

EXTENT OF THE STUDY AREA

Landscape Study Area

10.3.8. The extent of the Study Area has been determined by a desk-based review and field work to understand the Scheme's position in relation to the wider landscape around it which the Scheme may influence in a significant manner (Ref. 10.20). In addition, to initially aid in identifying the extent of visibility of the Scheme in the wider landscape, a Zone of Theoretical Visibility (ZTV) was generated by extrapolating the heights of the built features within the Scheme over a terrain model. The ZTV shows the extent of potential visibility and assist in defining the Study Area. Based on the

desk-based review, findings of field work, ZTV and agreed viewpoints, a 2km Study Area was determined as shown on **Figure 10.2: Context Plan**.

Visual Study Area

10.3.9. The Study Area for the visual assessment is initially defined by the extent to which the Scheme may be visible: by definition, visual effects can only occur where at least some part of the development is visible. The first step in identifying the extent of visibility is to identify the Zone of Theoretical Visibility (ZTV) for the Scheme**.** The ZTV shows the extent of potential visibility and forms the Study Area, as illustrated in **Figure 10.1: Zone of Theoretical Visibility Plan**.

Zone of Theoretical Visibility

10.3.10. The ZTV is produced by drawing 'lines of sight' from high points of the Scheme (target points) using LiDAR 2m DSM surface model with the addition of the proposed 3m noise barrier to analyse where on the ground these points may be seen for a viewer eye at a height of 1.6m above ground, as recommended in GLVIA3.

10.3.11. This is a 'with screening' ZTV (**Figure 10.1: ZTV Plan**). Existing buildings and blocks of woodland shown on the Ordnance Survey (OS) 1:20,000 map were modelled to take account of the screening they provide. Buildings were modelled at 6m high (representing a typical two storey house). This is an overrepresentation for single storey buildings and an underrepresentation for buildings above two storeys and overall gives a worst-case scenario for the visual envelop. Woodland is modelled at 12m high (based on observation of average heights in the study area). No allowance has been made for screening from linear features not shown on the OS map such as tall hedges and walls. In addition, there may be minor variations in the landform not represented in the Digital Surface Model that mean that there are small areas with a view not shown, or areas shown as having a view that do not.

10.3.12. The ZTV is based on several target points at 100m intervals along the Scheme at a height of 4.5m above the existing ground level to take account of high sided vehicles. The ZTV accounts for earth curvature and atmospheric refraction.

METHOD OF BASELINE DATA COLLATION

DESK STUDY

10.3.13. Information has been gathered primarily from a structured site survey, supported by desk study and consultation with relevant consultees.

10.3.14. The desk study included:

- Identifying natural and built features such as landform, vegetation, settlement patterns and hydrology in relation to the Scheme using Ordnance Survey (OS) mapping;
- Studying aerial photography and online photographic resources;
- Review of relevant national, regional and local planning policy documents; and
- Review of relevant published landscape character assessments.

Site Visit

10.3.15. Detailed landscape and visual site survey work was carried out on Tuesday 25th February 2020. The field survey was designed to collect data for both the landscape and visual impact assessments and the following tasks were undertaken:

- Recording the baseline landscape and its character;
- Checking and ground-truthing the visual receptors;
- Identifying impacts and evaluation of effects, both on the landscape and on visual amenity;
- Consideration of potential design and mitigation proposals; and
- Site photography.

10.3.16. Photography was undertaken in sunny conditions, with clear air and fair visibility. A full frame digital camera with a 50mm prime lens was used.

ASSESSMENT METHODOLOGY

10.3.17. The assessment considers two distinct but closely related areas: landscape character and visual amenity. Landscape assessment considers the effects of the Scheme on landscape character and landscape as a resource. Visual assessment is concerned with the views that are available to people who may be affected by the Scheme, and their perception and responses to changes in these views.

10.3.18. The assessment involves four key stages:

- Establishment of the baseline conditions: the landscape character and visual context of the receiving environment and the quality, value and sensitivity to change of these resources;
- Contributions to the iterative process of design and mitigation based on understanding the nature, form and features of the Scheme;
- An evaluation of the magnitude of change likely to result from the Scheme, both during construction and at completion on visual amenity and the landscape resource; and
- An assessment of the significance of landscape and visual effects considering the sensitivity of resources and the magnitude of change.

10.3.19. For both the landscape and visual assessments, the significance of effect derives from the combination of the magnitude of change and the sensitivity of the landscape or visual receptor. A full methodology is set out in **Appendix 10.1**.

10.3.20. Effects found to be moderate or greater are normally considered to be significant in the context of the EIA Regulations, whilst effects less than moderate are considered to be not significant.

10.3.21. It should be noted that professional judgement is always used in determining both the sensitivity of a receptor and the magnitude of change. As a result, there are situations where the conclusions regarding significance in this report differ from that suggested by the significance matrix (

10.3.22. Table 10-6).

10.3.23. This is most frequent where there is a low but not negligible magnitude of visual effect on a receptor of high sensitivity, where following the table gives a conclusion of moderate effect but the assessor considers the effect not to be significant. In this circumstance the significance would be found to be 'minor to moderate' or even 'minor', depending on circumstances.

10.3.24. The assessment considers the effects of the Scheme at various stages and the predicted duration of effect - whether these are temporary (short or medium term) or permanent.

Table 10-6 – Landscape and Visual Impact Significance Matrix based on LA 104 (Ref. 10.21)

		MAGNITUDE OF IMPACT (degree of change)				
		No Change	**Negligible**	**Minor**	**Moderate**	**Major**
ENVIRONMENTAL VALUE (sensitivity)	**Very high**	Neutral	Slight	Moderate/ Large	Large/ Very Large	Very Large
	High	Neutral	Slight	Slight/ Moderate	Moderate/ Large	Large/ Very Large
	Medium	Neutral	Neutral/ Slight	Slight	Moderate	Moderate/ Large
	Low	Neutral	Neutral/ Slight	Neutral/ Slight	Slight	Slight/ Moderate
	Negligible	Neutral	Neutral	Neutral/ Slight	Neutral/ Slight	Slight

Construction Period

10.3.25. This considers the likely temporary effects specific to the construction process (Ref. 10.22). Details of the specific construction methods to be used on-site will be decided by the construction contractor after planning permission has been granted. However, an outline of the likely construction methodology, compounds and programme is set out in Ch3, upon which this assessment is based.

Operational period

Permanent effects

10.3.26. This considers the permanent effects arising from the existence of the Scheme. The design life of the Scheme is 25+ years. For the purposes of this assessment, 25 years is considered long enough that an ordinary observer would reasonably consider it to be permanent.

Temporary effects

10.3.27. The committed mitigation built into the design ('primary mitigation') includes planting which will take time to mature. The assessment therefore considers the effects in the short term (at the time of completion) as well as the longer-term effects (15 years after completion, once planting has become established).

Operational effects

10.3.28. The effects arising from the operation of the Scheme: the effects from the traffic using the road.

10.4. BASELINE CONDITIONS

INTRODUCTION & LOCAL LANDSCAPE DESCRIPTION

10.4.1. The Scheme is located approximately 1.4km to the south of the SDNP and to the north of the coastal town of Bognor Regis within National Character Area 126 – South Coast Plain. It is a transitional landscape characterised by a mix of small to medium sized fields containing traditional orchards and woodland and arable and open areas (including market gardening) interspersed by settlements and scattered farmsteads.

10.4.2. Around the periphery of the Site are the settlements of Barnham, Eastergate, Fontwell and Walberton. All four settlements are linear in nature, located on either side of the roads that run through them. The Site is bound on all four sides by the existing road network, which comprises Eastergate Lane, Barnham Lane, Barnham Road and Fontwell Avenue (north, east, south and west respectively). Intermittent views of the higher ground to the north are visible from within the area, although largely blocked by existing vegetation.

10.4.3. The Site is currently unlit; however, it is considered that it experiences a degree of light spill due to street lighting installed along the B2233 Barnham Road and A29 Fontwell Avenue. Given the general absence of artificial lighting within the Site, the lighting environment within the Site is considered to be indicative of an E2 Environmental Zone ('low district brightness') (Ref. 10.23).

LAND USE, ROADS AND INFRASTRUCTURE

10.4.4. The Site comprises arable fields, woodland, hedgerows, orchard and areas of managed grassland. Eastergate Lane lies to the north of the Site, running in a west to east direction. To the west of the Site the current route for the A29 runs from Capel (south of Dorking) and terminates on the A259 at Bognor Regis (approximately 3.5 miles from the Site).

10.4.5. The Site acts as an intermediary, separating the settlements of Eastergate to the south-west and Barnham to the south-east. It is bordered to the north by residential dwellings and several commercial facilities, including a self-storage facility and Eastmere Training Stables, along Eastergate Lane. To the east, primarily two storey residential properties are located within a development with rear gardens backing onto the Site. A mix of residential and commercial properties are located either side of the current A29 alignment to the west of the Site with a grouping of dwellings located to the south-east of the Site.

10.4.6. A commercial site (Halo Accident Repair Centre) is located immediately next to the Scheme on the south-western part of the boundary that joins the B2233 Barnham Road. A track road runs from the back of the commercial premises north and joins with a fenced off area of land to the south of Eastergate lane. Fleurie nursery (horticultural) is located to the south of B2233 Barnham Road.

10.4.7. There are 10 Public Rights of Way (PRoW) within 1km of the Scheme with one PRoW crossing the proposed A29 route. PRoW (Eastergate 318-1) is a local walking route connecting Barnham Road with Eastergate Lane. It's orientation, running north to south, has the potential to act as part of a wider network connecting the South Downs National Park with the coastal plain to the south. This footway is identified within the Bognor Regis Green Infrastructure Framework and Arun Local Plan as part of a Green Infrastructure corridor linking Bognor Regis with the national park. The nearest railway station is Barnham Station which is located approximately 0.6km to the south-east of the Site boundary.

TOPOGRAPHY AND VEGETATION

10.4.8. The Site and its immediate context are located on relatively low-lying ground. The land is flat with regular field patterns, gently rising to the north towards the chalk dip slopes of the South Downs National Park. The Site and its immediate context have a network of small and medium-sized broadleaved woodlands, including ancient and semi-natural woodland, well linked by hedgerows and garden exotics providing an enclosed field framework.

10.4.9. There are no other landscape or ecological designations within the study area. There is a network of streams and ditches throughout the study area, increasing in frequency towards the South, although there are no watercourses within the Site. Watercourses in the wider area include Lidsey Rife, Ryebank Rife, and Aldingbourne Rife which flow south towards the coast, meeting at Bognor Regis before reaching the sea.

LANDSCAPE DESIGNATIONS

10.4.10. The Scheme is located approximately 1.4km to the south of the SDNP. In 2016, the South Downs National Park was designated as an International Dark Sky Reserve (Ref. 10.24).

10.4.11. To the east and north of the Scheme, located within the wider 2km study area, are a number of areas of Ancient Woodland; none of which would be affected by the Scheme.

NATIONAL LANDSCAPE CHARACTERISATION

10.4.12. Natural England has developed a series of National Character Area (NCA) profiles. These NCA profiles provide a broad range of information including key characteristics of a given area, description of the natural and cultural features that shape the landscapes, change over time, the current key drivers for ongoing change, a broad analysis of each area's characteristics and ecosystem services, and an array of opportunities for positive environmental change.

10.4.13. The whole study area shown on **Figure 10.3** lies within National Character Area Profile 126: South Coast Plain. The relevant key characteristics of South Coast Plain are outlined as follows:

- *"The plain slopes gently southwards towards the coast. From the coastal plain edge there are long views towards the sea and the Isle of Wight beyond.*
- *The underlying geology of flinty marine and valley gravels extends several miles inland to the dip slope of the South Downs and the South Hampshire Lowlands. This gives rise to deep and well-drained high-quality soils.*
- *In places, streams and rivers flow south from the higher land of the Downs to the sea.*
- *Coastal inlets and 'harbours' contain a diverse landscape of narrow tidal creeks, mudflats, shingle beaches, dunes, grazing marshes and paddocks. These include the internationally important Chichester, Langstone, Portsmouth and Pagham harbours, the Hamble Estuary and the recent coastal realignment site at Medmerry between Chichester Harbour and Selsey.*
- *There are stretches of farmed land between developed areas, often with large arable fields defined by low hedges or ditches.*
- *There are isolated remnants of coastal heath in the west.*
- *Sand dune grasses and intertidal marsh communities are characteristic of the coastline, while small areas of species-rich meadow remain inland.*
- *The coastline provides feeding grounds for internationally protected populations of overwintering waders and wildfowl and is also extensively used for recreation.*

- *Along the exposed, open coastal plain and shoreline, tree cover is limited to isolated wind-sculpted woodlands and shelterbelts.*
- *The area has significant urban development, with settlements along the coastline dominated by the Portsmouth conurbation, suburban villages and seaside towns including Bognor Regis, Littlehampton and Worthing linked by major road and rail systems.*
- *Historic fortifications along the coast include the Roman fort at Portchester and 19th-century defences and later naval installations built to protect the Portsmouth naval dockyard."*

10.4.14. Outside of the Study Area National Character Area Profile 125: South Downs lies around 1.5km to the north. The relevant key characteristics of South Downs are outlined as follows:

- *"A broad elevated east–west chalk ridge with a predominantly steep north-facing scarp slope and a gentle southerly dip slope, breaking into a series of hills in the west and terminating in distinctive chalk cliffs in the east.*
- *Cliffs between Beachy Head and Seaford Head are part of a Geological Conservation Review (GCR) site of international importance for its landscape and for research into coastal geomorphology.*
- *The principal rivers – the Arun, Adur, Cuckmere and Ouse – slice through the eastern half of the downs as wide U-shaped valleys with steep sides and flat alluvial flood plains with intensive dairying and crops, and characterised by criss-crossing ditches and meandering river channels. The meanders of the River Cuckmere by Seven Sisters chalk cliffs are particularly significant. Remnant wetland habitats including flood plain grazing marsh, fens and reed beds.*
- *Chalk streams running off both the north- and south-facing scarp slopes providing a key habitat for the scarp and the flood plain landscape, supporting species such as the brown trout.*
- *Woodland a feature of the central downs and, to a lesser extent, the western downs, also concentrated on the steep scarp slopes, consisting of both broadleaved, mostly ancient, woodland with beech, veteran trees, ash and sycamore, and conifers, with some large plantations. Kingley Vale National Nature Reserve (NNR) contains a wealth of yew woodland.*
- *Several different types of heathland habitat, including wet heath, wooded heath and chalk heath dependent on loess soils. Lullington Heath NNR near Eastbourne is one of the largest areas of chalk heath in the UK.*
- *The eastern downs characterised by large open arable and grassland fields, mostly enclosed by the 16th century, with a general absence of woodland and hedgerow boundaries, creating an open, exposed landscape. To the west of the River Arun, where holdings were smaller and 'sheep-and-corn' farming less important, hedgerows enclose medium to large irregular fields between the woodlands and designed parkland landscapes, the latter a particular feature of the central areas.*
- *Poor soils on the north-west area of the downs with patches of birch woodland, conifer plantation, bracken and rough grassland. The Gault Clay forms shallow, gently rolling lowland crossed by many streams flowing northwards. On the chalk hills, the infertile soils are generally thin, well drained and rich in calcium.*
- *Distinctive fragments of semi-natural chalk grassland dotted with chalk springs on scarp and combe slopes, with important associated habitats including rare chalk heath and species-rich chalk scrub. A vast array of wildlife such as otters and barn owls; lesser known species such as the barbastelle bat, the chalk carpet moth, sundews (carnivorous plants) and the round-headed rampion, the county flower of Sussex; threatened species include the bee orchid, small blue butterfly and nightjar.*

- *Roads and villages concentrated in the river valleys, the more elevated areas sparsely settled with scattered farmsteads. The eastern end of the Downs is squeezed against the coastal plain conurbations of Brighton and Hove, and Worthing, which contain a wealth of architecture and give the area a strong sense of identity. There is also an almost continuous string of seaside towns: Rottingdean, Saltdean, Peacehaven, Newhaven and Seaford.*
- *Flint, brick and timber frame conspicuous in the built environment in walls, buildings, churches and barns, while roofs are of tile, slate or traditional thatch. The South Downs was once lined with windmills, some of which survive.*
- *Bronze-age round barrows and prominently sited iron-age hill forts, such as Cissbury Ring and Old Winchester Hill, are notable prehistoric features of the scarp and hill tops, especially in the west, as well as Mount Caburn in the east, and further bronze-age barrows and a causewayed camp at Willingdon (most of which are designated as Scheduled Ancient Monuments).*
- *The Long Man of Wilmington – a large hill figure located on the steep slopes near Eastbourne. One of only two extant human hill figures in England, it is 69 metres tall and is designated as a Scheduled Ancient Monument. Current archaeological research suggests that it dates from the 16th or 17th century. Others believe it to be more ancient, perhaps contemporary with the nearby Neolithic flint mines and barrows, or the work of medieval monks from Wilmington Priory.*
- *Public rights of way following drove roads and ancient routes along the accessible downland tops, benefiting from panoramic views across the downs and the Low Weald NCA. Roads and lanes striking across the downs perpendicularly and following historic tracks that originally brought livestock to their summer grazing."*

LANDSCAPE CHARACTER TYPES AND CHARACTER AREAS

Regional and Local Landscape Characterisation

10.4.15. The following landscape character assessments provide detail at a local level and have been used to further inform the baseline landscape character description for the assessment.

West Sussex County Council – Landscape Character Assessment 2003

10.4.16. The study area is covered by Landscape Character Area SC8 Fontwell Upper Coastal Plain, identified at a County level. It is described within the assessment as a transition area between the open lower Coastal Plain to the south and the wooded Downs to the north. Key characteristics of the area include "*clear views to the higher ground of the SDNP, good cover of woodland and trees, and well settled with scattered pattern of rural villages and farmsteads."*

10.4.17. At a local level the character of the landscape is described within the Arun Landscape Study (2006) (Ref. 10.25). The South Downs Integrated Landscape Character Assessment (2011) (Ref. 10.26) covers the landscape character of land north of the study area.

Arun Landscape Study 2006

10.4.18. Arun Landscape Study was developed as part of a wider set of studies to assist work on the Arun District Local Development Framework. The study is "*…to inform decision making on where major development might be accommodated within the District without an unacceptable impact on landscape character in general and on the setting of outstanding assets within Arun District"*. It outlines the Local Landscape Character Areas (LLCA), along with an indication of each character areas' capacity to accommodate future development.

10.4.19. The report defines landscape capacity as the extent to which a particular area or type of landscape is able to accommodate change without significant effects on character; or overall change in landscape type. It reflects the inherent sensitivity of the landscape itself and its sensitivity to the development in question; and the value attached to the landscape, or to specific elements within it.

10.4.20. The Site is located in Landscape Character Area 16 – Fontwell-Eastergate Mosaic Medium described in the Landscape Capacity Appraisal as a '*small scale landscape, area contains ancient woodland, ecological and heritage interest and Fontwell racecourse. Provides separation between Westergate and Barnham'.* The site is also located within Zone 2 – Five Villages of the Landscape Structural Analysis which is comprised of the villages of Eastergate, Westergate, Walberton, Barnham and Yapton. The study identifies the settlement pattern of the towns which have developed as linear settlements along a main road. The settlements have limited separation between each other, and land uses in the area are described as "…*a mosaic of horticulture: both glasshouses and nurseries, paddocks, pasture and small holdings associated with low density, linear, post war development*".

LOCAL LANDSCAPE CHARACTER AREAS

10.4.21. Due to the relatively large geographical extent of existing assessments, and the length of time since the Study Area was characterised, a number of finer grained character areas have been identified within this assessment to provide a better understanding of the local context within which the Scheme lies, and which are specific to the Study Area. These character areas have been identified in accordance with 'An Approach to Landscape Character Assessment' (2014) (Ref. 10.27) and Townscape Character Assessment Technical Information Note 05/2017 (Ref. 10.28). The identified Landscape Character Areas (LCAs) within the Study Area are shown in **Figure 10.3** and described below.

LCA1: Eastergate Village

10.4.22. Situated to the southwest of the Scheme, LCA1 Eastergate Village is centred on Elm Tree Stores, a two-storey central convenience store that includes the local post office. Eastergate Cricket Club and the playing fields of Ormiston Six Villages Academy and Sports Centre lie either side of Church Lane which leads to a local pub, parish church and a conservation area. The surrounding residential areas are primarily detached bungalows on narrow local streets, setback from the road with grass verges. Some areas such as St. Georges Walk and Cherry Tree Drive have footpaths. Closer to the Scheme there are two storey residential properties on Collins Close and along Fontwell Avenue, where the buildings are setback further from the busier arterial road. Vegetation is mostly within front and back gardens throughout the character area with trees, hedgerows, shrubs and plants.

10.4.23. Barnham Road and the A29 are the main roads through the LCA leading to the nearby villages of Westergate to the west and Barnham to the southeast. The A29 continues north from the junction with Barnham Road towards Fontwell. The western extent of the Scheme is located on the A29 north of Eastergate.

LCA2: Eastergate Semi-Rural Land

10.4.24. Situated in the land through which the Scheme would run, LCA2 is characterised as a semi-rural area with a regular field pattern and a network of small to medium sized woodlands linked by hedgerows. Residential dwellings are primarily located in clusters along the main roads of Eastergate Lane and Barnham Road. Public Right of Way 318 runs from north to south through the

centre of the LCA. Commercial premises such as Stoneyfield Nursery and Eastmere Training Stables are located to the northeast of the character area setback from Eastergate Lane. Halo Accident Repair Centre and Fleurie Nursery are located on Barnham Road and represent the gradual creep of development between the two settlements of Eastergate and Barnham. South of Barnham Road there is a grid of arable fields which extend south to the railway line.

LCA3: Barnham Village

10.4.25. Barnham Village LCA is located to the southeast of the Scheme. The village is centred on Barnham Road running from Eastergate in the northwest through Barnham towards Yapton in the southeast. The majority of the village is located north of the railway line with some residential dwellings, a community hall, and a local pub located south of the railway line. The village centre is located around 1km southeast of the Scheme and includes the train station, a pharmacy, supermarkets and take-aways. St. Philip Howard Catholic School is located to the south of the LCA, while Barnham Primary School is located within the residential area to the north. Several large-scale nurseries are located in the land east of Barnham between Barnham Lane and Yapton Lane.

10.4.26. Similar to Eastergate, Barnham residential dwellings are primarily bungalows with some two-storey building throughout, including those in Murrell Gardens, Chantry Mead, and Ewen Gardens near the Scheme. The main roads such as Barnham Road and Orchard Way have pavements, while many of the secondary roads do not. Front and back gardens have extensive vegetation with some street trees seen throughout the character area.

10.5. BASELINE VISUAL CONDITIONS

Overview

10.5.1. As noted above, whilst it is the people living, working, passing through or enjoying recreational activities in the area who actually see the view and enjoy the visual amenity, it is the places they may occupy that are mapped and described as the 'receptors' of the views.

10.5.2. **Figure 10.1** shows the ZTV for the wider area, out to beyond 2km from the Site. The extent of potential visibility from residential receptors can be seen from the background map. The main recreational and visitor receptors are highlighted as they are not immediately apparent from the map. The following visual receptors have been identified within the study area, and are considered as part of the LVIA:

- Residential properties located on Fontwell Avenue, Eastergate Lane, Downview Road, Barnham Road, Collins Close, in Murrell Gardens, Chantry Mead, and Upton Brooks, and at Field Place;
- Users of Public Rights of Way 318; and
- Users of the existing road network, including Fontwell Avenue, Eastergate Lane, and Barnham Road.

VIEWPOINTS

10.5.3. This assessment includes a series of photographic viewpoints from a range of distances and directions showing a representative sample of the likely views of the Scheme, including key and important views, from the visual receptor groups identified above.

10.5.4. These viewpoints were initially identified as part of the desk study, and they were discussed and agreed with the statutory consultees. Some minor changes were made during fieldwork where a better or more representative viewpoint was obtainable or where necessary to ensure a safe

location. The viewpoints agreed with the statutory consultees (WSCC) are listed in **Table 10-7**, below.

Table 10-7 - Viewpoints

No.	Location	Reasons for selection	Direction & distance
01	Fontwell Avenue BNG Ref: 587022, 0.655217	Likely effects on transport users of Fontwell Avenue and fixed users of residential properties on Fontwell Avenue	Looking northeast next to the Scheme
02	Eastergate Lane BNG Ref: 587019, 0.655217	Likely effects on transport users of Eastergate Lane	Looking south around 150m north of the Scheme
03	PRoW (Path 318) BNG Ref: 586625, 0.649464	Likely effects on transport users of PRoW 318.	Looking south around 30m north of the Scheme
04	Downview Road BNG Ref: 586431, 0.646594	Likely effects on fixed users of residential properties on Downview Road.	Looking west around 120m east of the Scheme
05	Murrell Gardens BNG Ref: 586585, 0.648611	Likely effects on fixed users of residential properties in Murrell Gardens.	Looking west around 10m east of the Scheme
06	Barnham Road BNG Ref: 586624, 0.649125	Likely effects on transport users of Barnham Road	Looking northwest along the Scheme
07	PRoW (Path 318) BNG Ref: 586802, 0.651772	Likely effects on transport users of PRoW 318.	Looking northeast around 350m southwest of the Scheme

10.6. FUTURE BASELINE

10.6.1. Schedule 4 of the EIA Regulations requires consideration of the likely evolution of the current baseline in the absence of the Scheme. Whilst there are considerable limitations to the predictions that can be made about baseline conditions at a future point in time, some topic areas require projections to account for future change. This section summarises the future baseline that will be used to inform these elements of the assessment.

A29 REALIGNMENT PHASE 2

10.6.2. The A29 upgrade will be delivered in two phases. The Scheme relates to Phase 1 (North) and is the primary focus of this ES and EIA. The Scheme to be delivered by WSCC is the northern section from the A29 Fontwell Avenue, south of Eastergate Lane, to a new junction with Barnham Road, as described in **Chapter 3: Description of Scheme**.

10.6.3. Phase 2 of the A29 Realignment project comprises a combination of road infrastructure and a mixed-use urban extension. Phase 2 will link to Phase 1 (the Scheme) at Barnham Road and will cross the West Coast Mainline and then connect with Lidsey Road near Lidsey. The urban

extension is still at the masterplan stage but is anticipated to include new residential development, a primary school, a secondary school, a mixed-use centre, open space and habitat areas. Phase 2 is expected to be constructed fully within 16 years and will be complete in 2036.

ADJACENT PROPOSED SCHEME

10.6.4. The Adjacent Proposed Scheme, which is located to the south and west of the Scheme, is expected to comprise up to 500 homes. Construction works are anticipated to begin in 2022 and be completed by 2027. The access to the development will be from Barnham Road, in the south and Fontwell Avenue in the north. The proposed land uses include residential development, a care home, informal open space, planting, a sustainable drainage system and a wildlife corridor. The proposed development would introduce a significant number of additional buildings within the landscape and further separate the Scheme from the residential properties on Barnham Road, Collins Close, and Fontwell Avenue. The development would also alter the landscape character of the area increasing the urban setting of Eastergate and reducing the valuable gaps between settlements. The specific design and layout of the Barratts masterplan is currently unknown.

10.7. SENSITIVE RECEPTORS

LANDSCAPE

10.7.1. In determining the sensitivity of the landscape, each of the LCAs is considered regarding the value attached to the LCA and the susceptibility of the LCA to the type of change arising from the Scheme.

10.7.2. **Table 10-8** below analyses the value and susceptibility of each LCA to provide an overall sensitivity for each individual LCA.

Table 10-8 - Landscape Sensitivity

Landscape Sensitivity	
LCA 1: Eastergate Village	
Value	The character of LCA1: Eastergate Village is that of a typical rural village. The area is primarily made up of quiet residential developments with a small amount of retail and community uses centred on the junction of Barnham Road, Fontwell Avenue, and Nyton Road. There are several listed buildings at the centre of Eastergate around the Elm Tree Stores, as well as around The Wilkes Head pub, Manor Farm, and St. George's Church to the south on Church Lane. Eastergate Square and Eastergate (Church Lane) are conservation areas in the LCA. There are also several Tree Protection Orders in the LCA, particularly around Old Rectory Drive. The area as whole is of medium importance and rarity at a local scale, resulting in an overall LCA value of low.
Susceptibility	Eastergate Village LCA will continue to undergo development at strategic locations in keeping with local policy. Arun Local Plan (Policy SD SP3) identifies the importance of maintaining the distinctive settlement pattern of the Arun District. The importance of retaining settlement structure is recognised along with the value of gaps between settlements. The Scheme maintains the existing settlement structure through the introduction of a road of a similar scale and nature to the surrounding roads. The landscape characteristics of the LCA are considered tolerant of change of the nature of the Scheme without detriment to the overall present character. The area's ability to accommodate change results in low susceptibility to the proposed change.

Overall Sensitivity	**Low**
LCA 2: Eastergate Semi-Rural Land	
Value	LCA 2 Eastergate Semi-Rural Land can be characterised as a network of semi-rural fields with scattered vegetation and small to medium sized woodland. The area has several Tree Preservation Orders. The LCA is bordered by local distributor roads with a Public Right of Way running from north to south through the centre of the LCA. A number of residential and commercial properties are located at the edges of the LCA with Fordingbridge Industrial Estate and Fleurie Nursery located on Barnham Road. There are no listed buildings or conservation areas in the LCA. Although the area comprises open fields, it does not display a meaningful sense of remoteness or tranquillity and there are no landscape designations or areas of local recognition associated with this LCA. The area is an undesignated landscape with limited distinctiveness resulting in an overall value of low.
Susceptibility	Land within LCA 2 is recognised as proposed future growth area 'Barnham-Eastergate-Westergate Growth Area'. The land to the west of the LCA, interfacing with LCA 1: Eastergate Village, is under planning application to be developed. The pressures future growth may have on landscape character, the protection of strategic gaps, identity of settlements, and the prevention of coalescence is an important consideration in the susceptibility of development within the LCA. However, it is considered the Scheme would maintain the existing settlement structure through the introduction of the road and the LCA as a whole would be tolerant of change of the nature of the Scheme without undo consequences for the landscape characteristics of the area. The area has a low susceptibility to the proposed change.
Overall Sensitivity	**Low**
LCA 3: Barnham Village	
Value	LCA3: Barnham Village is located to the southeast of the Scheme. The linear village is centred on Barnham Road running northwest to southeast. The village is designated as an Area of Special Character (Ref. 10.29) within the Arun District, considered to be of distinctive character or quality, and therefore worthy of protection through control of new development. The Edwardian style dwellings along with trees and hedgerows in Barnham are of particular importance to the street scene. Closer to the Scheme, the recent residential developments in Murrell Gardens, Chantry Mead and Ewen Gardens interface the Site. The area as whole is of medium importance and rarity at a regional scale with limited potential for substitution, resulting in an overall LCA value of medium.
Susceptibility	Barnham Village LCA will continue to undergo development at strategic locations in keeping with local policy. The importance of retaining settlement structure is recognised in local policy along with the value of gaps between settlements. The area's urban setting combined with the discernible nature of existing infrastructure similar in scale to the Scheme result in landscape characteristics considered to be tolerant of change to that of the nature of the Scheme without detriment to the overall present character. The area's ability to accommodate change results in low susceptibility to the proposed change.
Overall Sensitivity	**Low**

VISUAL

10.7.3. The expectations and occupation or activity of a visual receptor helps determine their susceptibility to the type of development proposed (GLVIA3, para 6.32). Visual sensitivity is a function of the susceptibility of the different visual receptors to changes in the view and visual amenity they enjoy, and the value attached to views. The following table sets out the value, susceptibility and subsequent sensitivity of the identified visual receptors, with reference to representative viewpoints where relevant.

10.7.4. As views from residential receptors are fixed, they can be experienced over long periods of time, so they are generally considered to be of high susceptibility to change. **Table 10-9** - Value, Susceptibility and Overall Sensitivity of Receptors sets out the sensitivity for each receptor or group of receptors.

Table 10-9 - Value, Susceptibility and Overall Sensitivity of Receptors

R1 – Fontwell Avenue – Transport receptors (VP1)	
Value	The view obtained is considered to be of low value as it is not designated and does not have any cultural or locally important associations.
Susceptibility	The receptors in this locality would include those with some appreciation of their surroundings, but views would be transient and secondary to their employment (typically of getting from A to B). Their susceptibility to the type of development proposed is considered to be low.
Sensitivity	**Low**
R2 – Fontwell Avenue – Residential receptors	
Value	The view obtained is considered to be of medium value as it is not designated but the open fields with vegetation forms an important factor in enjoyment of views.
Susceptibility	As the receptors in this locality would include those at their place of residence, their susceptibility to the type of development proposed is considered to be high.
Sensitivity	**High**
R3 - Eastergate Lane – Transport receptors (VP2)	
Value	The view obtained is considered to be of low value as it is not designated and does not have any cultural or locally important associations.
Susceptibility	Receptors in this locality include road travellers with direct but transient, glimpsed views of the wider landscape. Their susceptibility to the type of development proposed is therefore considered to be moderate.
Sensitivity	**Low**
R4 – Eastergate Lane – Residential receptors	
Value	The view obtained is considered to be of medium value as it is not designated but the open fields with vegetation forms an important factor in enjoyment of views.

Susceptibility	As the receptors in this locality would include those at their place of residence, their susceptibility to the type of development proposed is considered to be high.
Sensitivity	**High**
R5 – Ryburn Farm – Commercial receptors	
Value	The view obtained is considered to be of low value as it is not designated and does not have any cultural or locally important associations.
Susceptibility	As the receptors in this locality would include those at their place of residence as well as at their place of work, their susceptibility to the type of development proposed is considered to be high.
Sensitivity	**High**
R6 - PRoW (Path 318) – Transport receptors (VP3)	
Value	The view obtained is considered to be of low value as it is not designated and does not have any cultural or locally important associations.
Susceptibility	Receptors in this locality include users of the PRoW with direct but transient, glimpsed views of the landscape. Their susceptibility to the type of development proposed is therefore considered to be moderate.
Sensitivity	**Medium**
R7 – Field Place – Residential receptors	
Value	The view obtained is considered to be of medium value as it is not designated but the open fields with vegetation forms an important factor in enjoyment of views.
Susceptibility	As the receptors in this locality would include those at their place of residence, their susceptibility to the type of development proposed is considered to be high.
Sensitivity	**High**
R8 - Downview Road – Residential receptors (VP4)	
Value	The view obtained is considered to be of low value as it is not designated and does not have any cultural or locally important associations.
Susceptibility	As the receptors in this locality would include those at their place of residence, their susceptibility to the type of development proposed is considered to be high.
Sensitivity	**High**
R9 - Murrell Gardens – Residential receptors (VP5)	
Value	The view obtained is considered to be of low value as it is not designated and does not have any cultural or locally important associations.
Susceptibility	As the receptors in this locality would include those at their place of residence, their susceptibility to the type of development proposed is considered to be high.
Sensitivity	**High**

R10 - Barnham Road – Transport receptors (VP6)	
Value	The view obtained is considered to be of low value as it is not designated and does not have any cultural or locally important associations.
Susceptibility	Receptors in this locality include travellers with direct but transient, glimpsed views of the wider landscape. Their susceptibility to the type of development proposed is therefore considered to be moderate.
Sensitivity	**Low**
R11 – Upton Brooks – Residential receptors	
Value	The view obtained is considered to be of low value as it is not designated and does not have any cultural or locally important associations.
Susceptibility	As the receptors in this locality would include those at their place of residence, their susceptibility to the type of development proposed is considered to be high.
Sensitivity	**High**
R12 – PRoW off Barnham Road (Path 318) – Transport receptors (VP7)	
Value	The view obtained is considered to be of low value as it is not designated and does not have any cultural or locally important associations.
Susceptibility	Receptors in this locality include users of the PRoW with direct but transient, glimpsed views of the landscape. Their susceptibility to the type of development proposed is therefore considered to be moderate.
Sensitivity	**Medium**
R13 – Collins Close – Residential receptors	
Value	The view obtained is considered to be of low value as it is not designated and does not have any cultural or locally important associations.
Susceptibility	As the receptors in this locality would include those at their place of residence, their susceptibility to the type of development proposed is considered to be high.
Sensitivity	**High**

10.8. PRIMARY MITIGATION

10.8.1. The purpose of mitigation is to avoid, reduce and where possible remedy or offset predicted adverse effects on the environment arising from development proposals. This study determines that the Scheme does not impact any landscape designations, does not exhibit any rare or unusual landscape features and lies within a localised landscape setting outlined for future development. The design of the Scheme has included for primary mitigation embedded into the scheme design to reduce potential adverse landscape and visual effects.

10.8.2. The principal constraints to the Scheme include:

- The visibility of the Scheme and its associated noise barrier from close range for residential properties in Murrell Gardens, Ewens Gardens, and Downview Road. This was addressed through considered design of the noise barrier as well as the introduction of new woodland edge planting along with the introduction of a hedge and shrub planting to visually contain the Noise Barrier;
- The visibility of the Scheme and its associated attenuation pond from the surrounding arable fields and Field Place. This was addressed through proposals for new specimen tree planting and woodland edge planting to screen views; and
- PRoW 318 which crosses through the Scheme, however, this was diverted, and its landscape and visual amenity was improved by incorporating new planting along the route.

10.8.3. The Landscape General Arrangement Plans Sheet 1 to 5 (**Appendix 3.3**) as listed below accompany the planning application and illustrate the design and principles for the landscape proposals:

- 70060779-WSP-LAN-PLA-Landscape Sheet 1 of 5;
- 70060779-WSP-LAN-PLA-Landscape Sheet 2 of 5;
- 70060779-WSP-LAN-PLA-Landscape Sheet 3 of 5;
- 70060779-WSP-LAN-PLA-Landscape Sheet 4 of 5; and
- 70060779-WSP-LAN-PLA-Landscape Sheet 5 of 5.

10.8.4. A robust landscape-led approach to the Scheme has ensured that it is successfully integrated into the landscape and that it responds positively to the recommendations of the relevant published landscape character assessments.

10.8.5. In broad terms the aims of all proposed landscape mitigation measures are:

- To blend the Scheme into the surrounding landscape, minimising adverse effects on landscape character and visual amenity;
- To enhance and extend the existing landscape framework where this improves the quality and character of the local area, with reference to published landscape character assessments;
- To protect and incorporate the existing features of the landscape into the wider landscape framework to assist in the assimilation of the new scheme into the local landscape setting; and
- To create an attractive setting for the Scheme.

10.8.6. The key features of the proposed landscape mitigation include:

- New woodland planting to provide green visual containment in addition to creating habitat for wildlife;

- New specimen tree planting to enhance visual appeal and integrate the Scheme into the surrounding landscape;
- New hedgerow planting to enhance visual amenity of the Scheme, respond positively to the local character and screen the nearby residents from the proposed noise barrier;
- Areas of wildflower grassland and bulb planting to enhance the biodiversity along with visual appeal; and
- Established areas of existing vegetation are proposed to be retained and enhanced where possible.

10.8.7. The following construction phase mitigation measures have been identified for the Scheme following fieldwork and are those which are standard best practice and included in the assessment of effects:

- Temporary construction lighting to be minimal in extent and use. The lighting is to be highly directional and seek to minimise light spill and glare into the surrounding landscape. Construction operations to be limited to daylight working hours where possible;
- Noise and dust to be kept to a minimum; and
- Construction working area to be as contained and constrained as possible to minimise land take, vegetation loss and reinstatement requirements, by implementation of a Construction Environmental Management Plan (CEMP).

10.9. ASSESSMENT OF EFFECTS, MITIGATION AND RESIDUAL EFFECTS

10.9.1. In this assessment, the likely effects have been appraised at the construction phase of the Scheme, 'Year 1', once the Scheme has been completed, and at 'Year 15' to take into account the ongoing establishment of the planting proposals illustrated in the Landscape General Arrangement Plans Sheet 1 to 5, submitted as part of the planning application.

LANDSCAPE EFFECTS

10.9.2. In determining the significance of effect, the sensitivity to change and magnitude of effect are combined and assessed to give a final judgement on the overall significance of effect that the Scheme would have on the landscape.

LCA1: Eastergate Village

10.9.3. LCA 1: Eastergate Village would experience an indirect change to its landscape character. The Scheme would be located at the northern extents of the LCA on Fontwell Avenue, running south-east through LCA2 to Barnham Road. The Scheme is located in the north of the LCA and would be experienced by properties on Fontwell Avenue and Barnham Road, impacting their setting within the character area.

10.9.4. The Scheme would include a new section of single carriageway road with a 3m wide footway and cycleway with landscaping on one side of the carriageway. It would link Fontwell Avenue at the northern end of the LCA to Barnham Road in LCA2, introducing a three-arm roundabout at the western end at the new junction with the A29 Fontwell Avenue; a three-arm roundabout in the centre of the Scheme to provide future access to housing; and a three-arm roundabout at the southern end, at the new junction with the B2233 Barnham Road. Folly Foot Farm, courtyard and adjacent weatherboard structure on A29 Fontwell Avenue would be demolished as part of the Scheme. Public Right of Way 318 would be accommodated through an uncontrolled pedestrian crossing around 21m east of its existing alignment with a 2.5m wide central island to enable users of the PRoW to cross the carriageway.

10.9.5. Most of LCA 1: Eastergate Village would be unaffected by the Scheme as the scale and nature of the new road would be in keeping with that of the surrounding roads and sufficiently removed from the village centre as to have minimal impact on the overall character. However, properties and businesses to the north of the character area would interface with the three-arm roundabout at the western end of the Scheme. Some dwellings would have views north-east across the fields to the Scheme impacting their setting. The impact of the Scheme on the landscape character would be mitigated through planting, allowing the Scheme to integrate into the landscape.

10.9.6. The construction of the Scheme would include the temporary introduction of additional construction related features, including an increase in construction traffic on the roads, views of construction activities including machinery such as tall cranes from nearby residences and businesses, a reduction in tranquillity from the noise and an increase in the activity of the LCA. The magnitude of effect during construction is considered to be **minor (Adverse)**.

10.9.7. The Scheme would constitute a minor loss or alteration to the overall landscape character features and elements. The magnitude of effect (change) is considered to be **minor (adverse)** during operation.

Assessment

Construction

10.9.8. The construction of the Scheme would include the introduction of construction related features and activities, particularly around the new roundabout at the junction of A29 Fontwell Avenue. For a semi-rural area these changes are somewhat unusual, however, they would be experienced on a temporary basis. Overall, the effect is considered to be **slight (Adverse) Not Significant** during construction.

Year of Opening

10.9.9. The Scheme would be in the northern extents of the LCA, introducing a new built element along the existing road. The properties interfacing LCA2 along Fontwell Avenue and Barnham Road would have their setting impacted by the introduction of the Scheme, while the remaining areas within the LCA would be unaffected for the most part. The demolition of Folly House on A29 Fontwell Avenue and the removal of areas of vegetation that contribute to the setting of properties within the LCA would add to the effect experienced from the Scheme. Overall, given that the magnitude of change is minor and the sensitivity to change is low, the resulting effect during operation would be **slight (Adverse) Not Significant** at road opening.

Year of Opening + 15 Years

10.9.10. The effect of realignment of A29 Fontwell Avenue to introduce a new junction at the northern extent of the LCA would be slightly softened due to the establishment of new planting. The proposed new planting would establish over time providing screening to residents further south on Fontwell Avenue and Barnham Road and allow the Scheme to blend into the landscape. The effect during operation would remain **slight (Adverse) Not Significant** after 15 years.

LCA2: Eastergate Semi-Rural Land

10.9.11. LCA 2: Eastergate Semi-Rural Land would experience a direct and permanent change to its landscape character from the Scheme. The LCA is characterised by arable fields with areas of woodland and orchard, and areas of managed grassland. Public Right of Way 318 runs through the

LCA from north to south while Barnham Road bisects the LCA from east to west. The LCA is bordered by Eastergate village to the west and Barnham village to the south-east. Eastergate Lane provides the physical boundary to the north, while West Coast Mainline provides the physical boundary to the south. The introduction of the Scheme would be a new linear feature running through the existing landscape.

10.9.12. The Scheme would include a new section of single carriageway road with a 3m shared cycle and footway west of the carriageway. It would link the new roundabout on Fontwell Avenue at the north-west of the LCA to Barnham Road near Fleurie Nursery at the southern end of the LCA. A three-arm roundabout would be included in the centre of the Scheme to provide future access to housing. The Scheme would also include a new access to the Halo site north of Barnham Road.

10.9.13. The Scheme includes a 3m high weathered steel noise barrier, 3m from the carriageway edge between chainages 890 – 1200. Public Right of Way 318 would be accommodated through an uncontrolled pedestrian crossing to enable users of the PRoW to cross the carriageway.

10.9.14. The construction of the Scheme would include the temporary introduction of additional construction related features, including an increase in construction traffic on the roads, views of construction activities including machinery such as tall cranes from nearby residences and businesses, a reduction in tranquillity from the noise and an increase in the activity of the LCA. The magnitude of effect during construction is considered to be **major (Adverse)**.

10.9.15. The Scheme runs through the centre of LCA2 and will unavoidably introduce built elements which are uncharacteristic of this character area. The Scheme will result in the loss of areas of arable land including hedgerows and trees. However, the new planting associated with the Scheme will introduce diverse areas of new landscape connecting to the existing tree and hedgerow structure within the area. Overall the magnitude of effect (change) is considered to be **major (Adverse)** during operation.

Assessment

Construction

10.9.16. The construction of the Scheme would include the introduction of considerable construction related features and activities. For a semi-rural area these changes would be unusual, however, they would be experienced on a temporary basis. Overall, the effect is considered **moderate (Adverse) Significant** during construction.

Year of Opening

10.9.17. The Scheme would be located through the centre of the LCA. Residential properties to the east within LCA3 and to the north of the Scheme as well as commercial properties on Barnham Road and Eastergate Lane would be directly and permanently impacted by the introduction of a new road into a predominantly arable landscape. The setting of PRoW 318 would also be impacted by the introduction of the Scheme through the existing fields. The Scheme would intersect the PRoW 318 as it runs south to Barnham Road. Users of the PRoW would be diverted around 21m east to cross the Scheme through an uncontrolled crossing before continuing south. The setting of the path would be materially impacted by the Scheme; however, the introduction of new planting would help the Scheme blend into the setting.

10.9.18. No buildings within the LCA would be affected, although areas of vegetation would be removed where the proposed road intersects the field boundaries and existing woodland. Overall, given that

the magnitude of change is major and the sensitivity to change is low, the resulting effect during operation would be **moderate (Adverse) Significant** at road opening.

Year of Opening + 15 Years

10.9.19. The proposed planting in the LCA would establish over time providing screening to nearby residents, businesses, and PRoW users, and allow the Scheme to integrate into the existing landscape character. The effect during operation would reduce to **slight (Adverse) Not Significant** after 15 years.

LCA3: Barnham Village

10.9.20. LCA 3: Barnham Village would experience an indirect change to its landscape character. The Scheme would be located at the western extents of the LCA on Barnham Road, running north through LCA2 and parallel to the properties in Murrell Gardens, Chantry Mead, and Downview Road before turning west to Fontwell Avenue. The Scheme is not located in the LCA; however, the Scheme would be experienced by properties on the western edge of the LCA which interface LCA2 and would have an impact on their landscape character setting.

10.9.21. The Scheme would include a new single carriageway road with a 3m shared cycle and footway with landscaping on one side of the carriageway. The new road would link Barnham Road at the southern end of LCA2 introducing a roundabout at the junction. The proposed noise mitigation to protect the dwellings at Murrell Gardens, Chantry Mead and Ewens Gardens in LCA3 would be a 3m high noise barrier.

10.9.22. The majority of Landscape Character Area 3: Barnham Village would be unaffected by the Scheme as the scale and location of the new road would be removed from the setting of most of the receptors in the LCA. The Scheme is also in keeping with that of the surrounding roads and sufficiently removed from the village centre. The Area of Special Character, located along the Barnham Road, stretches to properties on Downview Road but separated from the Scheme through existing properties in Murrell Gardens. Residential properties that interface LCA2 and have views west to the Scheme would have an impact on their setting. The impact of the Scheme on the landscape character would be mitigated somewhat through woodland planting, screening the road from view and allowing the Scheme to integrate into the landscape.

10.9.23. The construction of the Scheme would include the temporary introduction of additional construction related features, including an increase in construction traffic on the roads, views of construction activities including machinery such as cranes from nearby residences and businesses, a reduction in tranquillity from the noise and an increase in the activity of the LCA. This change would be experienced by a small number of receptors in the LCA. The magnitude of change during construction is considered to be **minor (Adverse)**.

10.9.24. The Scheme would constitute a very minor loss or alteration to the existing landscape character features and elements. Overall the magnitude of change to the landscape character of the area is considered to be **negligible (adverse)** during operation.

Assessment

Construction

10.9.25. The construction of the Scheme would include the introduction of construction related features and activities, particularly around the new roundabout at the junction of Fontwell Avenue. For a semi-

rural area these changes are somewhat unusual, however, they would be experienced on a temporary basis. Overall, given that the magnitude of change is minor and the sensitivity to change is low, the resulting the effect is considered **slight (Adverse) Not Significant** during construction.

Year of Opening

10.9.26. The Scheme would be located on the periphery of the LCA running through LCA2. The properties interfacing LCA2 would be directly and permanently adversely impacted by the introduction of the Scheme. The remaining areas within the LCA would be unaffected for the most part. No buildings or vegetation in the LCA would be affected that contribute to the setting of properties within the LCA. Overall, given that the magnitude of change is negligible and the sensitivity to change is low, the resulting effect during operation would be **slight (Adverse) Not Significant** at road opening.

Year of Opening + 15 Years

10.9.27. The proposed planting would establish over time providing screening to residents in LCA1 and allow the Scheme to blend into the existing landscape character. The effect during operation would remain **slight (Adverse) Not Significant** after 15 years.

VISUAL EFFECTS

Overview

10.9.28. Landscape and visual assessments are separate although linked procedures. The landscape baseline information, its analysis and the assessment of landscape effects all contribute to the baseline for visual assessment studies.

10.9.29. Accordingly, the baseline landscape information provided in Section 10.4 has been used in assessing the visual impacts.

10.9.30. The Zone of Theoretical Visibility presented in **Figure 10.1** identifies key views and visual receptors from which the proposed study area is currently visible and, therefore, would potentially be affected by the Scheme.

Visual Impact – Construction Phase

10.9.31. During the construction phase, the visual impacts are likely to include:

- Construction traffic – large vehicles moving along roads and throughout the site;
- Removal of vegetation;
- Visual intrusion of construction compounds & temporary lighting;
- Presence of bare earth before seeding has established;
- Noise from machinery, workmen etc, affecting tranquillity which impacts on the user experience of the view;
- View of partially constructed infrastructure elements;
- Earth-moving – stripping of topsoil, installation of temporary topsoil stores and permanent embankments to proposed road alignment; and
- Installation of road drainage (Water-Sensitive Design Systems).

Visual Impact – Operational Phase

10.9.32. During the operational phase, visual impacts would include:

- Presence of hard-surfaced carriageway and pathway;
- Lighting columns at junctions (**Appendix 10.2**);

- New site furniture;
- New ponds;
- Areas of new planting (immature at Year 1);
- Traffic – Cars, buses and large vehicles moving along the road in what was a previously static site;
- Traffic headlights at night and movement of people and cyclists (where not screened by noise barrier) in a previously static and unlit landscape; and
- (Depending on detailed proposals) increased tree and shrub cover. Noise barrier and traffic movements would be visible in the short term until planting grows and establishes itself.

Assessment of Visual Receptors

10.9.33. **Fontwell Avenue Road Users (Receptor 1)** would have close distance views of the Scheme looking east from Fontwell Avenue south of Eastergate Lane. The Scheme would introduce a new roundabout junction at Fontwell Avenue and a new road extending east into the arable field network before turning south to Barnham Road. Receptors of this view would be users of Fontwell Avenue and some properties on the western side of Fontwell Avenue.

10.9.34. The existing view from the road is of a single carriageway road with a narrow verge on either side. There is a pavement on the eastern side with a stone wall and tall vegetation beyond providing a sense of enclosure on the eastern side. To the west residential properties are set back from the road with front gardens and brick property boundary walls. Vegetation in the front gardens can also be seen.

10.9.35. Receptors here would experience a change in view introducing a new roundabout which would re-orientate the road east to accommodate a slip road for access to residential properties. The new junction would be the dominant feature and focal point of the view. It would be mitigated, in part, by proposed wildflower, shrub, and woodland edge planting along the road.

10.9.36. Based on the above, a **major (Adverse)** magnitude of impact would arise. Given that the magnitude of change is major, and the sensitivity of the receptor is low, the resulting effect would be **moderate (Adverse) Significant**.

10.9.37. During construction, views of construction activities including machinery such as cranes, boring drills, and HGVs would be very noticeable, resulting in a **major (Adverse)** magnitude of impact**.** Given that the magnitude of impact is major, and the sensitivity of the receptor is low, the resulting effect during construction will be **moderate (adverse) Significant**.

10.9.38. The proposed planting would establish over time providing some screening to the sensitive receptors and help integrate the Scheme into the landscape, however, the Scheme would remain dominant within the view. The effect during operation would remain **moderate (Adverse) Significant** after 15 years.

10.9.39. **Fontwell Avenue (Receptor 2)** residents would experience direct close views of the Scheme looking north-east. The Scheme would introduce a new road in the landscape through the arable fields with woodland, hedgerows, and orchards to the rear of the properties. A two-storey residential property would be demolished as part of the Scheme, while the front access to Folly House would be redesigned and landscaped. The Westview, Ndirande, and Fairfields properties have existing open views of the fields, partly blocked by garden fences and some vegetation. The receptors would experience a change in view from some of their gardens and the ground and first floor. The change

in view would be mitigated through proposed woodland edge planting along the southern side of the proposed road providing some screening to the receptors in this location.

10.9.40. Based on the above, a **moderate (Adverse)** magnitude of effect would arise. Given that the magnitude of effect is moderate**,** and the sensitivity of the receptor is high, the resulting effect would be **moderate (Adverse) Significant**.

10.9.41. During construction, views of construction activities including machinery such as cranes, boring drills, and HGVs would be very noticeable, resulting in a **major (Adverse)** magnitude of effect. Given that the magnitude of effect is major, and the sensitivity of the receptor is high, the resulting effect during construction will be **large (adverse) Significant**.

10.9.42. The proposed tree planting would establish over time providing further screening to the sensitive receptors and help integrate the Scheme into the landscape, however, the Scheme would remain a noticeable element within the receptor view. The effect during operation would remain **moderate (Adverse) Significant** after 15 years.

10.9.43. **Eastergate Lane Road Users (Receptor 3)** would experience indirect yet close views of the Scheme looking south. The Scheme would introduce a new road within the landscape through the arable fields to the south of the road. The users of Eastergate Lane would have periodical views south towards the proposed road and junction with Fontwell Avenue, partly blocked by an existing roadside hedgerow. Folly Foot Farm can be seen beyond the open field with an existing orchard on the left of view and Lyndhurst residential property on the right of the view. The receptors would experience a change in view looking south as they travel along the road. The change in view would be intermittent as users travel along the road and mitigated through proposed woodland planting along the Scheme providing screening to the receptors in this location.

10.9.44. Based on the above, a **moderate (Adverse)** magnitude of impact would arise. Given that the magnitude of change is moderate**,** and the sensitivity of the receptor is low, the resulting effect would be **slight (Adverse) Not Significant**.

10.9.45. During construction, views of construction activities would be noticeable, although experienced temporarily as users are transient, resulting in a **minor (Adverse)** magnitude of effect**.** Given that the magnitude of effect is minor**,** and the sensitivity of the receptor is low, the resulting effect would be **slight (Adverse) Not Significant**.

10.9.46. The proposed planting would establish over time providing further screening to the sensitive receptors and help integrate the Scheme into the landscape. The effect during operation would reduce to **neutral Not Significant** after 15 years.

10.9.47. **Eastergate Lane Residents (Receptor 4)** would experience direct close views of the Scheme looking south-west. The Scheme would introduce a new road within the landscape through the arable fields to the rear of the properties. The residential properties on Eastergate Lane between Wayside and Keepers Cott have existing open views south-west towards the proposed junction with Fontwell Avenue, partly blocked by an existing orchard. Views south are blocked by garden fences and an area of woodland. The receptors would experience a change in view from some of their gardens and the ground and first floor. The change in view would be mitigated through proposed woodland planting along the Scheme providing screening to the receptors.

10.9.48. Based on the above, a **moderate (Adverse)** magnitude of impact would arise. Given that the magnitude of change is moderate**,** and the sensitivity of the receptor is high, the resulting effect would be **moderate (Adverse) Significant**.

10.9.49. During construction, views of construction activities including machinery such as cranes, boring drills, and HGVs would be noticeable, resulting in a **moderate (Adverse)** magnitude of effect. Given that the magnitude of effect is moderate**,** and the sensitivity of the receptor is high, the resulting effect would be **moderate (Adverse) Significant**.

10.9.50. The proposed tree planting would establish over time providing further screening to the sensitive receptors and help integrate the Scheme into the landscape, however, the Scheme would remain a noticeable element within the receptor view. The effect during operation would remain **moderate (Adverse) Significant** after 15 years.

10.9.51. **Ryburn Farm (Receptor 5)** residents would experience direct middle distance views of the Scheme looking south. The Scheme would introduce a new road within the landscape around 350m to the south, through the arable fields to the rear of the property. The residential property located on Eastergate Lane near PRoW 318 has existing open views of the arable and pastoral fields, partly blocked by garden fences and some vegetation including field boundary hedgerows. The receptors would experience a change in view from their garden and the ground and first floor. The change in view would be mitigated through proposed tree and shrub planting along the proposed road providing screening to the receptors in this location.

10.9.52. Based on the above, a **moderate (Adverse)** magnitude of effect would arise. Given that the magnitude of effect is moderate**,** and the sensitivity of the receptor is high, the resulting effect would be **moderate-large (Adverse) Significant**.

10.9.53. During construction, views of construction activities including machinery such as cranes, boring drills, and HGVs would be noticeable but at a distance and through existing vegetation, resulting in a **moderate (Adverse)** magnitude of effect**.** Given that the magnitude of effect is moderate**,** and the sensitivity of the receptor is high, the resulting effect would be **moderate-large (Adverse) Significant**.

10.9.54. The proposed woodland planting would establish over time providing screening to the sensitive receptors and blend the Scheme into the landscape. The effect during operation would reduce to **moderate (Adverse) Significant** after 15 years.

10.9.55. **Public Right of Way 318 (Receptor 6)** users would experience direct close views of the Scheme looking south. The Scheme would introduce a new section of road linking Fontwell Avenue with Barnham Road. Receptors of this view would be users of PRoW 318. The existing view is of a narrow, enclosed, and unpaved path, bound to the east by a hedgerow and trees and bound to the west by a chain-link fence and vegetation. Several of the trees on the eastern side of the path are designated under Tree Preservation Orders (TPO). The receptors would experience a change in view and considerable change in noise, introducing a built element with moving vehicles within the landscape which would intersect the PRoW around 50m to the south, diverting the path east before crossing the new road through an uncontrolled pedestrian crossing and continuing south to Barnham Road. The Scheme would introduce a pond to the west of the receptor with a new roundabout beyond. The new road would become the dominant feature and focal point of the view despite the retention of existing vegetation around the TPO trees. The change in view would be mitigated, in part, by proposed planting along the road.

10.9.56. Based on the above, a **major (Adverse)** magnitude of impact would arise. Given that the magnitude of change is major, and the sensitivity of the receptor is medium**,** the resulting effect would be **large (Adverse) Significant**.

10.9.57. The magnitude of effect from construction related activities such as cranes, boring drills, and HGVs would be very noticeable, resulting in a **major (Adverse)** magnitude of impact. A major magnitude of effect along with a medium sensitivity for the receptor will result in a **large (adverse) Significant** effect.

10.9.58. The proposed tree planting would establish over time providing some limited additional screening to the sensitive receptors and help integrate the Scheme into the landscape, however, the Scheme would form a noticeable feature or element of the view which is readily apparent to the receptor. The effect during operation would reduce to **moderate (Adverse) Significant** after 15 years.

10.9.59. **Field Place (Receptor 7)** residents would experience indirect, medium distance views of the Scheme looking west. The Scheme would introduce a new linear feature within the landscape including moving elements around 350m west of the residential property. Existing views from the residential properties are limited to the first floor due to the presence of up to three hedgerows and existing garden fences and vegetation between the Scheme and the property. Existing views are of the predominantly flat and open arable field network to the west with field boundary hedgerows and trees. Properties to the south on Downview Road are screened by existing vegetation. The property would experience a minor change in view from their first floor with intermittent and infrequent views of transitory elements screened for the most part by existing vegetation. The Scheme would be mitigated through proposed shrub and tree planting along the proposed road.

10.9.60. It is considered the Scheme, or a part of it, would be perceptible but not alter the overall balance of features and elements that comprise the existing view. As a result, a **minor (Adverse)** magnitude of impact would arise. Given that the magnitude of change is minor, and the sensitivity of the receptor is high, the resulting effect would be **slight (Adverse) Not Significant**.

10.9.61. During construction, views of construction activities including machinery such as cranes, boring drills, and HGVs would be noticeable but from a medium distance and screened by existing vegetation, resulting in a **minor (Adverse)** magnitude of effect**.** A minor magnitude of effect along with a high sensitivity for the receptor will result in a **moderate (adverse) Significant** effect.

10.9.62. The proposed tree planting would establish over time providing further screening to the sensitive receptors and help integrate the Scheme into the landscape. The effect during operation would remain **slight (Adverse) Not Significant** after 15 years.

10.9.63. **Downview Road (Receptor 8)** residents would experience close views of the Scheme looking west. The properties have a north-south orientation with views west from front and rear gardens and oblique views from ground and first floor windows. The Scheme would be a noticeable intrusion in the westward view with the addition of the new road, noise and visual disturbance of moving vehicles, and attenuation basin with associated access road. A proposed noise barrier would be located next to the Scheme and within view of the receptors.

10.9.64. The residential properties at Downview Road have existing open, static views of the arable fields with hedgerows and woodland beyond. The properties would experience a substantial change of their view from their gardens and ground and first floor. The change in view would be mitigated through proposed woodland and wildflower meadow planting, helping to screen the road and noise barrier from the resident's view.

10.9.65. Based on the above, a **major (Adverse)** magnitude of effect would arise. Given that the magnitude of effect is major**,** and the sensitivity of the receptor is high, the resulting effect would be **large (Adverse) Significant**.

10.9.66. During construction, views of construction activities including machinery such as cranes, boring drills, and HGVs would be very noticeable, resulting in a **major (Adverse)** magnitude of effect**.** Given that the magnitude of effect is major**,** and the sensitivity of the receptor is high, the resulting effect would be **large (Adverse) Significant**.

10.9.67. The proposed tree planting would establish over time providing screening to the sensitive receptors and help integrate the Scheme into the landscape, however, the Scheme would remain a noticeable element within the receptor view. The effect during operation would remain **large (Adverse) Significant** after 15 years.

10.9.68. **Murrell Gardens (Receptor 9)** residents would experience close views of the Scheme looking west. The properties have an east-west orientation with rear gardens backing onto the Scheme. The receivers would have views west from rear gardens and from their ground and first floor. The Scheme would be a noticeable introduction in the view with the addition of the new road fronted by a proposed 3m noise barrier.

10.9.69. The residential properties at Murrell Gardens have existing views of a strip of open land with an existing earth bund and vegetation along the eastern boundary of the Fordingbridge Industrial Estate. Buildings within the industrial estate can be partly seen beyond the bund. Oblique views south include Barnham Road and Fleurie Nursery beyond. The properties views are partially blocked by garden fences and some vegetation. The properties would experience a substantial change in view from some of their gardens and the ground and first floor, including views of moving traffic. The change in view would be mitigated through proposed woodland, helping to screen the road from the residents.

10.9.70. Based on the above, a **major (Adverse)** magnitude of impact would arise. Given that the magnitude of change is major**,** and the sensitivity of the receptor is high, the resulting effect would be **large (Adverse) Significant**.

10.9.71. During construction, views of construction activities would be very noticeable and from a close range, resulting in a **major (Adverse)** magnitude of effect**.** Given that the magnitude of effect is major**,** and the sensitivity of the receptor is high, the resulting effect would be **large (Adverse) Significant**.

10.9.72. The proposed woodland edge and shrub planting would establish over time providing some screening to the sensitive receptors and help integrate the Scheme into the landscape, however, the Scheme would remain the dominant element within the receptor view. The effect during operation would remain **large (Adverse) Significant** after 15 years.

10.9.73. **Barnham Road (Receptor 10)** users would experience close distance views of the Scheme looking west from Barnham Road near the entrance to Fleurie Nursery. The Scheme would introduce a new three arm roundabout junction at Barnham Road at the existing entrance to the nursery and a new road extending north through the strip of open land between Fordingbridge Industrial Estate and Murrell Gardens before turning west to Fontwell Avenue. Receptors of this view would be users of Barnham Road.

10.9.74. The existing view for these receptors is of a single carriageway road with a narrow verge and pavement on the northern side. Tall vegetation lines the southern side of the road before giving way to hedgerow further west. The properties on the northern side of the road are set back from the road with low brick boundary walls, fences and some vegetation.

10.9.75. The receptors would experience a change in view introducing a new roundabout which would re-orientate the road south. The new junction would be the dominant feature and focal point of the view mitigated, in part, by proposed wildflower meadow and shrub planting along the road.

10.9.76. Based on the above, a **major (Adverse)** magnitude of impact would arise. Given that the magnitude of change is major, and the sensitivity of the receptor is low, as well as the nature of change from a road environment to that of a similar scale and character, the resulting effect would be **moderate (Adverse) Significant**.

10.9.77. The magnitude of effect from construction related activities will be **major (Adverse)** as they will dominate the view and traffic management requirements will alter the experience of the road users. A major magnitude of effect along with a low sensitivity for the receptor will result in a **moderate (adverse) Significant** effect.

10.9.78. The proposed planting would establish over time; however, the Scheme would remain dominant within the view. The effect during operation would remain **moderate (Adverse) Significant** after 15 years.

10.9.79. **Upton Brooks (Receptor 11)** residents would experience close views of the Scheme looking west. The properties have an east-west orientation with rear gardens backing onto Fleurie Nursery. The receivers would have views west from rear gardens and from their ground and first floor. The Scheme would be a noticeable introduction in the view including the addition of the new Barnham Road junction to the northwest and an attenuation pond to the southwest.

10.9.80. The residential properties at Upton Brooks have existing views of buildings associated with Fleurie Nursery, screened in part by rear garden trees and vegetation along their western boundary. The Scheme includes the demolition of the buildings associated with Fleurie Nursery with no proposed planting. The properties would experience a change in view from first floor as well as potential changes in views from ground floor and rear gardens. Mitigation would be limited to wildflower meadow grass at the new roundabout at Barnham Road and wetland grass at the new attenuation pond. There is no planting proposed between the residential properties and the Proposed Scheme as it runs south from Barnham Road.

10.9.81. Based on the above, a **moderate (Adverse)** magnitude of impact would arise. Given that the magnitude of change is major**,** and the sensitivity of the receptor is high, the resulting effect would be **moderate-large (Adverse) Significant**.

10.9.82. During construction, views of construction activities including machinery such as cranes, boring drills, and HGVs would be very noticeable, resulting in a magnitude of **major (Adverse)** impact**.** Given that the magnitude of impact is major, and the sensitivity of the receptor is high, the resulting effect during construction will be **large (adverse) Significant**.

10.9.83. The proposed planting would establish over time; however, this would provide no further screening to the receptors and the Scheme would remain readily apparent within the receptor view. The effect during operation would remain **moderate-large (Adverse) Significant** after 15 years.

10.9.84. **Public Right of Way 318 off Barnham Road (Receptor 12)** users would experience medium to long distance views of the Scheme looking northeast. The Scheme would introduce a new section of road linking Fontwell Avenue with Barnham Road, crossing the open field to the northeast of the receptor. Receptors of this view would be users of PRoW 318. The view is also representative of views experienced by some of the residents on Barnham Road that back onto the field.

10.9.85. The existing view is of an unpaved path bound to the west by a chain-link fence and vegetation. Broken hedgerows and trees on the eastern side of the path provide intermittent views northeast. The existing view is of an open field with hedgerows and trees associated with Fordingbridge Industrial Estate (Halo) to the east. Views northeast provide longer distance views to residential properties in Downview Road and Ewens Gardens. The receptors would experience a change in view introducing a built element within the landscape which would cross the field around 350m to the northeast as it turns south towards Barnham Road. The Scheme would include a new section of single carriageway road with a 3m shared cycle and footway on the western side of the carriageway. The change in view would be partially mitigated through the provision of planting along the road.

10.9.86. Based on the above it is considered the Scheme would be perceptible but not alter the overall balance of features and elements that comprise the existing view. A **minor (Adverse)** magnitude of impact would arise. Given that the magnitude of change is minor, and the sensitivity of the receptor is medium**,** the resulting effect would be **slight (Adverse) Not Significant**.

10.9.87. During construction, views of construction activities including machinery such as cranes, boring drills, and HGVs would be partly noticeable, resulting in a magnitude of **moderate (Adverse)** effect**.** Given that the magnitude of effect is moderate, and the sensitivity of the receptor is medium, the resulting effect during construction will be **moderate (adverse) Significant**.

10.9.88. The proposed tree planting would establish over time providing screening to the receptors in this location and helping to integrate the Scheme into the landscape. Only a very small part of the Scheme would be discernible and would be at such a distance it would form a barely noticeable feature of the view. The effect during operation would reduce to **neutral Not Significant** after 15 years.

10.9.89. **Collins Close (Receptor 13)** residents would experience indirect, medium to long distance views of the Scheme looking north and northeast. The Scheme would introduce a new linear feature within the landscape including moving elements around 300m north and around 500m northeast of the residential properties. Existing views from the residential properties are limited to the first floor due to the presence of existing garden fences and vegetation as well as large areas of existing vegetation between the Scheme and the properties. Existing views are of the predominantly flat and open arable field network to the north and east with field boundary hedgerows and trees and woodland beyond. The properties would experience a minor change in view from their first floor with intermittent and infrequent views of transitory elements screened for the most part by existing vegetation. The Scheme would be mitigated through proposed shrub and tree planting along the proposed road.

10.9.90. It is considered the project, or a part of it, would be perceptible but not alter the overall balance of features and elements that comprise the existing view. As a result, a **minor (Adverse)** magnitude of impact would arise. Given that the magnitude of change is minor, and the sensitivity of the receptor is high, the resulting effect would be **slight (Adverse) Not Significant**.

10.9.91. During construction, views of construction activities including machinery such as cranes, boring drills, and HGVs would be noticeable but from a medium distance and screened by existing vegetation, resulting in a **minor (Adverse)** magnitude of impact**.** A minor magnitude of impact along with a high sensitivity for the receptor will result in a **moderate (adverse) Significant** effect.

10.9.92. The proposed tree planting would establish over time providing further screening to the sensitive receptors and help integrate the Scheme into the landscape. The effect during operation would remain **slight (Adverse) Not Significant** after 15 years.

10.10. LIMITATIONS AND ASSUMPTIONS

10.10.1. The following limitations and assumptions have been identified for the Scheme;

- Assumed loss of agricultural land and scrub is perceived by the majority of dispassionate observers as a negative landscape and visual effect;
- The assessment of visual effects has been undertaken from publicly accessible areas only; and
- The assessment is based on the plans outlined in Section 10.8.3.

10.11. SUMMARY

10.11.1. Landscape Character and Visual Assessment has been undertaken to inform the iterative design process of the Scheme and assess the likely effects on identified landscape and visual receptors.

10.11.2. From the Landscape and Visual Assessment, the Scheme is considered not to be located in a landscape covered by any landscape designations, does not exhibit any rare or unusual landscape features and is within a localised landscape which already experiences existing infrastructure of a similar scale and nature as that of the Scheme. The effects of the Scheme on the existing landscape character and local visual amenity have been assessed against the existing baseline conditions.

10.11.3. The design of the Scheme has included for primary mitigation measures embedded into the scheme design to reduce the potential landscape and visual effects. The primary mitigation measures include:

- New woodland planting to create habitat for wildlife in addition to provide green visual containment;
- New specimen tree planting to enhance visual appeal and integrate the Scheme into the surrounding;
- New hedgerow planting to enhance visual amenity of the Scheme and respond positively to the local character; and
- Areas of wildflower grassland and bulb planting to enhance the biodiversity along with visual appeal.

10.11.4. The following tables provide a summary of the effects on landscape character and visual amenity at both construction and operational phase.

Table 10-10 - Summary of Effects Table for Landscape Character

LCA No.	Landscape Character Area	Sensitivity	Magnitude of Effect (Change)		Significance of Effect		
			Construction	Operation	Construction	Operation (Year 1)	Operation (Year 15)
LCA1	**Eastergate Village**	Low	Minor (Adverse)	Minor (Adverse)	Slight (Adverse) Not Significant	Slight (Adverse) Not Significant	Slight (Adverse) Not Significant
LCA2	**Eastergate Semi-Rural Land**	Low	Major (Adverse)	Major (Adverse)	Moderate (Adverse) Significant	Moderate (Adverse) Significant	Slight (Adverse) Not Significant
LCA3	**Barnham Village**	Low	Minor (Adverse)	Negligible (Adverse)	Slight (Adverse) Not Significant	Slight (Adverse) Not Significant	Slight (Adverse) Not Significant

Table 10-11 - Summary of Effects Table for Visual Amenity

Receptor No.	Visual Receptor	Representative Viewpoint	Sensitivity	Magnitude of Effect (Change)		Significance of Effect		
				Construction	Operation	Construction	Operation (Year 1)	Operation (Year 15)
R1	**Fontwell Avenue Road Users**	1	Low	Major (Adverse)	Major (Adverse)	Moderate (Adverse) Significant	Moderate (Adverse) Significant	Moderate (Adverse) Significant
R2	**Fontwell Avenue**	N/A	High	Major (Adverse)	Moderate (Adverse)	Large (Adverse) Significant	Moderate (Adverse) Significant	Moderate (Adverse) Significant
R3	**Eastergate Lane Road Users**	2	Low	Minor (Adverse)	Moderate (Adverse)	Slight (Adverse) Not Significant	Slight (Adverse) Not Significant	Neutral Not Significant
R4	**Eastergate Lane Residents**	N/A	High	Moderate (Adverse)	Moderate (Adverse)	Moderate (Adverse) Significant	Moderate (Adverse) Significant	Moderate (Adverse) Significant
R5	**Ryburn Farm**	N/A	High	Moderate (Adverse)	Moderate (Adverse)	Moderate – Large (Adverse) Significant	Moderate – Large (Adverse) Significant	Moderate (Adverse) Significant

R6	**PRoW (Path 318)**	3	Medium	Major (Adverse)	Major (Adverse)	Large (Adverse) Significant	Large (Adverse) Significant	Moderate (Adverse) Significant
R7	**Field Place**	N/A	High	Minor (Adverse)	Minor (Adverse)	Moderate (Adverse) Significant	Slight (Adverse) Not Significant	Slight (Adverse) Not Significant
R8	**Downview Road**	4	High	Major (Adverse)	Major (Adverse)	Large (Adverse) Significant	Large (Adverse) Significant	Large (Adverse) Significant
R9	**Murrell Gardens**	5	High	Major (Adverse)	Major (Adverse)	Large (Adverse) Significant	Large (Adverse) Significant	Large (Adverse) Significant
R10	**Barnham Road**	6	Low	Major (Adverse)	Major (Adverse)	Moderate (Adverse) Significant	Moderate (Adverse) Significant	Moderate (Adverse) Significant
R11	**Upton Brooks**	N/A	High	Major (Adverse)	Moderate (Adverse)	Large (Adverse) Significant	Moderate-Large (Adverse) Significant	Moderate-Large (Adverse) Significant
R12	**PRoW off Barnham**	7	Medium	Moderate (Adverse)	Minor (Adverse)	Moderate (Adverse) Significant	Slight (Adverse)	Neutral Not Significant

	Road (Path 318)						Not Significant	
R13	**Collins Close**	N/A	High	Minor (Adverse)	Minor (Adverse)	Moderate (Adverse) Significant	Slight (Adverse) Not Significant	Slight (Adverse) Not Significant

10.12. REFERENCES

- Ref. 10.1: Council of Europe, 2006, European Landscape Convention (https://www.coe.int/en/web/landscape/publications)
- Ref. 10.2: The National Parks Commission, 1949, National Parks and Access to the Countryside Act 1949
- Ref. 10.3: Department for Communities and Local Government, Revised National Planning Policy Framework (Feb 2019)
- Ref. 10.4: Ministry of Housing, 2019, Communities and Local Government
- Ref. 10.5: Arun District Council, The Arun Local Plan 2011-2031 (2018) https://www.arun.gov.uk/adopted-local-plan [Accessed April 2019]
- Ref. 10.6: West Sussex County Council, West Sussex Structure Plan 2001-16 (Feb 2005) https://www.westsussex.gov.uk/media/7125/structure_plan_05.pdf
- Ref. 10.7: Arun District Council, 2012, Arun Green Infrastructure Study
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- Ref. 10.11: West Sussex County Council, 2019, Adoptable Highway Drainage and SuDS, Guidance Note for Developers
- Ref. 10.12: West Sussex County Council, 2018, Pollinator Action Plan 2019-2022
- Ref. 10.13: Arun District Council and PMP, 2009, Open space sport and recreation study
- Ref. 10.14: Aecom, 2013, Water. People. Places. A guide for master planning sustainable drainage into developments
- Ref. 10.15: West Sussex County Council Landscape Character Assessment 2003 - https://www.westsussex.gov.uk/land-waste-and-housing/landscape-and-environment/landscape-character-assessment-of-west-sussex/ (Sourced November 2018)
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- Ref. 10.18: Highways England (2019). LA 107 Landscape and Visual Effects (Revised February 2020)
- Ref. 10.19: Landscape Institute and Institute of Environmental Management & Assessment, Guidelines for Landscape and Visual Impact Assessment, 3rd Edition, Routledge

- Ref. 10.20: Landscape Institute and Institute of Environmental Management & Assessment, Guidelines for Landscape and Visual Impact Assessment, 3rd Edition, Routledge [paragraph 5.2]
- Ref. 10.21: Highways England (2019). LA 104 Environmental Assessment and Monitoring
- Ref. 10.22: The permanent effects that arise during this time – from landform changes, permanent loss of vegetation or landscape features, etc, that exist throughout the life of the Proposed Scheme are considered under the operational period.
- Ref. 10.23: Institution of Lighting Professionals, 2011, Guidance Notes for the Reduction of Obtrusive Light. (Revised 2020)
- Ref. 10.24: An international designation for public or private land possessing an exceptional or distinguishable quality of starry nights and nocturnal environmental that is specifically protected for its scientific, natural, educational, cultural, heritage and/or public enjoyment.
- Ref. 10.25: Arun Landscape Study https://www.arun.gov.uk/download.cfm?doc=docm93jijm4n3578.pdf&ver=3232 (Sourced November 2018)
- Ref. 10.26: South Downs Integrated Landscape Character Assessment 2011 https://www.southdowns.gov.uk/planning/planning-advice/landscape/ (Sourced November 2018)
- Ref. 10.27: Natural England, (2014). An Approach to Landscape Character Assessment.
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- Ref. 10.29: Arun District Council, (2005). Supplementary Planning Document - Areas of Special Character