

**Key**

- Red Line Boundary
- 2km Study Area

**National Character Area Profiles**

- NCA 125 - Fontwell-Eastergate Mosaic
- NCA 126 - Westergate Barnham Coastal Plain

**WSCC Landscape Character Assessment 2003 - Landscape Character Area**

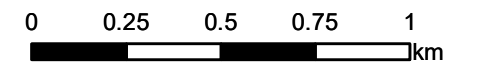
- Fontwell Upper Coastal Plain

**Arun Landscape Study 2006 - Landscape Character Area**

- Fontwell-Eastergate Mosaic
- Westergate Barnham Coastal Plain

**Identified Local Landscape Character Area**

- Eastergate Village
- Eastergate Semi-Rural Land
- Barnham Village



Client:	<b>West Sussex County Council</b>
Project:	<b>A29 Realignment</b>
Title:	<b>Landscape Character Plan</b>

Drawing No:	Figure 10.3	Drawn:	GH
Date:	22/06/2020	Checked:	CC
Scale:	20,000 @ A3	Approved:	CC

Approximate extent of the Proposed Scheme

Fontwell Avenue



View 1: From Fontwell Avenue, looking east



Zoom-in Extract, Recommended Viewing Distance at A3: 300mm

Camera Height: 1.6m

Viewpoint Location (BNG Ref.): 587022, 0.655217

Project Number: 70060779

Project: A29 Phase 1

Camera Type: Canon EOS 6D Mark II

Viewpoint Elevation (AOD): 12m

Sheet Size: A3

Client: West Sussex County Council

Focal Length: 50mm

Distance to the Site Boundary: 10m

Photography Date & Time: 25/02/2020, 11:59

Document Date: May 2020

Figure 10.4

View 1





View 2: From Eastergate Lane, looking south



Zoom-in Extract, Recommended Viewing Distance at A3: 300mm

**Camera Height:** 1.6m

**Camera Type:** Canon EOS 6D Mark II

**Focal Length:** 50mm

**Viewpoint Location (BNG Ref.):** 631028, 145102

**Viewpoint Elevation (AOD):** 109.60m

**Distance to the Site Boundary:**

**Project Number:** 70060779

**Sheet Size:** A3

**Photography Date & Time:** 24/01/2020, 11:02

**Project:** A29 Phase 1

**Client:** West Sussex County Council

**Document Date:** May 2020

**Figure 10.4**

**View 2**



Approximate extent of the Proposed Scheme

PRoW  
318



View 3: From Public Right of Way 318, looking south



Zoom-in Extract, Recommended Viewing Distance at A3: 300mm

Camera Height: 1.6m

Viewpoint Location (BNG Ref.): 630862, 144950

Project Number: 70060779

Project: A29 Phase 1

Camera Type: Canon EOS 6D Mark II

Viewpoint Elevation (AOD): 106.60m

Sheet Size: A3

Client: West Sussex County Council

Focal Length: 50mm

Distance to the Site Boundary:

Photography Date & Time: 24/01/2020, 11:20

Document Date: May 2020

Figure 10.4

View 3



Approximate extent of the Proposed Scheme

Fordingbridge Industrial Estate

Vegetation associated with field boundary



View 4: From Downview Road, looking west



Zoom-in Extract, Recommended Viewing Distance at A3: 300mm

Camera Height: 1.6m

Viewpoint Location (BNG Ref.): 630981, 144794

Project Number: 70060779

Project: A29 Phase 1

Camera Type: Canon EOS 6D Mark II

Viewpoint Elevation (AOD): 106.60m

Sheet Size: A3

Client: West Sussex County Council

Focal Length: 50mm

Distance to the Site Boundary:

Photography Date & Time: 24/01/2020, 11:35

Document Date: May 2020

Figure 10.4

View 4



Approximate extent of the Proposed Scheme



View 5: From Murrell Gardens, looking south-west



Zoom-in Extract, Recommended Viewing Distance at A3: 300mm

Camera Height: 1.6m

Viewpoint Location (BNG Ref.): 630835, 144931

Project Number: 70060779

Project: A29 Phase 1

Camera Type: Canon EOS 6D Mark II

Viewpoint Elevation (AOD): 112.70m

Sheet Size: A3

Client: West Sussex County Council

Focal Length: 50mm

Distance to the Site Boundary:

Photography Date & Time: 24/01/2020, 12:24

Document Date: May 2020

Figure 10.4

View 5





View 6: From Barnham Road, looking north-west



Zoom-in Extract, Recommended Viewing Distance at A3: 300mm

Camera Height: 1.6m

Viewpoint Location (BNG Ref.): 630569, 144730

Project Number: 70060779

Project: A29 Phase 1

Camera Type: Canon EOS 6D Mark II

Viewpoint Elevation (AOD): 116.10m

Sheet Size: A3

Client: West Sussex County Council

Focal Length: 50mm

Distance to the Site Boundary:

Photography Date & Time: 24/01/2020, 12:12

Document Date: May 2020

Figure 10.4

View 6



Approximate extent of the Proposed Scheme

Residential properties  
on Downview Road

Fordingbridge Industrial Estate



View 7: From Public Right of Way 318, looking north-east



Zoom-in Extract, Recommended Viewing Distance at A3: 300mm

Camera Height: 1.6m

Viewpoint Location (BNG Ref.): 630113, 144653

Project Number: 70060779

Project: A29 Phase 1

Camera Type: Canon EOS 6D Mark II

Viewpoint Elevation (AOD): 125m

Sheet Size: A3

Client: West Sussex County Council

Focal Length: 50mm

Distance to the Site Boundary:

Photography Date & Time: 24/01/2020, 13:10

Document Date: May 2020

Figure 10.4

View 7





## 11. WATER RESOURCES AND FLOOD RISK

### 11.1. INTRODUCTION

- 11.1.1. This chapter reports the outcome of the assessment of likely significant effects arising from the Scheme upon water resources, flood risk and drainage in the context of the baseline conditions at and within the vicinity of the Site. Where appropriate, this chapter also identifies proposed mitigation measures to prevent, minimise or control likely negative effects arising from the Proposed Development and the subsequent anticipated residual effects.
- 11.1.2. 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.
- 11.1.3. This chapter (and its associated figures and appendices) is intended to be read as part of the wider ES, with particular reference to **Chapters 3 Description of the Scheme, Chapter 12 Geology and Soils and Chapter 14 Cumulative Effects** and the Flood Risk Assessment (FRA) (**Appendix 11.1**) and the Surface Water Drainage Strategy that accompany the planning application.

### 11.2. LEGISLATIVE FRAMEWORK, POLICY AND GUIDANCE

#### LEGISLATIVE FRAMEWORK

- 11.2.1. The applicable legislative framework is summarised in **Table 11-1** below.

**Table 11-1 - Water Resources and Flood Risk: Summary of Legislation**

Legislation	Summary	Chapter Reference
<i>Floods Directive 2007 (2007/60/EC) (Ref. 11.1)</i>	<i>Sets out the duties of the EA and LLFA in terms of Preliminary Flood Risk Assessments and flood mapping. Following these assessments, the authorities must identify areas which are at significant risk of flooding. The assessments and decisions of areas at significant risk must be reviewed at least every six years.</i>  <i>The Floods Directive is implemented in England and Wales through the Flood Risk Regulations 2009.</i>	<i>This Chapter uses flood risk documents produced by the LLFA and EA to inform the FRA.</i>
<i>The Water Resources Act 1991 (Ref. 11.2)</i>	<i>Regulates water resources, pollution, water quality and flood defence. The Act aims to prevent and minimise pollution of water. Currently, the EA is responsible for the policing of this Act. Under the Act, it is an offence to cause or knowingly permit any poisonous, noxious or polluting material, or any solid waste to enter any controlled water.</i>  <i>The Water Resources Act 1991 (Amendment) (England and Wales) Regulations 2009 allow the enforcement of powers to protect and remediate deleterious</i>	<i>This Chapter considers water resources, pollution, water quality and flood defence in accordance with the applicable legislative framework to flood risk and water resources in the UK.</i>

	<p>effects on water bodies. These effects can be caused by either damage to hydro-morphological elements which affect water control, such as river erosion, or general pollution.</p>	
<p><i>Land Drainage Act 1994 (Ref. 11.3)</i></p>	<p><i>Local Authorities and Internal Drainage Boards have duties and powers associated with the management of flood risk under the Land Drainage Act 1991. As the Land Drainage Authorities, consent must be given for any permanent or temporary works that could affect the flow within an ordinary watercourse under their jurisdiction to ensure that local flood risk is not increased. The Land Drainage Act also sets out the maintenance responsibilities riparian owners have to reduce local flood risks. Riparian owners, who are landowners with a watercourse either running through their land or adjacent to, have the responsibility to ensure that the free flow of water is not impeded by any obstruction or build-up of material within the watercourse.</i></p> <p><i>The 1994 amendment adds new environmental duties to the Land Drainage Act 1991. It requires the Internal Drainage Board and Local Authorities to further the conservation and enhancement of natural beauty, and to conserve flora, fauna and geological or physiographical features of special interest, as well as taking account of any effects which the proposals may have on the beauty or amenity of any rural or urban area, or on any such flora, fauna or features.</i></p>	<p><i>This Chapter, including the appended FRA, has been prepared in consultation with the LLFA who are the relevant Land Drainage Authority for this area.</i></p>
<p><i>Water Framework Directive (WFD) 2000 (Ref. 11.4)</i></p>	<p><i>Aims to improve and integrate the way waterbodies are managed throughout Europe. In order to address the requirements of the Directive, the EA has produced river basin management plans, which develop new ways of protecting and improving the water environment. The main aims of the WFD are to ensure that all surface water and groundwater bodies reach 'good' status (in terms of ecological and chemical quality and water quantity, as appropriate). The WFD also contains provisions for controlling discharges of dangerous substances to surface waters and groundwater.</i></p> <p><i>The WFD is implemented in England and Wales through the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017.</i></p>	<p><i>This Chapter has considered the potential effects of the Scheme on the objectives of the WFD.</i></p> <p><i>This Chapter uses the information included in the EA Catchment Data Explorer online which provides information regarding the relevant water bodies and their classifications under the Water Framework Directive 2000.</i></p> <p><i>The EA Catchment Explorer Data is available under the Open Government Licence v3.0.</i></p>
<p><i>Groundwater Directive (2006/118/EC) 2006 (Ref. 11.5)</i></p>	<p><i>Establishes specific measures to prevent and control groundwater pollution. In particular; (a) criteria for the assessment of good groundwater chemical status; and (b) criteria for the identification and reversal of significant and sustained upward trends and for the definition of starting points for trend reversals. The Directive also aims to prevent the deterioration of the status of all bodies of groundwater.</i></p> <p><i>The Directive has been developed in response to the requirements of Article 17 of the WFD, specifically the assessment of the chemical status of groundwater and objectives to achieve 'good' status.</i></p>	<p><i>This Chapter assessed the potential impacts on groundwater in accordance with this legislation.</i></p>

	<i>The Groundwater Directive is implemented in England and Wales through the Groundwater (England and Wales) Regulations 2009.</i>	
<i>Flood and Water Management Act 2010 (Ref. 11.6)</i>	<i>Revises and consolidates legislation relating to flooding, land drainage, coastal erosion and reservoir safety. The Act gave new responsibilities to unitary and county councils to manage local flood risk. The Act also includes provisions regarding flood risk management assets, sustainable drainage, powers to undertake environmental works, reservoir safety and a number of alterations to water and sewerage provision.</i>	<i>The FRA is appended to this Chapter and it has been prepared in consultation with the LLFA and EA.  The available drainage design documents prepared by Capita Jackson have been appended to the FRA.</i>
<i>The Environmental Damage (Prevention and Remediation) (England) Regulations 2015 (Ref. 11.7)</i>	<i>Provides guidance for imminent threats of 'environmental damage' or actual 'environmental damage', related to surface water and groundwater. Guidance is provided to ensure appropriate mitigation measures, such as easements when working near water, is allowed for. In addition, it recommends remediation measures, should there be significant effects to cause a change in surface water and groundwater.</i>	<i>This Chapter assesses the potential impact on the water environment which includes surface water and groundwater impacts and describes how the potential significant effects would be managed in accordance with the relevant legislative framework.</i>
<i>The Environmental Permitting (England and Wales) Regulations 2016 (Ref. 11.8)</i>	<i>The Regulations replaced the Water Resources Act 1991 as the key legislation for water pollution in the UK. Under the Regulations it is an offence to cause or knowingly permit a water discharge activity, including the discharge of polluting materials to freshwater, coastal waters, relevant territorial waters or groundwater, unless complying with an exemption or an environmental permit. An environmental permit is obtained from the EA. The EA sets conditions which may control volumes and concentrations of particular substances or impose broader controls on the nature of the effluent, taking into account any relevant water quality standards from the relevant EU Directives.  The Regulations also assist in the management of flood risk and, as of 6 April 2016, any activity which has the potential to impact on a main river will require a Flood Risk Activities Permit (FRAP) (previously referred to as Flood Defence Consent) to be granted by the EA and specifies the appropriate conditions to ensure works do not increase flood risk or damage flood defences.</i>	<i>The FRA is appended to this Chapter and it references that a FRAP would be required from the EA.</i>

## POLICY

11.2.2. The applicable policy framework is summarised in **Table 11-2** below.

**Table 11-2 - Water Resources and Flood Risk: Summary of Policy**

<b>Policy</b>	<b>Summary</b>	<b>Chapter Reference</b>
<i>National Planning Policy Framework (NPPF) 2019 (Ref. 11.9)</i>	<i>The NPPF, published in March 2012 and updated on 16 June 2019, sets out the Government's planning policies for England and how these should be applied.</i>	<i>A FRA has been prepared in accordance with the NPPF to assess the risks of flooding to and from the Scheme. The assessment also details how climate change has been taken into account.</i>

	<p><i>Section 10 – ‘Meeting the challenge of climate change, flooding and coastal change of the NPPF’ requires an FRA to be prepared to assess the potential impacts of flooding on and as a result of the scheme and ensure that the scheme is sequentially appropriate which may involve passing the exception test if required.</i></p> <p><i>The NPPF is supported by the National Planning Practice Guidance (PPG). The PPG for Flood Risk and Coastal Change was published in March 2014 and is updated regularly to respond to changes in guidance and best practice.</i></p>	
<p><i>Arun Local Plan 2011-2031 (Ref. 11.10)</i></p>	<p><i>The Arun Local Plan was adopted in 2018 and includes three policies that apply to this assessment:</i></p> <p><i>Policies W SP1, W DM1 and W DM2 require that developments maintain/enhance water quality, improve efficiency and reduce flooding risk.</i></p>	<p><i>This Chapter has assessed the potential effects of the Scheme on water quality.</i></p> <p><i>A FRA has been prepared to assess the risks of flooding to and from the Scheme.</i></p> <p><i>A drainage design has been developed by Capita Jackson as part of the Scheme to manage potential increase in flood risk and risks to water quality. The latest drainage proposals are appended to the FRA for reference.</i></p>

## GUIDANCE

11.2.3. The applicable guidance documents are summarised in **Table 11-3** below.

**Table 11-3 - Water Resources and Flood Risk: Summary of Guidance**

<b>Policy</b>	<b>Summary</b>	<b>Chapter Reference</b>
<p><i>Flood Risk Assessments: Climate Change Allowances (2019) (Ref. 11.11)</i></p>	<p><i>The Environment Agency has produced this guidance for the use of climate change allowances in flood risk assessments and strategic flood risk assessments</i></p>	<p><i>The FRA uses the latest climate change allowances in accordance with this guidance.</i></p>
<p><i>Environment Agency Flood Risk Assessment: Standing Advice (2017) (Ref. 11.12)</i></p>	<p><i>This advice sets out the expected content of a Flood Risk Assessment and provides standard information on whether a development is likely to be considered suitable with regards to flood risk.</i></p>	<p><i>The FRA has been prepared in accordance with the EA Flood Risk Assessment Standard Advice. This Chapter uses the information presented in the FRA.</i></p>
<p><i>Arun District Council Strategic Flood Risk Assessment 2016 (Ref. 11.13)</i></p>	<p><i>The SFRA summarises the flood risk from all sources throughout the district and provides recommendations for development control policies for new development within the district, including the sustainable management of surface water runoff for flood risk control and water treatment.</i></p>	<p><i>The SFRA establishes flood risk within Arun District at a strategic level. It does not specifically assess flood risk to the Site but gives an overview of the flood risk within the area. It provides advice and recommendations on the likely applicability of sustainable drainage systems for managing surface water runoff</i></p>

<p><i>West Sussex Local Flood Risk Management Strategy (LFRMS) 2014 (Ref. 11.14)</i></p>	<p><i>The West Sussex LFRMS (2013 – 2018) sets out how West Sussex County Council carries out its flood risk responsibilities that are a statutory requirement of the Flood and Water Management Act 2010.</i></p> <p><i>The Strategy states that all new development near areas of flood risk needs to be appropriate and requires building design and drainage to be scrutinised to ensure risk is managed acceptably. Development should not be granted permission if proposals will increase flood risk to others.</i></p>	<p><i>This Chapter includes a FRA. Drainage design documents were also produced by Capita / Jackson. The latest drainage proposals are appended to the FRA for reference.</i></p>
<p><i>The SuDS Manual, CIRIA C753 (2015) (Ref. 11.15)</i></p>	<p><i>The SuDS Manual offers guidance for the planning, construction and maintenance of Sustainable Drainage Systems (SuDS), ensuring their effective implementation in order to manage flood risk, water quality, and maximising biodiversity benefits.</i></p>	<p><i>The proposed drainage design appended to the FRA has taken the recommendations of the SuDS Manual into account and also applied the Simple Index Approach promoted by the SuDS Manual to assess risks to water quality.</i></p>
<p><i>Design Manual for Roads and Bridges (DMRB) LA113 Road Drainage and the Water Environment, Revision 1, 2019 (Ref. 11.16)</i></p>	<p><i>The DMRB LA113 Road Drainage and the Water Environment discusses the requirements for the assessment and management of the impacts that road projects may have on water environments and flood risk. The guidance is specifically relevant to the strategic road network (managed by Highways England in England) although the same principles can be applied to any road project.</i></p>	<p><i>This chapter adopted the principles of the DMRB for the assessment of effects to the water environment and flood risk. HEWRAT<sup>10</sup> have been applied to assess the risks to water quality.</i></p>
<p><i>Site handbook for the construction of SuDS, CIRIA C698 (2007) (Ref. 11.17)</i></p>	<p><i>This CIRIA document offers guidance on the construction of Sustainable Drainage Systems (SuDS) to facilitate their effective implementation within developments.</i></p>	<p><i>Guidance has been taken into account for mitigation in the construction phase</i></p>
<p><i>The Environment Agency's Approach to Groundwater Protection (2018) (Ref. 11.18)</i></p>	<p><i>The Environment Agency's Approach to Groundwater Protection provides information about the Environment Agency's approach to managing and protecting groundwater resources, detailing how they deliver government policy for groundwater.</i></p>	<p><i>The groundwater sensitive receptors have been assessed in accordance with the EA guidance.</i></p>
<p><i>CG 501 Design of Highway Drainage Systems, Revision 2 (Ref. 11.19)</i></p>	<p><i>This document sets out requirements and provides recommendations on the design of drainage for the UK motorway and all-purpose trunk roads. It describes the various alternative drainage solutions that are available, including their potential to control pollution and flooding, as well as detailed design factors to be taken into account.</i></p>	<p><i>This chapter uses information of pollution control measures in drainage in Table 8.6.4N3. Table 8.6.4N3 presents potential treatment efficiencies for the various pollution control measure types for different contaminants.</i></p>

<sup>10</sup> Highways England Water Risk Assessment Tool

## 11.3. CONSULTATION, SCOPE, METHODOLOGY AND SIGNIFICANCE CRITERIA

### CONSULTATION UNDERTAKEN TO DATE

11.3.1. **Table 11-4** provides a summary of the consultation activities undertaken in support of the preparation of this chapter.

**Table 11-4 - Water Resources and Flood Risk: Summary of Consultation Undertaken**

<b>Body / organisation</b>	<b>Individual / stat body / organisation</b>	<b>Meeting dates and other forms of consultation</b>	<b>Summary of outcome of discussions</b>
<i>Environment Agency (Ref. 11.24)</i>	<i>Customers and Engagement Team.</i>	<i>16/12/2019 - Product 4 Flood risk, drainage and groundwater enquiry.</i>	<i>03/01/2020 Product 4 provided and included in the FRA.</i>
<i>Environment Agency (Ref. 11.24)</i>	<i>Customers and Engagement Team.</i>	<i>29/04/2020 – Email requesting data on records of licenced ground and surface water abstractions and consented discharges within 1 km of the Site.</i>	<i>06/05/2020 Response provided. EA confirmed that there are seven discharge permits and two abstraction licences within the vicinity of the Site.</i>
<i>Southern Water (Ref. 11.26)</i>	<i>Developer Services.</i>	<i>04/05/2020 - Pre-Development enquiry request.</i>	<i>21/05/20 Asset Location Plans provided 22/05/20 Sewer flooding history provided. SW confirmed that they have records of flood events within the Site's vicinity which are mainly related to foul sewers. Correspondence/data included in the FRA.</i>
<i>West Sussex County Council (LLFA) / Arun District Council (Ref. 11.25)</i>	<i>Flood and Water Management Team.</i>	<i>29/04/2020 – Pre-development enquiry request.</i>	<i>30/04/2020 – Pre-development enquiry provided. Arun District Council and the LLFA confirmed that there were past surface water flood events at Fontwell Avenue, Chantry Mead and Eastergate Lane. They confirmed that they do not hold any record of unlicensed private water abstractions. Correspondence/data included in the FRA.</i>

## SCOPE OF THE ASSESSMENT

- 11.3.2. The scope of this chapter has been established through an ongoing scoping process. Further information can be found in **Chapter 5: Approach to EIA**.
- 11.3.3. The original Scoping Report scoped out water resources and flood risk, however, correspondence with the EA, WSCC and ADC determined that these issues needed to be considered with in the ES due to high seasonal groundwater, presence of a Source Protection Zone within the chalk and surface water flood risk.

## ELEMENTS SCOPED OUT OF THE ASSESSMENT

- 11.3.4. The hydro-morphological characteristics of the watercourses are not likely to change as the Scheme does not cross any watercourses, is not within a river floodplain and the only potential impact would be because of the drainage outfalls. However, this potential effect has been scoped out as the proposed drainage design incorporates SuDS to control outflow rates to minimise in-channel erosion. The watercourses that will receive this discharge (Barnham Lan Ditch and School Ditch) are likely to be ephemeral and their hydro-morphological quality is not likely to be affected by the construction of an outfall.
- 11.3.5. Groundwater Dependent Terrestrial Ecosystems (GWDTE) were not identified at the Site based on a high level desk study, and, therefore these were not included in this assessment. The potential impacts on the ecology is assessed separately within Chapter 9: Ecology and Nature Conservation.

## ELEMENTS SCOPED INTO THE ASSESSMENT

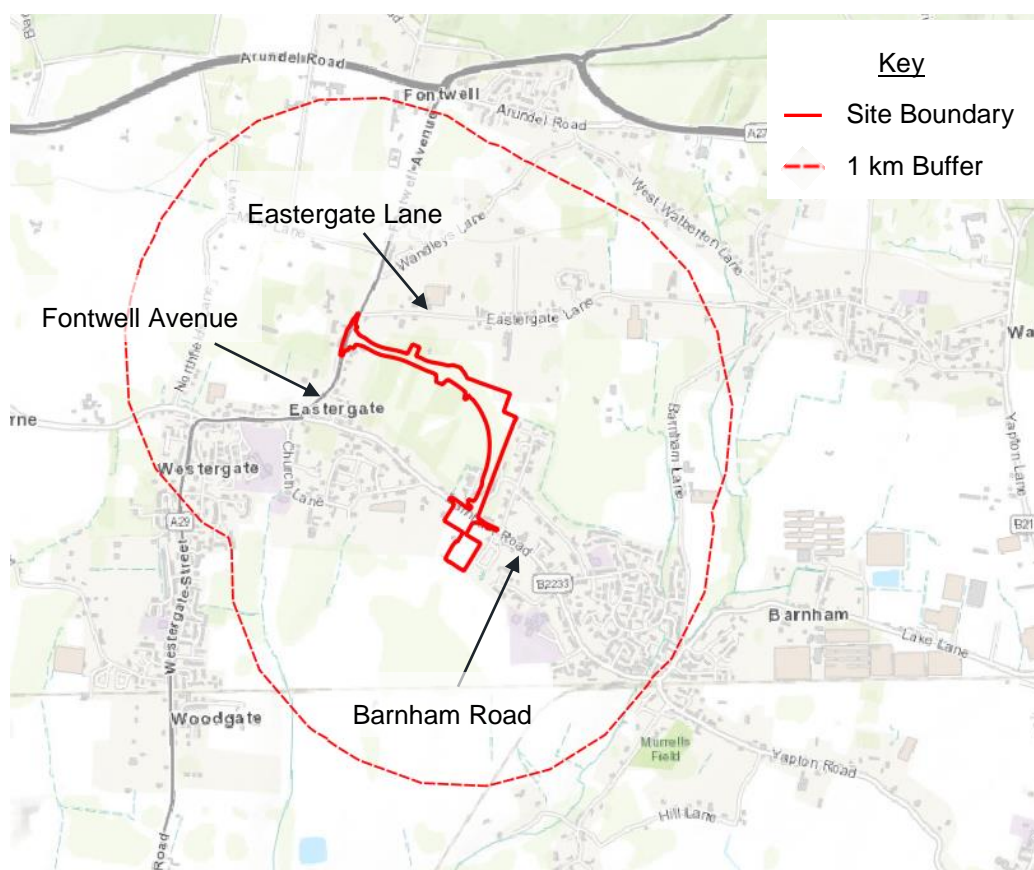
### Construction Phase

- 11.3.6. 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:
- Short-term increase in flood risk due to construction activities;
  - Potential effects on the water quality of surface water and groundwater resources due to construction activities or accidental leaks and spillages; and
  - Potential increase in physical contamination (i.e. sedimentation) of surface water bodies due to ground disturbance.

### Operation Phase

- 11.3.7. 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:
- Potential increase in on and off-site flood risk, due to an increase in impermeable surface areas, interception of overland surface water flows and the disturbance of groundwater flow paths; and
  - Potential effects on the water quality of water resources associated with routine runoff and spillage, including watercourses and groundwater. This effect includes both potential chemical and physical contamination).

## EXTENT OF THE STUDY AREA



**Figure 11-1:** Extent of study area.

11.3.8. The scheme is located approximately 1.4 km south of the South Downs National Park, within a transitional landscape, and to the north of the coastal town of Bognor Regis within the upper coastal plains. Around the periphery of the Site are the settlements of Barnham, Eastergate, Fontwell and Walberton. The Barnham residential estate is adjacent to the east of the site. The existing A29 Fontwell Avenue near its crossing with Eastergate Lane is situated to the west of the Site. Agricultural fields are located to the north and to the south of the Site, as shown of **Figure 11-1** above.

Features that are in hydraulic connectivity with the Scheme have been considered, including downstream watercourses. Based on professional judgement and current knowledge of the area, features located up to 1 km from the red line boundary has been considered.

11.3.9. The baseline conditions studied in this chapter will be within 1 km of the red line boundary of the Scheme.



## METHOD OF BASELINE DATA COLLATION

### DESK STUDY

11.3.10. To investigate baseline conditions and to consider potential effects of the proposed Scheme with respect to surface water and groundwater quality, drainage and flood risk, a review of available desk-based information has taken place.

11.3.11. This desk study assessment has included the review of the following available datasets and reports:

- EA Flood Mapping (Ref. 11.20);
- BGS Geindex Onshore mapping 1:50,000 scale (Ref. 11.21);
- DEFRA Magic Map (Ref. 11.22);
- EA Catchment Data Explorer (Ref. 11.23);
- EA correspondence, including Product 4 and abstraction licence data (Ref. 11.24);
- LLFA and ADC correspondence and flood risk data provided (Ref. 11.25);
- Southern Water – history of flooding and Asset location plans (Ref. 11.26);
- WSP Flood Risk Assessment included in **Appendix 11.1**; and
- Drainage design documents provided by Capita / Jackson on 03 August 2020 - appended to the above FRA (Ref. 11.27).

### SURVEYS

11.3.12. This Chapter uses the following survey data undertaken for the A29 or surrounding areas, all of which have been appended to the FRA:

- Geotechnics (2019) – A29 Realignment, Eastergate. Factual Report – ground investigation to inform the A29 Realignment Transport Business Case (Ref. 11.28);
- Land Science (2020) – ground investigations subsequent groundwater level monitoring undertaken to inform the A29 realignment Phase 1 (Ref. 11.39);
- Wilson Bailey 2018, 2019 and 2020 – ground investigations undertaken on behalf of Barratts (Ref. 11.30);
- 3D Engineering Surveys Limited 2019 – topographic survey (Ref. 11.31);
- Geomatic Surveyors 2018 – topographic survey (Ref. 11.32); and
- Pellfrishman 2018 – topographic survey (Ref. 11.33).

### ASSESSMENT METHODOLOGY

11.3.13. This Chapter provides an assessment of the potential effects of the Scheme on the water environment and flood risk. The assessment methodology used in this chapter is based on the DMRB guidance LA 113 Road Drainage and the Water Environment (Ref. 11.16).

### SIGNIFICANCE CRITERIA

11.3.14. 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 and low, 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**.

## EFFECT SIGNIFICANCE

### Assessing the sensitivity / value of receptors

11.3.15. **Table 11-5** specifies the general criteria used in qualitatively assessing the sensitivity of surface water and flood risk receptors using professional judgement based on the information presented within this ES. The sensitivity of the receptors is based on Table 3.70 from LA113 Road Drainage and the Water Environment (Ref. 11.16).

**Table 11-5 –Sensitivity/ Value of Water Resource Receptor**

Sensitivity/ Value	Criteria	Example
Very High	Nationally significant attribute of high importance	<p><b>Surface water</b> Watercourse having a WFD classification shown in a River Basin Management Plan (RBMP) and <math>Q95 \geq 1.0 \text{ m}^3/\text{s}</math>. Site protected/designated under EC or UK legislation (SAC, SPA, SSSI, Ramsar site, salmonid water)/Species protected by EC legislation LA108.</p> <p><b>Groundwater</b> Principal aquifer providing a regionally important resource and/or supporting a site protected under EC and UK legislation LA 108; Groundwater locally supports GWDTE. SPZ1.</p> <p><b>Flood Risk</b> Essential infrastructure or highly vulnerable development.</p>
High	Locally significant attribute of high importance	<p><b>Surface water</b> Watercourse having a WFD classification shown in a RBMP and <math>Q95 &lt; 1.0 \text{ m}^3/\text{s}</math>. Species protected under EC or UK legislation LA 108</p> <p><b>Groundwater</b> Principal aquifer providing locally important resource or supporting a river ecosystem. Groundwater supports a GWDTE. SPZ2</p> <p><b>Flood Risk</b> More vulnerable development.</p>
Medium	Of moderate quality and rarity	<p><b>Surface water</b> Watercourses not having a WFD classification shown in a RBMP and <math>Q95 &gt; 0.001 \text{ m}^3/\text{s}</math>.</p>

		<p><b>Groundwater</b> Aquifer providing water for agricultural or industrial use with limited connection to surface water. SPZ3</p> <p><b>Flood Risk</b> Less vulnerable development</p>
Low	Lower quality	<p><b>Surface water</b> Watercourses not having a WFD classification shown in a RBMP and Q95 <math>\leq 0.001\text{m}^3/\text{s}</math>.</p> <p><b>Groundwater</b> Unproductive Strata</p> <p><b>Flood Risk</b> Water compatible development</p>

Assessing the magnitude of impact / change

11.3.16. The likely magnitude or extent of an impact (or change) on a receptor is established by assessing the degree of the impact relative to the nature and extent of the Scheme (see **Table 11-6** – Magnitude of Change Criteria). Potential effects can be both adverse and beneficial. The derivation of magnitude is carried out independently of the sensitivity / value of the water resource receptor.

**Table 11-6 – Magnitude of Impact / Change Criteria**

Magnitude of Change	Criteria	Example
Major	Results in loss of attribute and/or quality and integrity of the attribute, or results in major improvement of attribute quality.	<p><b>Surface Water</b></p> <p><u>Adverse</u> Failure of both acute-soluble and chronic-sediment related pollutants in HEWRAT but compliance with Environmental Quality Standard (EQS) values. Calculated risk of pollution from spillages ≥1% annually and &lt;2% annually. Partial loss in productivity of a fishery. Degradation of regionally important public water supply or loss of major commercial/industrial/agricultural supplies.</p> <p>Contribution to reduction in water body WFD classification.</p> <p><u>Beneficial</u> Removal of existing polluting discharge or removing the likelihood of polluting discharges occurring to a watercourse. Improvement in water body WFD classification.</p> <p><b>Groundwater</b></p> <p><u>Adverse</u> Partial loss or change to an aquifer. Degradation of regionally important public water supply or loss of significant commercial/ industrial/ agricultural supplies. Potential medium risk of pollution to groundwater from routine runoff - risk score 150-250. Calculated risk of pollution from spillages ≥1% annually and &lt;2% annually. Partial loss of the integrity of GWDTE. Contribution to reduction in water body WFD classification. Damage to major structures through subsidence or similar effects or loss of minor structures.</p> <p><u>Beneficial</u> Removal of existing polluting discharge to an aquifer or removing the likelihood of polluting discharges occurring. Recharge of an aquifer. Improvement in water body WFD classification.</p> <p><b>Flood Risk</b></p> <p><u>Adverse</u> Increase in peak flood level (&gt; 100mm).</p> <p><u>Beneficial</u> Creation of flood storage and decrease in peak flood level (&gt; 100mm).</p>
Moderate	Results in impact on integrity of attribute or loss of part of attribute, or results in moderate improvement of attribute quality.	<p><b>Surface Water</b></p> <p><u>Adverse</u> Failure of both acute-soluble and chronic-sediment related pollutants in HEWRAT but compliance with EQS values. Calculated risk of pollution from spillages ≥1% annually and &lt;2% annually. Partial loss in productivity of a fishery. Degradation of regionally important public water supply or loss of major commercial/industrial/agricultural supplies. Contribution to reduction in water body WFD classification.</p> <p><u>Beneficial</u> HEWRAT assessment of both acute-soluble and chronic-sediment related pollutants becomes pass from an existing site where the baseline was a fail condition. Calculated reduction in existing spillage by 50% or more (when existing spillage risk &gt;1% annually). Contribution to improvement in water body WFD classification.</p>

		<p><b>Groundwater</b></p> <p><u>Adverse</u>            Partial loss or change to an aquifer.            Degradation of regionally important public water supply or loss of significant commercial/ industrial/ agricultural supplies.            Potential medium risk of pollution to groundwater from routine runoff - risk score 150-250.            Calculated risk of pollution from spillages <math>\geq 1\%</math> annually and <math>&lt; 2\%</math> annually.            Partial loss of the integrity of GWDTE.            Contribution to reduction in water body WFD classification.            Damage to major structures through subsidence or similar effects or loss of minor structures.</p> <p><u>Beneficial</u>            Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk is <math>&gt; 1\%</math> annually).            Contribution to improvement in water body WFD classification.            Improvement in water body catchment abstraction management Strategy (CAMS) (or equivalent) classification.            Support to significant improvements in damaged GWDTE.</p> <p><b>Flood Risk</b></p> <p><u>Adverse</u>            Increase in peak flood level (<math>&gt; 50\text{mm}</math>).</p> <p><u>Beneficial</u>            Creation of flood storage and decrease in peak flood level (<math>&gt; 50\text{mm}</math>).</p>
<p>Minor</p>	<p>Results in some measurable change in attributes, quality or vulnerability, or results in some beneficial effect on attribute or a reduced risk of negative effect occurring.</p>	<p><b>Surface Water</b></p> <p><u>Adverse</u>            Failure of either acute soluble or chronic sediment related pollutants in HEWRAT.            Calculated risk of pollution from spillages <math>\geq 0.5\%</math> annually and <math>&lt; 1\%</math> annually.            Minor effects on water supplies.</p> <p><u>Beneficial</u>            HEWRAT assessment of either acute soluble or chronic-sediment related pollutants becomes pass from an existing site where the baseline was a fail condition.            Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk is <math>&lt; 1\%</math> annually).</p> <p><b>Groundwater</b></p> <p><u>Adverse</u>            Potential low risk of pollution to groundwater from routine runoff - risk score <math>&lt; 150</math>.            Calculated risk of pollution from spillages <math>\geq 0.5\%</math> annually and <math>&lt; 1\%</math> annually.            Minor effects on an aquifer, GWDTEs, abstractions and structures.</p> <p><u>Beneficial</u>            Calculated reduction in existing spillage risk by 50% or more to an aquifer (when existing spillage risk <math>&lt; 1\%</math> annually).            Reduction of groundwater hazards to existing structures.            Reductions in waterlogging and groundwater flooding.</p> <p><b>Flood Risk</b></p> <p><u>Adverse</u>            Increase in peak flood level (<math>&gt; 10\text{mm}</math>).</p> <p><u>Beneficial</u>            Creation of flood storage and decrease in peak flood level (<math>&gt; 10\text{mm}</math>).</p>

Negligible	Results in an impact on attribute but of insignificant magnitude to affect the use / integrity.	<p>The proposed project is unlikely to affect the integrity of the water environment.</p> <p><b>Surface Water</b> No risk identified by HEWRAT (pass both acute-soluble and chronic-sediment related pollutants). Risk of pollution from spillages &lt;0.5%.</p> <p><b>Groundwater</b> No measurable impact upon an aquifer and/or groundwater receptors and risk of pollution from spillages &lt;0.5%.</p> <p><b>Flood Risk</b> Negligible change to peak flood level (<math>\leq \pm 10\text{mm}</math>).</p>
No Change	No change or impact in the use/integrity	No loss or alteration of characteristics, features or elements; no observable impact in either direction.

Assessing the classification of effect / significance criteria

11.3.17. Once the sensitivity / value of the water resource (receptor) and the magnitude of the impact / change are both established, the potential effect can then be derived by combining the two assessments in a simple matrix as set out in **Table 11-7**.

**Table 11-7 – Classification of Effect**

		Magnitude of impact (degree of change)				
		No change	Negligible	Minor	Moderate	Major
Environmental value (sensitivity)	Very High	Neutral	Slight	<b>Moderate or Large</b>	<b>Large or Very Large</b>	<b>Very Large</b>
	High	Neutral	Slight	Slight or Moderate	<b>Moderate or Large</b>	<b>Large or Very Large</b>
	Medium	Neutral	Neutral or Slight	Slight	<b>Moderate</b>	<b>Moderate or Large</b>
	Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or <b>Moderate</b>

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

- **Very Large** where the Scheme are likely to have a substantial improvement or deterioration on receptors;
- **Large 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;
- **Slight effect:** where the Scheme could be expected to result in a perceptible improvement or deterioration on receptors; and
- **Neutral effect:** where no discernible improvement or deterioration is expected as a result of the Scheme on receptors, including instances where no change is confirmed.

11.3.19. 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**.

## 11.4. BASELINE CONDITIONS

11.4.1. This Section summarises information on the baseline conditions of water resources and related receptors that have the potential to be influenced by the Scheme.

### TOPOGRAPHY

11.4.2. The topography survey completed by 3D Engineering Surveys Limited (Ref. 11.31), Geomatic Surveyors (Ref. 11.32), and Pellfrishman (Ref. 11.33), show that the Site slopes gently down towards the south-east and south. Ground levels range between approximately 8 and 16 metres above ordnance datum (m AOD). Further information can be found within the accompanying FRA.

### SURFACE WATER BODIES

11.4.3. All surface water bodies identified within the area of study are included in Figure 60799-LOC-002 in **Appendix 11.3**.

11.4.4. Lidsey Rife, an EA designated Main River, is located approximately 0.5 km south-west of the Site. Review of the Magic Map indicates that the watercourse issues close to the junction of Fontwell Avenue and Nyton Road and flows south through Eastergate and agricultural land to ultimately discharge to the sea at Bognor Regis approximately 6.3km to the south. The Lidsey Rife is monitored against the objectives of the WFD. The current WFD status (Cycle 2, 2016) of the Lidsey Rife water body (GB107041012010) is Moderate, with Moderate ecological quality and Good chemical quality. The waterbody is expected to reach Good status by 2027. The watercourse is not designated as artificial or heavily modified, however the stretch closest to the Site appears to be artificially straightened to align with Church Lane. The catchment of the watercourse (from source to sea) is stated on the EA Catchment Data Explorer to be 36km<sup>2</sup>. The Q95 low flow is unknown but is likely to be less than 1.0m<sup>3</sup>/s. Review of FEH data indicates the watercourse's catchment close to the Site is only approximately 1.4km<sup>2</sup> and therefore the Q95 low flow may be less than 0.001m<sup>3</sup>/s close to the Site. The waterbody is considered to be of High sensitivity in accordance with **Table 11-5** due to the waterbody's WFD designation.

11.4.5. Barnham Lane Ditch, an EA designated Main River, is located immediately adjacent to the eastern site boundary. The watercourse flows in an easterly direction along the northern periphery of West Barnham to confluence with Barnham Rife approximately 0.8km downstream of the Site. The Barnham Lane Ditch is not monitored against the objectives of the WFD but is likely to be an ephemeral ditch with very low flow and heavily modified. EA LiDAR data indicates that the watercourse's catchment upstream of to the Site is only 0.3km<sup>2</sup> and therefore the Q95 low flow is approximately 0.001m<sup>3</sup>/s close to the Site. This waterbody is therefore considered to have Low sensitivity in accordance with **Table 11-5**.

- 11.4.6. Barnham Rife is also an EA designated Main River located approximately 0.7km east of the Site. The watercourse flows in a south-westerly direction to confluence with the Lidsey Rife approximately 2.5km downstream of the watercourse's connection with the Barnham Lane Ditch. The watercourse is not monitored against the objectives of the WFD although given the similar characteristics with the Lidsey Rife it is considered appropriate to apply the same indicative WFD status classifications. Review of FEH data indicates the watercourse's catchment at its confluence with the Lidsey Rife is approximately 10.3km<sup>2</sup>. The Q95 low flow is unknown but is likely to be less than 1.0m<sup>3</sup>/s. Immediately downstream of the Site the catchment is approximately 2.1km<sup>2</sup>. This waterbody is therefore considered to have Medium sensitivity in accordance with **Table 11-5**.
- 11.4.7. Westergate Stream is also an EA designated Main River situated approximately 0.7 km west of the Site. The watercourse flows in a south-westerly direction and confluences with the Aldingbourne Rife approximately 2.5km downstream of the Site. The Scheme is not located in the drainage catchment of the Westergate Stream and there is no known hydraulic link between the Scheme and the watercourse. The Scheme is therefore not thought to have an impact upon this watercourse and therefore Westergate Stream has not been further assessed within this ES Chapter.
- 11.4.8. School Ditch, and Ordinary Watercourse under the jurisdiction of the LLFA, is located adjacent to the south of the Scheme. The watercourse is thought to be culverted further to the south. This watercourse has been determined to be of Low sensitivity due to its local scale.
- 11.4.9. Several small ordinary watercourses are also present within 1km from the Site. These watercourses are included as "Unnamed Ordinary Watercourses" on Figure 60799-LOC-002 in **Appendix 11.3**. The Scheme is not located in the drainage catchment of the unnamed watercourses and there are no known hydraulic links between the Scheme and the unnamed watercourses. The Scheme is therefore not considered to have an e upon these watercourses and therefore the "Unnamed Ordinary Watercourses" have not been further assessed within this ES Chapter.

### **GROUNDWATER BODIES**

- 11.4.10. BGS online mapping (Ref. 11.21) indicates that the Site is underlain by Head (gravel, sand, silt and clay) and River Terrace Deposits (sand, silt and clay). Available site investigation data indicate that the main lithology is sand and gravel. The bedrock geology which underlies the Head and River Terrace Deposits is the London Clay Formation which is classed as "Unproductive Strata" by the EA. Geology figures can be found in Appendix A of the FRA. Based on the BGS mapping (Ref. 11.21) the bedrock under the London Clay Formation is formed by the Lambeth Group which is then underlain by Chalk at the Site.
- 11.4.11. The geology which directly underlays the Site comprises of Superficial Deposits only (Head and River Terrace Deposits). The EA classifies the superficial deposits as a "Secondary A" aquifer and therefore are considered of Medium sensitivity.
- 11.4.12. The Lambeth Group and the Chalk are aquifers of national importance as they support large groundwater abstractions. However, at the Site, they are present under the London Clay Formation which acts as a confining layer and the Lambeth Group and the Chalk are therefore protected from potential impacts resulting from the Scheme and are not considered further in this assessment.



## SURFACE WATER AND GROUNDWATER ABSTRACTIONS AND DISCHARGES

- 11.4.13. The EA confirmed in correspondence in May 2020 that there are seven licensed discharges within 1 km of the Site: five to surface water and two to groundwater. The EA also confirmed the presence of 15 discharge exceptions, mainly related to discharges to ground. None of the discharges are within the red line boundary of the proposed Scheme.
- 11.4.14. The EA confirmed there are two licensed groundwater abstractions which are from the Chalk within 1 km of the Site. These are held by Portsmouth Water and Fuente. The Portsmouth Water abstraction is used for public water supply and is abstracting from the underlying confined aquifer as the SPZ is shown as subsurface source protection zone on Magic Map (Ref. 11.22). The daily abstraction licence limit is 41,000m<sup>3</sup>/day. The Fuente abstraction is used for irrigation for agricultural land and the abstraction licence limit is 102 m<sup>3</sup>/day.
- 11.4.15. **Table 11-8** below lists the groundwater abstraction data provided by the EA on 1 July 2020. As discussed above it is considered that the Scheme will not have an impact on the Chalk and therefore no further consideration has been given to potential impacts to these licensed abstractions.

**Table 11-8 – Groundwater abstraction data within 1km of the Site**

	<b>EASTERGATE PUMPING STATION (Portsmouth Water)</b>	<b>STONEFIELDS NURSERIES, EASTERGATE LANE, WALBERTON (Fuente)</b>
LIC_NO	10/41/542108	10/41/542211
START_DATE	01/04/2016 00:00	31/03/2016 00:00
LH_NAME	Portsmouth Water Ltd	Fuente
ADDR_LINE2	West Street	Eastergate Lane
POSTCODE	PO9 1LG	PO20 6SL
SUBPURPOSE	Public Water Supply	General Agriculture
USE	Potable Water Supply - Direct	Spray Irrigation - Direct
SOURCE	Southern Region Groundwater	Southern Region Groundwater
NGR	SU9406	SU95590592
CART1EAST	494	495590
CART1NORTH	106	105920
AQUIFR_TYP	H5CH Chichester Chalk / UGS	H5CH Chichester Chalk / UGS
Daily Licence Limit (m <sup>3</sup> /d)	41000	102
Annual Licence Limit (m <sup>3</sup> /year)	10357800	9092

Source: Environment Agency data provided in July 2020 - Open Government Licence v3.0

## DESIGNATIONS

11.4.16. DEFRA's online Magic Map application indicates that the Site is located within a designated Nitrate Vulnerable Zone. The zones indicate areas where waterbodies may be at risk from agricultural nitrate pollution. If soils are mobilised this may impact the water resources receptors.

11.4.17. There are no other statutory designated sites within 1 km of the Site.

## EXISTING SEWER AND DRAINAGE INFRASTRUCTURE

11.4.18. Information regarding the existing sewer and drainage infrastructure within the vicinity of the Scheme has been discussed in the supporting FRA.

11.4.19. Topographic surveys and data provided by ADC (included in the FRA) indicate that highway drains are located along Barnham Road and Fontwell Avenue. Existing sewer and drainage infrastructure would be maintained. In addition, along Barnham Road, additional gullies would be provided at the low points if the existing highway drainage has insufficient capacity, subject to CCTV survey.

## FLOOD RISK RECEPTORS

11.4.20. This section outlines the baseline flood risk from all sources as defined under the NPPF. The importance of receptors relates to the NPPF vulnerability classification for land uses potentially affected by the Scheme. Potential receptors can therefore be occupiers or users of the Scheme, as well as users or occupiers of land outside of the Site boundary and the construction workers that could be affected by changes to flood risk as a result of the Scheme.

11.4.21. The sensitivity of residents / users of the surrounding areas is considered to be High as the surrounding land use is predominantly residential and relates to a "more vulnerable" use base on the NPPF vulnerability classification.

11.4.22. The sensitivity of the scheme and future users of the Scheme is considered to be Very High as the Scheme would be classified as "Essential infrastructure" in accordance with NPPF, as it would provide an important transport link that should remain operational in times of flooding.

11.4.23. Flooding may affect construction workers and construction plant. Their sensitivity is considered to be Medium considering the flexibility of the works and limited time of exposure to risks during working hours.

11.4.24. The FRA provided an assessment of flood risk from all sources of flooding as listed below:

- Flooding from coastal and tidal sources;
- Flooding from fluvial sources;
- Flooding from pluvial / overland flow sources;
- Flooding from groundwater;
- Flooding from sewer and drainage infrastructure; and,
- Artificial sources of flooding.

11.4.25. The main sources of flooding identified in the FRA are from surface water, groundwater and fluvial sources. No other prominent sources of flooding have been identified as affecting the area.

## FUTURE BASELINE

- 11.4.26. Should the Scheme not proceed, it is considered that the future baseline conditions in relation to flooding, hydrology and water resources at the Site would remain relatively unchanged.
- 11.4.27. The volume and intensity of precipitation falling on the Site could increase due to climate change, leading to increased pluvial flood risk and increased pressure on sewerage infrastructure. Climate change could also result in a higher fluctuation of groundwater levels due to prolonged rainfall events. However, this is predicted to be relatively insignificant in the Site due to the high permeability of the underlying gravel (and ability to remove high volumes of water quickly).
- 11.4.28. Climate change may also cause prolonged periods of lower rainfall and drought conditions which, in turn, could also affect the ecological and chemical quality of watercourses in the vicinity of the Site. This stresses the need to maintain baseflow during low flow conditions, promote groundwater recharge and provide robust treatment of surface water runoff.
- 11.4.29. Residential developments are proposed in the surrounding areas which could impact on the identified sensitive receptors. However, under the NPPF, these developments should also demonstrate that they are implementing appropriate mitigation measures to ensure that there are no significant impacts on the sensitive receptors in the area.

## SENSITIVE RECEPTORS

- 11.4.30. **Table 11-9** below summarises the identified sensitive water resources and flood risk receptors that could be impacted by the Scheme.

**Table 11-9 – Sensitive Receptors**

<b>Water Resource Receptor</b>	<b>Sensitivity</b>
<b>Surface Water Bodies</b> Barnham Lane Ditch (Main River) Barnham Rife (Main River) Lidsey Rife (Main River) School Ditch (Ordinary watercourse)	Low Medium High Low
<b>Flood Risk receptors</b> Future users of the Scheme (Essential Infrastructure) Residents / users of the surrounding areas (More Vulnerable) Construction worker (Less Vulnerable)	Very High High Medium
<b>Groundwater</b> Superficial Deposits (Secondary aquifer)	Medium

## 11.5. ASSESSMENT OF EFFECTS, MITIGATION AND RESIDUAL EFFECTS

### CONSTRUCTION PHASE

- 11.5.1. Best practice recommendations for the prevention of contamination, management of flood risk and sediment control will be outlined in more detail in a Construction Environment Management Plan (CEMP) or equivalent and agreed with relevant statutory consultees prior to commencement of construction works. This will include measures to comply with relevant legislation, guidance and best practice measures, in line with the Considerate Contractors Scheme and Site handbook for the construction of SuDS (CIRIA C698) (Ref. 11.15).
- 11.5.2. The following potential construction impacts have been assessed within the chapter and are presented in the tables below:
- Short-term increase in flood risk due to construction activities;
  - Potential effects on the water quality of surface water and groundwater resources due to construction activities or accidental leaks and spillages; and
  - Potential increase in physical contamination (i.e. sedimentation) of surface water bodies due to ground disturbance.

**Table 11-9 – Short-term increase in flood risk due to construction activities (Construction)**

<b>Assessment Component</b>	<b>Commentary</b>
<b>Short-term increase in flood risk due to construction activities</b>	<p>The construction of the Scheme has the potential to increase flood risk within the Scheme area and within the vicinity of the Scheme due to the introduction of new impermeable areas leading to increased rates and volumes of surface water runoff.</p> <p>Fluvial flooding is possible at the east of the Scheme near the access road and proposed attenuation pond 3 associated with Barnham Lane Ditch. However, the proposed site compounds, access roads and permanent works are not located within areas identified to be at risk from surface water or fluvial sources and therefore the works are not predicted to pose flood risk to construction workers or increase flood risk elsewhere during construction. Description and location of the construction elements are provided in Chapter 3.</p> <p>Groundwater flooding is possible as excavation is proposed for the drainage ponds and road alignment from CH 15 to CH 100. This may pose risk to the stability of excavations that would require consideration but is not expected to pose flood risk to construction workers or increase flood risk elsewhere.</p> <p>The sensitivity of the residents / users of the surrounding areas is considered to be High and the sensitivity of the construction workers is considered to be Medium. The magnitude of change prior to mitigation is considered to be Minor associated with a potential increase in flood risk associated with uncontrolled surface water runoff from impermeable areas. Therefore, there is likely to be a direct, temporary, short-term <b>slight adverse</b> effect on the flood risk receptors (<b>not significant</b>) prior to the implementation of mitigation measures.</p>
<b>Secondary Mitigation</b>	Refer to the environmental mitigations listed in the CEMP in Appendix 3.4. The main mitigation measures are summarised below:

	<ul style="list-style-type: none"> <li>▪ Implement a construction-phase drainage strategy to intercept, capture and attenuate surface water runoff and adopt a phased approach to the construction of the operational drainage system to ensure impermeable areas are appropriately drained and attenuated prior to discharge. The construction-phase drainage strategy could include the provision of a bund along the lowest perimeters of the site to prevent uncontrolled runoff towards existing properties. Operational-phase drainage systems must be protected from ingress of sediment and debris and cleaned on completion of construction works.</li> <li>▪ Storage of material and construction plant should be set back from the Barnham Lane Ditch and away from areas that may be at risk of flooding or existing overland flow routes described in the FRA.</li> <li>▪ To minimise groundwater seepage into the areas of excavation/cutting, deep excavations should be constructed during the summer months as far as practicable and groundwater levels should ideally be monitored during construction.</li> </ul>
<p><b>Residual Effects and Monitoring</b></p>	<p>The magnitude of change following the implementation of secondary mitigation is considered to be negligible. Therefore, there is likely to be a direct, temporary, short-term <b>neutral to slight adverse</b> residual effect on the flood risk receptors (<b>not significant</b>) following the implementation of mitigation measures.</p>

**Table 11-10 – Potential effects on the water quality of water resources due to accidental leaks and spillages (Construction)**

<p><b>Assessment Component</b></p>	<p><b>Commentary</b></p>
<p><b>Potential effects on the water quality of water resources due to construction activities and accidental leaks and spillages</b></p>	<p>The construction of the Scheme has the potential to adversely impact on the water quality of water resources as a result of construction activities that cause accidental leaks and spillages or harmful substances. Sensitive water resources receptors that could be impacted by pollution are surface water bodies (Barnham Lane Ditch, Barnham Rife, Lidsey Rife and School Ditch) and groundwater bodies (Superficial Deposits). During the construction phase, the risk is primarily posed by materials being stored on site, such as oils, fuels and other chemicals.</p> <p>The sensitivity of Barnham Lane Ditch is considered to be Low and the magnitude of change prior to mitigation is considered to be Moderate given the watercourse’s close proximity to the construction works. Therefore, there is likely to be a direct, temporary, short-term <b>slight adverse</b> effect on Banham Lane Ditch (<b>not significant</b>) prior to the implementation of mitigation measures.</p> <p>The sensitivity of Barnham Rife is considered to be Medium and the magnitude of change prior to mitigation is considered to be Negligible as pollutants are likely to be trapped or diluted within the Barnham Lane Ditch prior to reaching the Barnham Rife. Therefore, there is likely to be a <b>neutral</b> effect on Barnham Rife (<b>not significant</b>) prior to the implementation of mitigation measures.</p> <p>The sensitivity of Lidsey Rife is considered to be High and the magnitude of change prior to mitigation is considered to be Negligible given the majority of the Scheme is not within the direct catchment of Lidsey Rife. Therefore, there is likely to be an indirect, temporary, short-term <b>slight adverse</b> effect on Lidsey Rife (<b>not significant</b>) prior to the implementation of mitigation measures.</p>

	<p>The sensitivity of School Ditch is considered to be Low and the magnitude of change prior to mitigation is considered to be Moderate given the watercourses' proximity to the construction works. Therefore, there is likely to be a direct, temporary, short-term <b>slight adverse</b> effect on the School Ditch (<b>not significant</b>) prior to the implementation of mitigation measures.</p> <p>The sensitivity of the Superficial Deposits is considered to be Medium and the magnitude of change prior to mitigation is considered to be Moderate as there will be excavation / cuttings as part of the construction activities. Therefore, there is likely to be an indirect, temporary, short-term <b>moderate adverse</b> effect on the Superficial Deposits (<b>significant</b>) prior to the implementation of mitigation measures.</p>
<p><b>Secondary Mitigation</b></p>	<p>Refer to the environmental mitigations listed in the CEMP in Appendix 3.4. The main mitigation measures are summarised below:</p> <ul style="list-style-type: none"> <li>▪ Surface water run-off from within the Site should be managed to prevent uncontrolled migration of pollutants to waterbodies. This could include temporary bunding and settlement ponds.</li> <li>▪ Preparation of incident response plans, prior to construction, which should be present on-site throughout construction to inform contractors of required actions in the event of a pollution incident.</li> <li>▪ Spillages and leaks would be immediately contained in line with the incident response plan.</li> <li>▪ On-site availability of oil spill clean-up equipment including absorbent material and inflatable booms for use in the event of an oil spill or leak.</li> <li>▪ Wherever possible, plant and machinery would be kept away from the drainage system and watercourses.</li> <li>▪ Use of drip trays under mobile plant.</li> <li>▪ Oil, fuels and other harmful substances should be stored on an impermeable surface with appropriate drainage or containment.</li> <li>▪ Construction materials brought to the Site should be free of any contaminated material, so as to avoid any possible contamination of watercourses.</li> <li>▪ Care should be taken to ensure that wet cement does not come into contact with surface water or near the watercourses and drainage ditches. Cement should be poured in dry conditions and consideration should be given to use fast drying cement.</li> <li>▪ If ground contamination is encountered during construction works, work would stop immediately and measures would be taken to prevent disturbance and mobilisation of contaminants, until the contamination has been treated in-situ or removed for off-site treatment.</li> </ul>
<p><b>Residual Effects and Monitoring</b></p>	<p>The magnitude of change following the implementation of secondary mitigation is considered to be negligible. Therefore, there is likely to be a direct, temporary, short-term <b>neutral to slight adverse</b> residual effect on the Superficial Deposits (<b>not significant</b>) following the implementation of mitigation measures. The potential residual effect to Barnham Lane Ditch, Barnham Rife, Lidsey Rife and School Ditch is considered to be <b>neutral (not significant)</b>.</p>

**Table 11-11 – Potential increase in physical contamination (i.e. sedimentation) of surface water bodies due to ground disturbance (Construction)**

Assessment Component	Commentary
<p><b>Potential increase in physical contamination (i.e. sedimentation) of surface water bodies due to ground disturbance</b></p>	<p>During the construction phase there would be a number of activities which could reduce surface water quality with respect to physical contaminants. These include site clearance; excavations; groundwater dewatering; localised ground remediation (if required); and materials handling, storage, stockpiling, spillage and disposal. In addition, during periods of heavy rainfall, vehicle movements associated with construction activities may result in damage to soil structure that may generate increased sedimentation within surface run-off.</p> <p>Sensitive water resources receptors that could be impacted by pollution are Barnham Lane Ditch, Barnham Rife, Lidsey Rife and School Ditch.</p> <p>The sensitivity of Barnham Lane Ditch is considered to be Low and the magnitude of change prior to mitigation is considered to be Moderate given the proximity of the watercourse to the construction works. Therefore, there is likely to be a direct, temporary, short-term <b>slight adverse</b> effect on Banham Lane Ditch (<b>not significant</b>) prior to the implementation of mitigation measures.</p> <p>The sensitivity of Barnham Rife is considered to be Medium and the magnitude of change prior to mitigation is considered to be No change as sediments are likely to settle within the Barnham Lane Ditch prior to reaching the Barnham Rife. Therefore, there is likely to be a <b>neutral</b> effect on Barnham Rife (<b>not significant</b>) prior to the implementation of mitigation measures.</p> <p>The sensitivity of Lidsey Rife is considered to be High and the magnitude of change prior to mitigation is considered to be Negligible given the majority of the Scheme is not within the direct catchment of Lidsey Rife. Therefore, there is likely to be an indirect, temporary, short-term <b>slight adverse</b> effect on Lidsey Rife (<b>not significant</b>) prior to the implementation of mitigation measures.</p> <p>The sensitivity of School Ditch is considered to be Low and the magnitude of change prior to mitigation is considered to be Moderate, given the proximity of the watercourse to the construction works. Therefore, there is likely to be a direct, temporary, short-term <b>slight adverse</b> effect on the School Ditch (<b>not significant</b>) prior to the implementation of mitigation measures.</p>
<p><b>Secondary Mitigation</b></p>	<p>Refer to the environmental mitigations listed in the CEMP in Appendix 3.4. The main mitigation measures are summarised below:</p> <ul style="list-style-type: none"> <li>▪ Working areas shall be clearly defined to ensure the disturbance of soils is minimised, where possible.</li> <li>▪ The cleaning of vehicle wheels prior to leaving Site.</li> <li>▪ Dust Management Plan (i.e. damping down) with subsequent consideration given to the management of surface water run-off.</li> <li>▪ Installation of systems such as perimeter bunds, silt traps and swales designed to trap silty water including adequate maintenance and monitoring of these to ensure effectiveness, particularly after adverse weather conditions.</li> <li>▪ The implementation of a temporary drainage strategy to prevent uncontrolled runoff.</li> <li>▪ Locating stockpiles and materials storage a minimum of 10m from any watercourses or drainage lines.</li> </ul>

	<ul style="list-style-type: none"> <li>▪ If perched groundwater is encountered within the made ground or superficial deposits at the Site, during the establishment of the foundations, dewatering may be required. The most appropriate method of dewatering would be chosen at this stage, which may include the enclosure of the excavation by sheet piling. Piezometers could be used outside of the sheet-pile to monitor groundwater levels. Damp proof membranes will be incorporated during construction to prevent the ingress of shallow groundwater.</li> <li>▪ If dewatering is required, water should be passed through an appropriate sediment control system prior to discharge.</li> </ul>
<p><b>Residual Effects and Monitoring</b></p>	<p>The magnitude of change to Barnham Lane Ditch and School Ditch following mitigation is considered to be Minor. Therefore, there is likely to be a direct, temporary, short-term <b>slight adverse</b> effect on Barnham Lane Ditch and School Ditch (<b>not significant</b>) following the implementation of mitigation measures.</p> <p>The magnitude of change to Lidsey Rife and Barham Rife following mitigation is considered to be No Change. Therefore, there is likely to be a <b>neutral</b> effect on Lidsey Rife and Barham Rife (<b>not significant</b>) following the implementation of mitigation measures.</p>

## OPERATIONAL PHASE

11.5.3. The following potential operational impacts have been assessed within the chapter and are presented in the tables below:

- Potential increase in on and off-site flood risk, due to an increase in impermeable surface areas, interception of overland surface water flows and the disturbance of groundwater flow paths; and
- Potential effects on the water quality (physical and chemical) of water resources associated with routine runoff and spillages, including watercourses and groundwater.

**Table 11-12 – Potential increase in flood risk, due to an increase in impermeable surface areas and the disturbance of surface water and groundwater flow paths (Operation)**

<p><b>Assessment Component</b></p>	<p><b>Commentary</b></p>
<p><b>Potential increase in flood risk, due to an increase in impermeable surface areas and the disturbance of surface water and groundwater flow paths</b></p>	<p>The Scheme has the potential to increase flood risk within the Scheme area and within the vicinity of the Scheme due to the introduction of new impermeable areas leading to increased rates and volumes of surface water runoff.</p> <p>The introduction of new impermeable areas may also intercept and displace overland flows, posing an increased flood risk. Analysis of the Environment Agency’s Risk of Flooding from Surface Water map indicates that the interception of overland flows could result in an increase in flood risk as the Scheme crosses existing flow routes (refer to the FRA). The Scheme has the potential to intercept the groundwater table through the installation of below-ground features (i.e. cuttings/excavations) resulting in reduced capacity of attenuation features. Infiltration to ground could also result in changes to the groundwater flows and potentially increase groundwater flood risk elsewhere.</p> <p>The Scheme is located entirely within Flood Zone 1 and therefore the fluvial flood risk has not been assessed for the operational phase.</p>



	<p>The potential increase in flood risk associated with surface water run-off from new impermeable areas would be managed through the implementation of the drainage design which was undertaken by Capita / Jackson and in consultation with WSCC (LLFA), ADC and the EA. For more details on flood risk mitigation measure refer to the FRA. In summary, the drainage design proposes the infiltration of runoff to ground for the (approximate) western half of the Scheme, and the controlled discharge to Barnham Lane Ditch and School Ditch for the (approximate) eastern half of the Scheme. The drainage proposals are designed to control runoff up to the 1 in 100-year event plus 40% increase due to climate change. The proposed discharge rate into the Barnham Lane Ditch is 1.8l/s which is a significant reduction of 14.6l/s in greenfield runoff for up to the 1 in 100 year plus 40% climate change event. A practicable minimum limit on the discharge rate of 5l/s will be applied to the discharge to School Ditch. The controlled discharge rates have been agreed with the LLFA and ADC.</p> <p>Groundwater monitoring (as detailed in the FRA) within the Site and surrounding areas indicates that groundwater levels are shallow (circa or less than 2m below ground level) in the western portion of the Site, are very shallow (up to approximately 0.5m below ground level) in the eastern and southern portions of the Site. The drainage design includes lined attenuation ponds in the eastern and southern portions as primary mitigation measures to prevent groundwater ingress into the drainage system. In the western part, the groundwater monitoring indicates that groundwater levels could rise above the base of the proposed soakaways which would limit the storage capacity of the drainage system. The groundwater monitoring locations however were not located within the area of the proposed soakaways and therefore the drainage design has not considered these as representative. Additional groundwater monitoring at the proposed infiltration locations is recommended to be undertaken prior to construction.</p> <p>The sensitivity of the future users of the Scheme is considered to be Very High and the magnitude of change prior to secondary mitigation is considered to be Minor, as although the proposed drainage system is designed to account for the 1 in 100 year plus 40% increase due to climate change event, there are uncertainties regarding groundwater levels in the western end of the scheme. Therefore, there is likely to be a direct, permanent, long-term, <b>moderate adverse</b> effect on future site users of the Scheme (<b>significant</b>) prior to the implementation of secondary mitigation measures.</p> <p>The Scheme ties into Fontwell Avenue and Barnham Lane where two overland flow routes are present along those roads. However, to mitigate the potential increase in surface water flood risk to others from blockage of the overland flow routes, the Scheme design proposes to keep the current road drainage systems along these roads. In addition, the Scheme incorporates additional gullies at low points. This has been consulted on and agreed with the LLFA and ADC. A CCTV condition survey along Barnham Road will be required to confirm the final road design/mitigation measures at the proposed roundabout with Barnham Road.</p> <p>The sensitivity of the residents / users of the surrounding areas is considered to be High and the magnitude of change prior to secondary mitigation is considered to be Minor, as the secondary mitigation measures to maintain the overland flow route along Barnham Road would need to be confirmed by a CCTV condition survey of the existing drainage prior to construction. Therefore, there is likely to be a direct, permanent, long-term, <b>moderate adverse</b> effect on residents / users of the surrounding areas (<b>significant</b>) prior to the implementation of secondary mitigation measures.</p>
<p><b>Secondary Mitigation</b></p>	<p>The proposed operational surface water drainage system has been taken into account in the assessment of potential effects. Secondary mitigation includes:</p>

	<ul style="list-style-type: none"> <li>▪ Additional groundwater monitoring and, if required, amendment to the drainage design prior to construction of the Scheme as suggested by WSCC (LLFA) and ADC in their correspondence dated 6 August 2020 and included in the FRA.</li> <li>▪ A CCTV condition survey along Barnham Road will be required to confirm the final road design / mitigation measures at the proposed roundabout with Barnham Road prior to construction. This has been agreed with WSCC (LLFA) and ADC in their correspondence dated 6 August 2020 and included in the FRA.</li> </ul>
<b>Residual effects and monitoring</b>	<p>The magnitude of change following secondary mitigation is considered to be Negligible. Therefore, there is likely to be a direct, permanent, long-term, <b>slight adverse</b> effect on the future users of the Scheme and residents / users of the surrounding areas (<b>not significant</b>) following the implementation of secondary mitigation measures.</p>

**Table 11-13 – Potential effects on the water quality (physical and chemical) of water resources, including water courses and groundwater (Operation)**

<b>Assessment Component</b>	<b>Commentary</b>
<b>Potential effects on the water quality of water (physical and chemical) resources, including watercourses and groundwater</b>	<p>During the operational phase, untreated routine surface runoff from impermeable areas and accidental spillages could be mobilised into the surface water drainage system, and this contaminated surface water could be discharged to the surface water or groundwater receptors via the proposed drainage system.</p> <p>The quality of surface water run-off from new impermeable areas would be managed through the implementation of the drainage design which was undertaken by Capita / Jackson and in consultation with WSCC (LLFA), ADC and the EA. For more details on the drainage strategy refer to the FRA. In summary, the drainage design proposes the infiltration of surface runoff to ground for the (approximate) western half of the Scheme, and the controlled discharge to Barnham Lane Ditch and School Ditch for the (approximate) eastern half of the Scheme. Treatment measures will include a combination of SuDS features as detailed below:</p> <ul style="list-style-type: none"> <li>▪ By-pass oil/petrol interceptors upstream of cellular units for groundwater protection in the western end of the Scheme.</li> <li>▪ Infiltration through the base of swales and infiltration pond for the northern portion of the Scheme;</li> <li>▪ Swales and a lined attenuation pond for the eastern portion of the scheme (runoff will discharge to Barnham Lane Ditch).</li> <li>▪ A lined attenuation pond and a by-pass oil/petrol interceptor for the eastern portion of the scheme (runoff will discharge to School Ditch).</li> </ul> <p>Water quality has been assessed using the Simple Index Approach in accordance with CIRIA C753 (Ref. 11.15), in consultation with the LLFA and ADC (refer to FRA Ref. 11.27), as well as a HEWRAT assessment in accordance with DMRB LA113 Revision 1 (Ref. 11.16). The Simple Index Approach is included in Appendix E2 of the FRA. The FRA and HEWRAT assessment are included in Appendix 11.1 and Appendix 11.2 respectively.</p> <p>Sensitive water resources receptors that could be impacted by pollution are surface water bodies (Barnham Lane Ditch, Barnham Rife and School Ditch) and groundwater bodies (Superficial Deposits). Lidsey Rife is not proposed to receive discharge from the Scheme and therefore no impacts are expected.</p>

The sensitivity of Barnham Lane Ditch is considered to be Low and the magnitude of change prior to secondary mitigation is considered to be Negligible as the proposed surface water drainage system would provide sufficient treatment based on the results of the HEWRAT and CIRIA C753 Simple index Approach assessments considering the treatment measures within the proposed drainage design. The HEWRAT results, after considering the proposed drainage design, indicate that the annual average concentration is 0.21µg/l for copper and 0.77µg/l for zinc which passes the acute impacts of soluble pollutants. The HEWRAT assessment for the chronic impacts of sediment-bound pollutants is also passed. The assessment of long-term pollution impacts considers the annual average pollutant concentrations associated with the Scheme against the EQS threshold values set out in the WFD. The annual average concentrations for both copper and zinc are well below the EQS thresholds when considering the proposed drainage design and go beyond the minimum standards required to pass the HEWRAT assessment. Therefore, there is likely to be a **neutral** effect on the water quality of Barnham Lane Ditch (**not significant**) prior to the implementation of secondary mitigation measures.

Discharge to the Barnham Ditch will migrate to the Barham Rife located approximately 0.8km downstream. Pollutants are expected to settle or be diluted prior to reaching Barnham Rife and therefore the magnitude of change prior to secondary mitigation is considered to be Negligible. Therefore, there is likely to be a **neutral** effect on the water quality of Barnham Rife (**not significant**) prior to the implementation of secondary mitigation measures.

The southern extent of the Scheme is proposed to discharge into School Ditch. The sensitivity of School Ditch is considered to be Low and the magnitude of change prior to secondary mitigation, is considered to be Negligible as the proposed surface water drainage system would provide sufficient treatment based on the results of the HEWRAT and CIRIA C753 Simple index Approach assessments considering the drainage design. Due to the low Q95 for this watercourse, School Ditch was assessed as a groundwater “shallow linear” feature. The HEWRAT results before primary mitigation was Medium Risk however, the drainage design incorporates swales and a lined attenuation pond which would provide sufficient treatment of at least 50% removal for dissolved copper, zinc and 80% removal for Total Suspended Solids (TSS) as per table 8.6.4N3 in CG501 (Ref. 11.19). Therefore, there is likely to be a **neutral** effect on the water quality of School Ditch (**not significant**) prior to the implementation of secondary mitigation measures.

	<p>Infiltration to ground will be within the underlying Superficial Deposits and potentially pollute groundwater resources if present. The sensitivity of the Superficial Deposits is considered to be Medium and the magnitude of change prior to secondary mitigation is considered to be Moderate based on the HEWRAT assessment (Appendix 11.2). It should be noted that the HEWRAT assessment does not consider the mitigation measures embedded into the drainage design of the Scheme. The proposed swales would reduce the risk of soluble contaminants by at least 50% as per table 8.6.4N3 in CG501 (Ref. 11.19), in addition, an infiltration pond would further facilitate the removal of dissolved metals and solids (Ref. 11.19). It should be noted however that the roundabout which connects the Scheme to Fontwell Avenue does not incorporate sufficient mitigation prior to discharge to ground (Superficial Deposits) as petrol interceptors are not given a value within table 8.6.4N3 in CG501 (Ref. 11.19). According to the treatment technical note provided by Capita (2020) (Ref. 11.27) where the Simple index Approach was applied, the proposed oil/petrol interceptors would provide sufficient treatment. The proposed treatment was presented and agreed with the LLFA and ADC. As the Fontwell Avenue roundabout is only ~0.18ha in area and the Simple index Approach does not take area into consideration within the assessment, the overall magnitude of change for the Superficial Deposits therefore is considered to be Negligible. Therefore, there is likely to be a <b>neutral</b> effect on the groundwater quality in the Superficial Deposits (<b>not significant</b>) prior to the implementation of secondary mitigation measures.</p>
<p><b>Secondary Mitigation</b></p>	<p>Not required.</p>
<p><b>Residual effects and monitoring</b></p>	<p>The magnitude of change to Barnham Lane Ditch, Barnham Rife, Lidsey Rife, School Ditch and the Superficial Deposits is considered to be Negligible. Therefore, there is likely to be a <b>Neutral</b> residual effect on the water quality to these features (<b>not significant</b>) and mitigation measures would not be required.</p>

## ASSESSMENT AGAINST FUTURE BASELINE

- 11.5.5. In the longer term, the risk of fluvial and surface water flooding at the Site and in the vicinity may increase with the effects of climate change due to an increase in the volume and intensity of precipitation falling on the Scheme and in the surrounding area. This could have a corresponding effect on flood risk associated with the drains and watercourses onsite and in the vicinity of the Scheme, including potentially more frequent surcharging of the road drainage.
- 11.5.6. Maximum groundwater levels in the southern part of the Site are very shallow and even if the road is protected surrounding land will not be raised as part of the Scheme. For the groundwater monitoring and maximum levels refer to the FRA. Other developments in the area have to develop drainage strategies and it is important that cumulative impacts on groundwater levels are considered, i.e. avoiding an increase in groundwater recharge during prolonged wet conditions.

## 11.6. CUMULATIVE EFFECTS

- 11.6.1. The Scheme has been designed to account for the potential increase in flood risk by including climate change allowance in the drainage design as required by the NPPF. Residential developments are proposed in the surrounding areas which could impact on the identified sensitive receptors. However, under the NPPF, these developments should also demonstrate that they are implementing appropriate mitigation measures to ensure that there are no significant impacts on the sensitive receptors in the area. Therefore, the cumulative impacts on flood risk and the water environment arising from the Scheme and the future developments would not be significant.

## 11.7. LIMITATIONS AND ASSUMPTIONS

- 11.7.1. The description of the proposed Scheme, including construction activities, is as confirmed in **Chapter 3 - Description of Scheme**.
- 11.7.2. In addition, it is assumed that the mitigation measures listed as part of the CEMP are correctly implemented and best practice is adopted at all times. It is also assumed that the flood mitigation measures included in the drainage design would be functional and able to successfully mitigate the potential impacts during the operation phase.
- 11.7.3. Drainage designs and additional mitigation measures are as provided by Capita / Jackson on 3 August 2020 and included in the FRA (**Appendix 11.1**).

## 11.8. SUMMARY

- 11.8.1. The following table provides a summary of the findings of the assessment.

**Table 11-15 - Summary of Effects Table for Water Resources and Flood Risk**

Description of Effects	Receptor	Significance and Nature of Effects Prior to Secondary Mitigation	Summary of Secondary Mitigation	Significance and Nature of Residual Effects
<b>Construction Phase</b>				
Short-term increase in flood risk due to construction activities	Residents / users of the surrounding areas	Slight - / T / D / ST	<ul style="list-style-type: none"> <li>▪ Implement a construction-phase drainage strategy to intercept, capture and attenuate surface water runoff and adopt a phased approach to the construction of the operational drainage system to ensure impermeable areas are appropriately drained and attenuated prior to discharge. The construction-phase drainage strategy could include the provision of a bund along the lowest perimeters of the site to prevent uncontrolled runoff towards existing properties. Operational-phase drainage systems must be protected from ingress of sediment and debris and cleaned on completion of construction works.</li> <li>▪ Storage of material and construction plant should be set back from the Barnham Lane Ditch and away from areas that may be at risk of flooding or existing overland flow routes described in the FRA.</li> <li>▪ To minimise groundwater seepage into the areas of excavation/cutting, deep excavations should be constructed during the summer months as far as practicable and groundwater levels should ideally be monitored during construction.</li> </ul>	Neutral to Slight - / T / D / ST
	Construction workers	Slight - / T / D / ST		Neutral to Slight - / T / D / ST
Potential effects on the water quality of water resources due to construction activities and accidental leaks and spillages	Barnham Lane Ditch	Slight - / T / D / ST	<ul style="list-style-type: none"> <li>▪ Surface water run-off from within the Site should be managed to prevent uncontrolled migration of pollutants to waterbodies. This could include temporary bunding and settlement ponds.</li> </ul>	Neutral

	Barnham Rife	Slight - / T / D / ST	<ul style="list-style-type: none"> <li>▪ Preparation of incident response plans, prior to construction, which should be present on-site throughout construction to inform contractors of required actions in the event of a pollution incident.</li> <li>▪ Spillages and leaks would be immediately contained in line with the incident response plan.</li> <li>▪ On-site availability of oil spill clean-up equipment including absorbent material and inflatable booms for use in the event of an oil spill or leak.</li> <li>▪ Wherever possible, plant and machinery would be kept away from the drainage system and watercourses.</li> <li>▪ Use of drip trays under mobile plant.</li> <li>▪ Oil, fuels and other harmful substances should be stored on an impermeable surface with appropriate drainage or containment.</li> <li>▪ Construction materials brought to the Site should be free of any contaminated material, so as to avoid any possible contamination of watercourses.</li> <li>▪ Care should be taken to ensure that wet cement does not come into contact with surface water or near the watercourses and drainage ditches. Cement should be poured in dry conditions and consideration should be given to use fast drying cement.</li> <li>▪ If ground contamination is encountered during construction works, work would stop immediately and measures would be taken to prevent disturbance and mobilisation of contaminants, until the contamination has been treated in-situ or removed for off-site treatment.</li> </ul>	Neutral
	Lidsey Rife	Slight - / T / I / ST		Neutral
	School Ditch	Slight - / T / D / ST		Neutral
	Superficial Deposits	Moderate - / T / I / ST		Slight - / T / I / ST
Potential increase in physical contamination (i.e. sedimentation) of surface water bodies due to ground disturbance	Barnham Lane Ditch	Slight - / T / D / ST	<ul style="list-style-type: none"> <li>▪ Working areas shall be clearly defined to ensure the disturbance of soils is minimised, where possible.</li> <li>▪ The cleaning of vehicle wheels prior to leaving Site.</li> <li>▪ Dust Management Plan (i.e. damping down) with subsequent consideration given to the management of surface water run-off.</li> <li>▪ Installation of systems such as perimeter bunds, silt traps and swales designed to trap silty water including adequate maintenance and monitoring of these to ensure effectiveness, particularly after adverse weather conditions.</li> <li>▪ The implementation of a temporary drainage strategy to prevent uncontrolled runoff.</li> <li>▪ Locating stockpiles and materials storage a minimum of 10m from any watercourses or drainage lines.</li> </ul>	Slight - / T / D / ST
	Barnham Rife	Neutral		Neutral

	Lidsey Rife	Slight - / T / I / ST	<ul style="list-style-type: none"> <li>If perched groundwater is encountered within the made ground or superficial deposits at the Site, during the establishment of the foundations, dewatering may be required. The most appropriate method of dewatering would be chosen at this stage, which may include the enclosure of the excavation by sheet piling. Piezometers could be used outside of the sheet-pile to monitor groundwater levels. Damp proof membranes will be incorporated during construction to prevent the ingress of shallow groundwater.</li> <li>If dewatering is required, water should be passed through an appropriate sediment control system prior to discharge.</li> </ul>	Neutral
	School Ditch	Slight - / T / D / ST		Slight - / T / D / ST
<b>Operational Phase</b>				
Potential increase in flood risk, due to an increase in impermeable surface areas and the disturbance of surface water and groundwater flow paths	Future site users of the Scheme	Moderate - / P / D / LT	<p>The proposed operational surface water drainage system has been taken into account in the assessment of potential effects. Secondary mitigation includes:</p> <ul style="list-style-type: none"> <li>Additional groundwater monitoring and, if required, amendment to the drainage design prior to construction of the Scheme as suggested by WSCC (LLFA) and ADC in their correspondence dated 6 August 2020 and included in the FRA.</li> <li>A CCTV condition survey along Barnham Road will be required to confirm the final road design / mitigation measures at the proposed roundabout with Barnham Road prior to construction. This has been agreed with WSCC (LLFA) and ADC in their correspondence dated 6 August 2020 and included in the FRA.</li> </ul>	Slight - / P / D / LT
	Residents / users of the surrounding areas	Moderate - / P / D / LT		Slight - / P / D / LT
Potential effects on the water quality of water resources, including water courses and groundwater	Barnham Lane Ditch	Neutral	Not required	Neutral
	Barnham Rife	Neutral		Neutral
	Lidsey Rife	Neutral		Neutral
	School Ditch	Neutral		Neutral





	Superficial Deposits	Neutral		Neutral
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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



## 11.9. REFERENCES

- Reference 11.1: Floods Directive 2007 (2007/60/EC)
- Reference 11.2: The Water Resources Act 1991
- Reference 11.3: Land Drainage Act 1994
- Reference 11.4: Water Framework Directive 2000
- Reference 11.5: Groundwater Directive (2006/118/EC) 2006
- Reference 11.6: Flood and Water Management Act 2010
- Reference 11.7: The Environmental Damage (Prevention and Remediation) (England) Regulations 2015
- Reference 11.8: The Environmental Permitting Regulations 2016
- Reference 11.9: National Planning Policy Framework (NPPF) 2019
- Reference 11.10: Adoption Arun Local Plan 2011-2031
- Reference 11.11: Flood Risk Assessments: Climate Change Allowances (2019)
- Reference 11.12: Environment Agency (2017) 'Flood Risk Assessment: Standing Advice'
- Reference 11.13: Arun District Council Strategic Flood Risk Assessment 2016
- Reference 11.14: West Sussex Local Management Strategy (LFRMS) 2014
- Reference 11.15: CIRIA, The SuDS Manual, C753 (2015)
- Reference 11.16: DMRB LA113 Road drainage and the water environment, Revision 1
- Reference 11.17: Site handbook for the construction of SuDS (CIRIA C698) (2007)
- Reference 11.18: The Environment Agency's Approach to Groundwater Protection (2018)
- Reference 11.19: CG 501 Design of Highway Drainage Systems, Revision 2
- Reference 11.20: Environment Agency Flood Mapping
- Reference 11.21: BGS Geindex Onshore mapping 1:50,000 scale
- Reference 11.22: DEFRA Magic Map
- Reference 11.23: Environment Agency Catchment Data Explorer
- Reference 11.24: Environment Agency correspondence, including Product 4 and abstraction licence data
- Reference 11.25: Lead Local Flood Authority and Arun District Council correspondence and flood risk data provided
- Reference 11.26: Southern Water – history of flooding and Asset location plans
- Reference 11.27: Drainage design documents provided by Capita / Jackson on 03 August 2020 - appended to the above FRA
- Reference 11.28: Geotechnics (2019) – A29 Realignment, Eastergate. Factual Report – ground investigation to inform the A29 Realignment Transport Business Case
- Reference 11.29: Land Science (2020) – ground investigations undertaken to inform the A29 realignment Phase 1
- Reference 11.30: Wilson Bailey 2018, 2019 and 2020 – ground investigations undertaken on behalf of Barratts
- Reference 11.31: 3D Engineering Surveys Limited 2019 – topographic survey
- Reference 11.32: Geomatic Surveyors 2018 – topographic survey and,
- Reference 11.33: Pellfrishman 2018 – topographic survey

## 12. GEOLOGY AND SOILS

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### 12.1. INTRODUCTION

- 12.1.1. This chapter provides a summary of the Preliminary Risk Assessment (PRA), provided in **Appendix 12.1**, based on the CIRIA Publication C552, Contaminated Land Risk Assessment – A Guide to Good Practice (Ref. 12.1) and outlines the potential risks of the Scheme in relation to ground contamination issues. At the request of WSCC during the EIA scoping process, consideration is given here as to whether or not there is the potential for significant effects on geology and soils as a result of the Scheme. Consideration of potential contamination impacts on surface water bodies and groundwater is provided in **Chapter 11: Water Resources and Flood Risk**, and hence is not repeated here.
- 12.1.2. An Outline Construction Environmental Management Plan (CEMP) has been prepared which sets out control measures and monitoring to be adopted by the Contractor to avoid any potential effects on the environment, based on good construction practice, including measures to avoid contamination/pollution events. In addition, geotechnical ground investigations will be undertaken prior to construction works starting, which will include contamination testing. In the event that contamination is present a suitable mitigation strategy will be developed.
- 12.1.3. In consideration of the findings of the PRA, the implementation of the measures set out in the Outline CEMP and the planned ground investigations, the potential for residual risks on geology and soils as a result of the Scheme is low (not significant).
- 12.1.4. This chapter is intended to be read as part of the wider ES and with the PRA (**Appendix 12.1**).

### 12.2. LEGISLATIVE FRAMEWORK, POLICY AND GUIDANCE

#### LEGISLATIVE FRAMEWORK

- 12.2.1. The applicable legislative, policy framework and guidance documents are summarised in **Table 12-1** below.

**Table 12-1 - Geology and Soils: Summary of Legislation, Policy and Guidance Documents**

Legislation	Summary
Part 2A of The Environmental Protection Act (1990) (Ref. 12.2)	This Guidance is intended to explain how local authorities should implement the regime, including how they should go about deciding whether land is contaminated land in the legal sense of the term. It also elaborates on the remediation provisions of Part 2A, such as the goals of remediation, and how regulators should ensure that remediation requirements are reasonable. This Guidance also explains specific aspects of the Part 2A liability arrangements, and the process by which the enforcing authority may recover the costs of remediation from liable parties in certain circumstances.
The National Planning Policy Framework (2019) (Ref. 12.3)	The National Planning Policy Framework sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally prepared plans for housing and other development can be produced.

Legislation	Summary
Environment Agency 'Model Procedures for the Management of Land Contamination', CLR11 (2004) (Ref. 12.4)	The Model Procedures for the Management of Land Contamination (CLR 11), have been developed to provide the technical framework for applying a risk management process when dealing with land affected by contamination.  The process involves identifying, making decisions on, and taking appropriate action to deal with land contamination in a way that is consistent with government policies and legislation within the UK.
CIRIA C552 'Contaminated Land Risk Assessment. A guide to good practice' (2001) (Ref. 12.1)	This book and the associated training pack (CIRIA C553, 2001) examine the risk assessment of contaminated land and explains the key elements of risk assessment practices and procedures.

## 12.3. CONSULTATION, SCOPE, METHODOLOGY AND SIGNIFICANCE CRITERIA

### CONSULTATION UNDERTAKEN TO DATE

**Table 12-2** provides a summary of the consultation activities undertaken in support of the preparation of this chapter.

**Table 12-2 - Geology and Soils: Summary of Consultation Undertaken**

Body / organisation	Individual / stat body / organisation	Meeting dates and other forms of consultation	Summary of outcome of discussions
The Envirocheck report includes information and data collected from several organisations.	Includes the Environment Agency (EA), the Local Authority, the British Geological Survey (BGS), Department for Environment, Food & Rural Affairs (Defra) and Health & Safety Executive (HSE).	N/A – Desktop based. February 2018	The summary of database searches is presented in Table 5-1 of Appendix 12.1 (PRA).
Planning Portal search	Arun District Council	N/A – Desktop based. June 2020	No significant planning applications have been submitted for the land located within the Site boundary.
Unexploded Ordnance (UXO)	Zetica	N/A – Desktop based. June 2020	The Zetica online bomb map indicates that there is a low risk from UXO. A detailed UXO desk study and risk assessment would not be required for the Site based on a Low risk.

Body / organisation	Individual / stat body / organisation	Meeting dates and other forms of consultation	Summary of outcome of discussions
West Sussex County Council, County Planning	Jane Moseley, County Planning Team Manager	Email – March 2020 (Appendix 5.1)	The information [in relation to geology and soils] should be included, even if initial surveys have confirmed that there would be no significant effect. The information in the relevant chapter should present this conclusion.

## SCOPE OF THE ASSESSMENT

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

## ELEMENTS SCOPED OUT OF THE ASSESSMENT

- 12.3.2. The elements shown in **Table 12-3** 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 12-3 - Elements Scoped Out of the Geology and Soils Assessment**

Element scoped out	Justification
Road users	The road is not a sensitive end-use.
Agricultural Land/Loss of Land; and Agricultural and rural dwellings	<p>The principal of the loss of agricultural land to the Scheme has already been accepted in the adopted local development and transport plans. Its loss is appropriately accounted for in the sustainability appraisal of the local plans, rather than at project level. This is set out in the Planning Statement.</p> <p>It is noted that the undeveloped parts of the land are not currently being used for agricultural purposes and that a sizeable proportion of the Site is under non-agricultural uses (such as orchard, woodland and hedgerows). In addition, due to the size of the Scheme and the required land take, the amount of best and most versatile agricultural land lost will not be significant.</p>
Safeguards for Soil and Gravel	<p>The area is safeguarded for soil and gravel in the West Sussex Joint Minerals Local Plan (2018). A Minerals Safeguarding Assessment has been prepared and will be submitted with the application, without the need for inclusion in the ES.</p> <p>It is considered unlikely to be economically viable to extract the underlying mineral deposits on-site (sands and gravels) due to the high percentage of recorded clay cohesive bands. Pockets of higher quality granular stratum could be recovered as part of the construction/earthworks phases of the Scheme. Although it is considered that the implementation of a small-scale incidental / opportunistic approach to mineral extraction may be possible the</p>

Element scoped out	Justification
	costs are likely to outweigh the benefits of extraction and sale/reuse of the aggregate.
Flood Risk	Flood Risk is considered in Chapter 11 – Water Resources and Flood Risk.
Contamination to surface water bodies and groundwater.	Consideration of the potential for contamination to surface water bodies and groundwater during both construction and operation of the Scheme is covered in Chapter 11 – Water Resources and Flood Risk.

## ELEMENTS SCOPED INTO THE ASSESSMENT

### Construction Phase

12.3.3. 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:

- Pre-existing contamination and effects on construction workers.

### Operation Phase

12.3.4. The potential for significant effects on surface water bodies and groundwater (including accidents and spills) during the operation phase of the Scheme is considered in **Chapter 11: Water Resources and Flood Risk**. Operational effects are therefore scoped out of this chapter.

## EXTENT OF THE STUDY AREA

12.3.5. The geographical extent of the assessment is the Site and a 1km study area.

## METHOD OF BASELINE DATA COLLATION & ASSESSMENT METHODOLOGY

12.3.6. As stated in the Introduction, this assessment is based on the PRA (**Appendix 12.1.**) and perceived risks based on the information reviewed. Following ground investigations to be undertaken prior to construction works, a more detailed assessment of the actual risks can be undertaken, and mitigation identified where applicable.

12.3.7. The preliminary assessment presented herein is qualitative based on professional judgements following the review of available data and within the context of the existing/proposed use, as set out in the PRA. A conceptual site model has been prepared (presented in **Appendix 12.1**) which considers the risk associated with the Scheme. This model considers the potential sources of contamination, sensitive receptors and the pathway linking them together, based on the CIRIA guidance (Ref. 12.1) as summarised below.

12.3.8. The risk categories presented (very low, low, low to moderate, moderate, high and very high) follow the CIRIA Publication C552, Contaminated Land Risk Assessment – A Guide to Good Practice (Ref. 12.1). CIRIA states that the risk levels should be based on an understanding of both the probability (likelihood) of a risk occurring and the magnitude of the potential consequence (severity) of a risk. CIRIA defines four levels of probability and four levels of severity in relation to contaminated land.

12.3.9. Following mitigation, any residual risks considered to be moderate or above are considered to represent a significant effect. Risks deemed as low or below are considered to represent a not significant effect.

12.3.10. The following bullets set out the method of data collation:

- Site walkover;
- A review of relevant previous reports pertaining to the site, where available;
- A review of publicly available historical maps and site plans (where available) to identify former land uses and potential contaminative activities on and surrounding the Site;
- A review of relevant regulatory databases; and
- A review of relevant publicly available information relating to hydrological features, hydrogeology, neighbouring land use, ecologically sensitive uses and geology in order to establish the environmental setting of the Site.

## **12.4. BASELINE CONDITIONS**

- 12.4.1. The Site is located in Eastergate between Fontwell Avenue (A29) and Barnham Road (B2233) and is approximately 11.8 hectares (Ha).
- 12.4.2. The Site is situated to the north, north east and east of the Eastergate Village in West Sussex. The Site generally comprises undeveloped land for the majority of the Site including a mix of agricultural land and undeveloped grass land and sparsely wooded areas. The one part of developed land on the Site is located to the south of Barnham Road (B2233). The route runs through the Fleurie Horticultural Nursery to the south of Barnham Road and ends short of the agricultural land to the south. An electrical substation is also present in the north-west corner of the Site on the existing A29 road. Part of the Scheme enters the Halo site in the form of a new entrance.
- 12.4.3. The north of the Site is generally bounded by agricultural land and undeveloped land. The south of the Site is bound by commercial units associated with a plant nursery and agricultural land. The east of the Site is bound by a mix of agricultural land, residential housing and a plant nursery. The western part of the route is bounded by a mixture of undeveloped land and agricultural land to the north, with small farms and residential properties beyond and a road (Eastergate Lane). The south-western part of the route is bound by a mix of agricultural land and commercial units Fleurie Horticultural Nursery and the Halo site.
- 12.4.4. Historical mapping provided in the Envirocheck report appended to the PRA indicates that the majority of the Site has never been developed. A gravel pit was excavated in the north-west corner of the Site in 1897 and was subsequently filled in between 1937 and 1939. The Fleurie Horticultural Nursery was first constructed in 1912 (originally named The Brooks). By 1974 additional buildings had been built in the plant nursery to resemble the current layout as well as two tanks. A rectangular reservoir structure is shown at the southern end of the Fleurie Horticultural Nursery.
- 12.4.5. BGS maps and historical logs indicate the underlying geology at the Site is likely to comprise superficial deposits of Head (Secondary Undifferentiated Aquifer) and River Terrace Deposits (Undifferentiated) (Secondary A Aquifer) with the bedrock of the London Clay Formation (Unproductive), Lambeth Group (Secondary A Aquifer) and the Chalk Group (Principal Aquifer) at depth. Limited Made Ground may be present above the natural drift deposits.
- 12.4.6. The topography of the Site is relatively flat ranging from 8 and 16 m above ordinance datum (m AOD). The ground cover is predominantly covered with vegetation of grassland and wooded areas. The area south of Barnham Road currently supports greenhouses.



- 12.4.7. Underground utilities including Scottish and Southern electricity service cable, Scottish and Southern electricity high voltage cable, Southern gas networks low pressure main, BT Telecoms, Portsmouth Water mains and Southern Water foul drainage are present along the existing A29 at Fontwell Avenue and along Barnham Road.
- 12.4.8. Ground investigations were undertaken in 2018 to inform the Scheme design, as reported in the PRA. Across the Site, no gross contamination was identified. However, as noted previously a buried feature was noted within the western fields. The nature of the buried material is unknown, therefore, supervision by a Geo-Environmental Engineer during excavations within this area are recommended to ensure that any risks possibly associated with the buried material can be managed.
- 12.4.9. It was identified that the man-made bund at the southern end of the site exhibits slightly elevated Benzo[a]pyrene results. Compared to the LQM/CIEH Suitable 4 Use Levels [Ref 27], this exceeds the threshold for residential land uses (please note, this has been used as a guide only). Therefore, care should be taken when handling this material. The bund was not fully penetrated due to refusal upon metallic objects and the extent of Made Ground not fully proven. Therefore, subject to the state in which this bund is to be left, further investigation and contamination testing is recommended to fully identify the nature and extent of the fill material.

### **FUTURE BASELINE**

- 12.4.10. **Chapter 2 – The Existing Site**, sets out the future details of the surrounding area from a planning perspective. Schedule 4 of the EIA Regulations requires consideration of the likely evolution of the current baseline in the absence of the Scheme.
- 12.4.11. No evidence has been presented that the future baseline will be significantly different from the current baseline. The Scheme will unlock development land to the west and south west. If this development were to take place in the absence of the Scheme, the future baseline would introduce new residential receptors. The Scheme would introduce new sensitive receptors but would also remediate any contamination in line with legislation and best practice.

## **12.5. SENSITIVE RECEPTORS**

- 12.5.1. The following potential sensitive receptors have been considered:
- Human health, including construction workers.

## **12.6. CONCEPTUAL SITE MODEL**

- 12.6.1. The conceptual site model presented in the PRA identifies there to be a low risk to construction workers during the construction phase of the Scheme.

## **12.7. OVERVIEW OF EFFECTS, MITIGATION AND RESIDUAL EFFECTS**

- 12.7.1. **Table 12-4** below set out the effects in the construction phase.

### **CONSTRUCTION PHASE**

**Table 12-4 - Assessment of Effects, Mitigation and Residual Effects (Construction)**

Assessment Component	Commentary
Human Health	<p>Ingestion, inhalation and dermal contact with contaminated soil and ground gases; inhalation of windblown dust; and soil vapour inhalation are some of the potential pathways to impact human health.</p> <p>There is likely to be a direct, temporary not significant effect on human health prior to the implementation of mitigation measures.</p>
Secondary Mitigation	<p>To minimise the risk of adverse impacts during construction, industry best practice measures will be employed. Appropriate measures are specified in the outline CEMP, which will become the Contractor CEMP during-construction works.</p> <p>As part of the Ground Investigations (geotechnical), contamination testing will be undertaken to ensure suitable mitigation is in place and if present, a suitable mitigation strategy developed which could include removal of contaminated material and disposal at authorised sites.</p>
Residual Effects and Monitoring	<p>Following the implementation of mitigation, there will be a not significant residual effect on surface water, ground water and human health.</p> <p>The CEMP will include a monitoring log to ensure measures to mitigate effects relating to geology and soils are in place and are effective. No other specific monitoring arrangement has been identified at this stage.</p>

## 12.8. LIMITATIONS AND ASSUMPTIONS

12.8.1. The assessment presented above is qualitative, and based on the information presented in the PRA (Appendix 12.1).

## 12.9. SUMMARY

- 12.9.1. The scope of the geology and soils assessment has focused on the potential risk to human health (construction workers) during the construction phase of the Scheme, with all other issues either scoped out or considered elsewhere within the ES.
- 12.9.2. At present the majority of the Site is undeveloped and is situated in agricultural land. The southern part of the Site is currently occupied by the Fleurie Horticultural Nursery which has a loose gravel surface and is occupied by several greenhouse buildings and other smaller ancillary buildings. An electrical substation is present in the north-western corner of the Site adjacent the existing A29 road.
- 12.9.3. Historical mapping indicates that the majority of the Site has never been developed.
- 12.9.4. A conceptual risk model has been undertaken considering the potential sources and pathways of pollution to sensitive receptors (i.e. human health/construction workers). This has concluded that there is a low risk to construction workers.
- 12.9.5. During construction, standard mitigation be required in the form of industry best practice and will be set out in the CEMP. The Scheme will be designed to industry standards, including oil interceptors in the drainage system to ensure pollutants entering the system do not flow into ground or surface water bodies.
- 12.9.6. **Table 12-5** provides a summary of the findings of the assessment.

**Table 12-5 - Summary of Effects Table for Geology and Soils**

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				
Ingestion, inhalation and dermal contact with contaminated soil and ground gases; inhalation of windblown dust; or soil vapour inhalation are some of the potential pathways.	Human Health – Construction workers and those living in proximity to construction works.	Not Significant -T/D/ST	CEMP to be followed.	Not Significant -T/D/ST

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

## 12.10. REFERENCES

Ref. 12.1 - CIRIA C552 'Contaminated Land Risk Assessment. A guide to good practice' (2001)

Ref. 12.2 - Part 2A of The Environmental Protection Act (1990)

Ref. 12.3 - The National Planning Policy Framework (2019)

Ref 12.4 - Environment Agency 'Model Procedures for the Management of Land Contamination', CLR11 (2004)

## 13. ARCHAEOLOGY AND HERITAGE

### 13.1. INTRODUCTION

- 13.1.1. This chapter reports the outcome of the assessment of likely significant effects arising from the Scheme upon Archaeology. The focus of the assessment is on buried heritage assets (archaeological remains). It does not include above ground heritage assets (buildings, structures, monuments and areas of heritage interest), which have been scoped out.
- 13.1.2. 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 environmental effects arising from the Scheme, 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.
- 13.1.3. This chapter (and its associated figures and appendices) is intended to be read as part of the wider ES and is supported by an Archaeological Desk-Based Assessment (ADBA) (**Appendix 13.1**) and a Geophysical Survey report (**Appendix 13.2**).

### 13.2. LEGISLATIVE FRAMEWORK, POLICY AND GUIDANCE

#### LEGISLATIVE FRAMEWORK

- 13.2.1. Other than The Town and Country Planning (Environmental Impact Assessment) Regulations 2017, there is no specific archaeology-related legislation relevant for the Site.

#### POLICY

- 13.2.2. The applicable policy framework is summarised in **Table 13-1** below.

**Table 13-1 - Archaeology: Summary of Policy**

Policy	Summary
National Planning Policy Framework (NPPF) 2019 (Paragraphs 184 – 202) (Ref. 13.1)	<p>The Government issued a revised version of the National Planning Policy Framework (NPPF) in February 2019 (MHCLG 2019).</p> <p>The NPPF requires the significance of heritage assets to be considered in the planning process, whether designated or not.</p> <p>Section 16 of the NPPF deals with 'Conserving and Enhancing the Historic Environment'. The NPPF recognises that heritage assets are an irreplaceable resource which 'should be conserved in a manner appropriate to their significance, so that they can be enjoyed for their contribution to the quality of life of existing and future generations' (para 184).</p>
Planning Practice Guidance (PPG) 2018 (Ref. 13.2)	The web-based National Planning Policy Guidance, provides supporting information in respect of conserving and enhancing the historic environment.

West Sussex County Council Structure Plan 2001–2016 (Ref. 13.3)	The West Sussex County Council Structure Plan 2001–2016 has no formal status in the current planning system. However, it remains West Sussex’s strategic policy statement for future development and land-use planning. Policy CH7 covers Archaeology:
Arun District Council’s Local Plan 2011–2031 (2018) (Ref. 13.4)	Arun District Council’s Local Plan 2011–2031 was adopted in July 2018. Policy SP1 covers the Historic Environment. Policy DM1 covers Archaeology.

## GUIDANCE

13.2.3. The applicable guidance documents are summarised in **Table 13-2** below.

**Table 13-2 - Archaeology: Summary of Guidance**

Policy	Summary
ClfA [Chartered Institute for Archaeologists] Dec 2014a, Standards and guidance for commissioning work or providing consultancy advice on archaeology and the historic environment, Reading. (Ref. 13.5)	Standards and guidance for commissioning work or providing consultancy advice on archaeology and the historic environment.
ClfA Dec 2014b, Standards and guidance for historic environment desk-based assessment, Reading (Ref. 13.6)	Standards and guidance for historic environment desk-based assessment.
Historic England, 2008 Conservation Principles (Ref. 13.7)	Conservation principles, policies and guidance for the Historic Environment.
Historic England, 2017 Conservation principles, policies and guidance. Consultation Draft. Swindon (Ref. 13.8)	Conservation principles, policies and guidance for the Historic Environment.

## 13.3. CONSULTATION, SCOPE, METHODOLOGY AND SIGNIFICANCE CRITERIA

### CONSULTATION UNDERTAKEN TO DATE

13.3.1. **Table 13-3** provides a summary of the consultation activities undertaken in support of the preparation of this chapter.

**Table 13-3 - Archaeology and Heritage: Summary of Consultation Undertaken**

<b>Body / organisation</b>	<b>Individual / stat body / organisation</b>	<b>Meeting dates and other forms of consultation</b>	<b>Summary of outcome of discussions</b>
West Sussex County Council	Scoping Opinion (Appendix 5.1)	2nd April 2019	Archaeology and cultural heritage should be 'scoped in' to the ES, focusing primarily on the potential for impacts on buried archaeology, though impact on built cultural heritage should also be considered.
West Sussex County Council	John Mills - County Archaeologist	12th June 2020	Comments provided on the draft ADBA.  Following discussion on these comments it was determined that none of the hedgerows on the Site were to be considered as historic hedgerows.
West Sussex County Council	John Mills - County Archaeologist	23rd July 2020	Comments and interpretation of geophysical survey.  If the whole of the route contains remnants of later prehistoric/ Roman agricultural landscape features, such as a field system(s) and some indications of rural settlement, these would normally merit archaeological investigation and recording in advance of road construction, but not preservation intact.
West Sussex County Council	John Mills – County Archaeologist	30th September, 12th, 15th and 16th October 2020	Discussions on options to undertake archaeological investigations prior to construction. This included review of the outline Archaeological Mitigation Strategy and draft Written Scheme of Investigation (WSI) which form Appendix 13.3 and 13.4 of the ES.

## SCOPE OF THE ASSESSMENT

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

## ELEMENTS SCOPED OUT OF THE ASSESSMENT

13.3.3. The effects shown in **Table 13-4** are considered insignificant and have therefore been scoped out of this ES chapter.

**Table 13-4 - Elements Scoped Out of the Assessment**

Element scoped out	Justification
Construction and operational effects on above ground assets	<p>Consideration has been given to the potential for significant effects on above ground assets and because of distance between the scheme and significant above ground heritage assets, it has been concluded that there is no potential for significant effects on these assets as a result of either the construction or operation of the Scheme. It is outside the scope of this report to consider the physical impact of the Scheme on above ground assets, e.g. physical impacts which would remove or change building fabric, or changes to the historic character and setting of designated above ground heritage assets within the Site or outside it.</p> <p>The Scheme will result in a decrease in vehicle numbers in Eastergate village but these are not considered to have a significant effect on listed buildings in this location.</p>
Operational effects on buried heritage assets	Operational phase effects on buried heritage assets have been scoped out on the basis that once the Scheme has been completed, no further ground disturbance would occur and consequently there would be no additional impacts upon buried heritage assets.
Cumulative effect on buried heritage assets	Cumulative effects are 'elevated' effects which occur when the combined effect of the Scheme with other proposed schemes in the vicinity, on a discrete and significant shared buried heritage asset, is more severe than that reported in the Site. This is on the basis that for intangible and deeply buried heritage assets it is not feasible to quantify accurately the nature of the resource across the study area, which would enable the identification of a cumulative impact and potential elevated effect.

## ELEMENTS SCOPED INTO THE ASSESSMENT

### Construction Phase

13.3.4. The following impacts have been identified and the resulting effect assessed in the Chapter:

- Partial or complete loss of buried heritage assets where ground disturbance is proposed.

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

- Site preparation (topsoil stripping is assumed to be site-wide); and
- Excavation for road construction; for attenuation ponds; for services/ drainage and possibly for planting.

13.3.6. The receptors that could be affected by the elements listed above are:



- Prehistoric and Roman remains -these two periods have been identified with the greatest potential. The significance depends on what/ if any remains are found.

## EXTENT OF THE STUDY AREA

- 13.3.7. In order to determine the full historic environment potential of the Site, a broad range of standard documentary and cartographic sources, including results from any archaeological investigations in the site and a 1.5km radius study area around it were examined in order to determine the likely nature, extent, preservation and significance of any known or possible buried heritage assets that may be present within or adjacent to the Site.
- 13.3.8. The study area is considered though professional judgement to be appropriate to characterise the historic environment of the Site and surrounding area. Where appropriate, there may be reference to assets beyond these study areas, e.g., where such assets are particularly significant and / or where they contribute to current understanding of the historic environment. This is highlighted, where appropriate, within this Chapter.

## METHOD OF BASELINE DATA COLLATION

### DESK STUDY

- 13.3.9. **Appendix 13.1** provides a desk-based study and includes a review of available information to determine the baseline conditions in the Site and surrounding study area. This assessment consisted of an analysis of existing written, graphic, photographic, electronic information and a site walkover, in order to identify the likely heritage assets within the Site and wider study area, and determine their significance. The following data sources have been reviewed:
- The National Heritage List for England (NHLE) for details of designated heritage assets (including World Heritage Sites, Scheduled Monuments, Listed Buildings, Registered Historic Parks and Gardens and Registered Battlefields);
  - The West Sussex Historic Environment Record (HER) for records on statutory designated sites, and for records of known archaeological or historical interest and archaeological events;
  - LPA information on conservation areas and locally listed buildings;
  - Primary sources such as maps and documents;
  - British Geological Survey data and available geotechnical and topographical survey data; and
  - Online sources, such as British History Online and the Archaeological Data Service.

### SITE VISIT

- 13.3.10. The assessment included a site visit carried out on the 25th of February 2020 in order to determine the topography of the Site and existing land use, identify any visible heritage assets (e.g. structures and earthworks), and assess any possible factors which may affect the survival or condition of any known or potential assets.

### GEOPHYSICAL SURVEY

- 13.3.11. A geophysical survey was conducted by Wessex Archaeology in June 2020. The survey was requested by the LPA archaeological advisor. Three separate areas of the Site were surveyed. The findings of this survey are included in **Appendix 13.2**.

## ASSESSMENT METHODOLOGY

13.3.12. **Chapter 5: Approach to EIA** sets out the general EIA methodology approach. The methodological approach specific to the present chapter is set out below and is informed by the ADBA (**Appendix 13.1**). Following the characterisation of the baseline conditions, the methodology used to characterise the likely environmental effects on potential archaeological buried heritage assets has entailed:

- Evaluating the significance of buried heritage assets, based on existing designations and professional judgment where such resources have no formal designation, and considering values as outlined in the NPPF (Ref. 10.4) and Historic England's Conservation Principles (Ref. 10.10);
- Predicting the magnitude of change upon the known or potential buried heritage significance of assets and the likelihood and resulting significance of environmental effect;
- Considering the mitigation measures that have been included within the Scheme and any additional mitigation that might be required in order to avoid, reduce or off-set any significant negative effects; and
- Quantifying any residual effects (those that remain after mitigation).

### ASSESSING ASSET (RECEPTOR) HERITAGE SIGNIFICANCE

13.3.13. The NPPF defines significance as 'The value of a heritage asset to this and future generations because of its heritage interest. That interest may be historic, archaeological, architectural or artistic.' The determination of the significance in this assessment is based on statutory designation and/or professional judgement against four values identified in Historic England Conservation Principles (Ref. 13.7):

- Evidential value: the potential of physical remains to yield evidence about past human activity. This might consider date; rarity; state of preservation; diversity/complexity; contribution to published priorities; supporting documentation; collective value and comparative potential;
- Historical value: the ways in which past people, events and aspects of life can be connected through a place and/or heritage asset to the present. This tends to be illustrative or associative;
- Aesthetic value: the ways in which people draw sensory and intellectual stimulation from a place and or heritage asset, considering what other people have said or written; and
- Communal value: the meanings of a place for the people who relate to it, or for whom it figures in their collective experience or memory.

13.3.14. These values encompass the criteria that Historic England are obliged to consider when statutorily designating heritage assets. Each asset is evaluated against the range of criteria listed above on a case by case basis. Unless the nature and exact extent of buried archaeological remains within any given area has been determined through prior investigation, significance is often uncertain.

13.3.15. In relation to designated heritage assets, the assessment considers the contribution which the historic character and setting makes to the overall significance (i.e. value) of the asset.

13.3.16. **Table 13-5** gives examples of the significance of designated and non-designated heritage assets for both above-ground and below-ground heritage assets, though it should be noted that above ground heritage assets are not considered in this chapter.

**Table 13-5 - Significance of heritage assets**

Heritage asset description	Significance
World heritage sites Scheduled monuments Grade I and II* listed buildings Grade I and II* registered parks and gardens Designated historic battlefields Protected Wrecks Undesignated heritage assets of high national importance	Very High
Grade II listed buildings Grade II registered parks and gardens Conservation areas Burial grounds Protected heritage landscapes (e.g. ancient woodland or historic hedgerows) Undesignated heritage assets of lower national, regional or county importance	High
Heritage assets with a district value or interest for education or cultural appreciation Locally listed buildings	Medium
Heritage assets with a local (i.e. parish) value or interest for education or cultural appreciation	Low
Item with no significant value or interest	Negligible
Heritage assets that have a clear potential, but for which current knowledge is insufficient to allow significance to be determined	Uncertain

**MAGNITUDE OF CHANGE**

13.3.17. Determination of magnitude of change upon the significance of known or potential heritage assets is based on the severity of the likely impact. **Table 13-6** describes the criteria used in this assessment to determine the magnitude of change. This determination of magnitude of change is based on professional judgement.

**Table 13-6 - Magnitude of change (impact)**

Magnitude of change	Description of change
High	Complete removal of asset.  Change to asset significance resulting in a fundamental change in our ability to understand and appreciate the resource and its historical context, character and setting. The transformation of an asset's setting in a way that fundamentally compromises its ability to be understood or appreciated. The scale of change

Magnitude of change	Description of change
	would be such that it could result in a designated asset being undesignated or having its level of designation lowered.
Medium	Change to asset significance resulting in an appreciable change in our ability to understand and appreciate the asset and its historical context, character and setting. Notable alterations to the setting of an asset that affect our appreciation of it and its significance; or the unrecorded loss of archaeological interest.
Low	Change to asset significance resulting in a small change in our ability to understand and appreciate the asset and its historical context, character and setting.
Negligible	Negligible change or no material change to asset significance. No real change in our ability to understand and appreciate the asset and its historical context, character and setting.
Uncertain	Level of survival / condition of resource in specific locations is not known: magnitude of change is therefore not known.
No change	No change

## SIGNIFICANCE OF ENVIRONMENTAL EFFECT

13.3.18. 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. For the historic environment, in terms of the NPPF, this equates to substantial harm to, or loss of, significance of an asset of very high, high or medium heritage significance, as a result of changes to its physical form or setting;
- **Moderate effect:** where the Scheme could be expected to have a noticeable improvement or deterioration on receptors. For the historic environment this equates to less than substantial harm to the significance of an asset of very high, high or medium heritage significance, as a result of changes to its physical form or setting;
- **Minor effect:** where the Scheme could be expected to result in a perceptible improvement or deterioration on receptors. For the historic environment this equates to less than substantial harm to the significance of an asset of very high, high or medium heritage significance, as a result of changes to its physical form or setting, or substantial harm to, or the loss of, significance of an asset of low heritage significance; 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.

**Table 13-7** shows the significance of environmental effect as derived from receptor significance and magnitude of change. The application of this criteria to the assessment is based on professional judgement.

**Table 13-7 - Significance of environmental effect**

Magnitude of change	Heritage Asset (Receptor) significance				
	Very high	High	Medium	Low	Negligible
High	Major	Major	Moderate or Major	Minor or Moderate	Negligible
Medium	Major	Moderate or Major	Moderate or Major	Minor	Negligible
Low	Moderate	Minor or Moderate	Minor	Minor	Negligible
Negligible	Minor or negligible	Minor or Negligible	Negligible	Negligible	Negligible
No change	No change	No change	No change	No change	No change

- 13.3.19. Effects that are classified as minor or above are considered to be significant. For archaeology minor adverse effects are still significant as they can cause partial loss of an asset. Effects classified as below minor are considered to be not significant. The language used in the NPPF (i.e. substantial or less than substantial harm) has been correlated with the standard EIA methodology. A major effect equates to 'substantial harm' whilst all the lesser effects are considered 'less than substantial harm'.
- 13.3.20. The assessment of likely significant effects has taken into account the site preparation, demolition and construction stages. The significance level attributed to each effect has been assessed based on the heritage significance of the affected receptor (heritage asset) and the magnitude of change (impact) to the heritage significance of the receptor due to the Scheme.
- 13.3.21. The significance of environmental effect is outlined in **Table 13-8**. Effects may be either negative (adverse) or positive (beneficial) and are defined initially without mitigation. The table is essentially a guide only, so that the process is transparent and the rationale for the effect scores is provided in the relevant sections. Where the resulting effect comprises two separate levels (i.e. 'moderate or minor' or 'minor or negligible'), professional judgement has been applied to select the most appropriate significance of effect.
- 13.3.22. Where information is insufficient to be able to quantify either the asset significance or magnitude of change with any degree of certainty, the effect is given as 'uncertain'. This might be the case for possible buried heritage assets, the presence, nature, date, extent and significance of which is uncertain due to the absence of any site-based investigation.

### **MITIGATION MEASURES AND SIGNIFICANCE OF RESIDUAL EFFECTS**

- 13.3.23. An appropriate mitigation strategy would aim to offset or reduce any negative effect. Measures to mitigate effects would normally consist of design adjustments, to allow significant resources to be protected and retained (preservation in situ) or, where this is not feasible, investigation and recording in advance of development (e.g. archaeological standing building recording in advance of demolition) with dissemination at an appropriate level (preservation by record).
- 13.3.24. As heritage assets are an irreplaceable resource it is generally considered as standard practice within the planning system to implement mitigation measures in order to reduce or offset any level of negative effect on a heritage asset where the proposed change would physically alter or remove the

asset, including minor negative. This is to ensure that finite and irreplaceable remains are not removed / lost without record. The level of mitigation proposed is, in each case, proportionate to the significance of the asset being affected.

13.3.25. The residual effect reflects the success rating for the recommended mitigation strategy.

## **13.4. BASELINE CONDITIONS**

### **DESIGNATED HERITAGE ASSETS**

13.4.1. The Site does not contain any nationally designated (protected) heritage assets, such as scheduled monuments, listed buildings or registered parks and gardens. The Site is not within or in close proximity to a conservation area or an Archaeological Notification Area.

### **TOPOGRAPHY**

13.4.2. Topography can provide an indication of suitability for settlement, and ground levels can indicate whether the ground has been built up or truncated, which can have implications for archaeological survival.

13.4.3. The Site is located on the West Sussex Coastal Plain. It lies between two dry valleys which form part of the Lidsey Rife river system. The dry valley to the west of the Site, following the approximate line of Fontwell Avenue, is a continuation of the Slindon Bottom dry valley.

13.4.4. There is a general slope down across the Site from north-west to south-east. The ground level is recorded at 15.4m Above Ordnance Datum (AOD) in the western part of the Site by Fontwell Avenue. The ground rises slightly to a level of 16.1m AOD at the wooded area in the west of the Site. From this high point the ground falls to 13.0m AOD in the centre of the Site. The ground level is recorded at 11.1m OD in the south of the Site by Barnham Road. South of Barnham Road the level is recorded at 11.0m OD. At the southernmost part of the Site the level is recorded at 10.0m OD.

### **GEOLOGY**

13.4.5. Geology can provide an indication of suitability for early settlement, and potential depth of remains. According to British Geological Survey (BGS) digital data the geology of the Site comprises Head deposits (superficial deposits of gravel and sand accumulated by down-slope solifluction and hill wash). There are river terrace deposits of sand, silts and clays in the southern and western parts of the Site.

13.4.6. A geotechnical investigation (GI), which was archaeologically-monitored (see below), was carried out for engineering purposes in 2018. The sequence recorded by the GI displayed a typical Quaternary succession for this part of the Coastal Plain. London Clay was overlain by marine deposits provisionally interpreted as relating to the Brighton-Norton raised beach. The highest depth of the marine deposits was recorded at 3.1m below ground level (mbgl). These, in turn, were overlain by fluvial gravel deposits. Localised Brickearth was recorded in several locations. Undated made ground (likely of modern origin, possibly dumping) was recorded in five locations. The results of the investigation are provided in greater detail in **Appendix 13.1**.

### **PAST ARCHAEOLOGICAL INVESTIGATIONS**

13.4.7. Two past archaeological investigations have been carried out within the Site. In 2018, a geoarchaeological watching brief was undertaken on the geotechnical investigation along the route (see above). Around half of the boreholes, test pits and windows samples were monitored

archaeologically. A single prehistoric flake fragment was found in one of the test pits. A single fragment of ceramic building material (CBM) of Roman or post-medieval date was found another test pit.

- 13.4.8. A geophysical survey was undertaken by Wessex Archaeology in three areas within the Site in June 2020 (**Appendix 13.2**). The survey identified the following potential heritage features:
- Buried trackway defined by ditches on either side – potentially Late Iron Age or Roman;
  - Lesser ditches – potentially prehistoric or Roman; and
  - Field division – potentially 19<sup>th</sup> century or earlier.
- 13.4.9. Within the area surveyed, there were no obvious indications of masonry structures, such as wall foundations of Roman or medieval buildings.
- 13.4.10. Within the study area archaeological investigations have been carried out at a further 10 sites. Prehistoric remains have been found at eight sites; Roman remains at five sites; later medieval remains at four sites; and post-medieval remains at three sites. Few of these investigations have been carried out in the immediate vicinity of the Site so the archaeological understanding of the area of the Site itself is limited, in particular for the prehistoric and Roman periods for which there is no documentary record, although the finds in the study area suggest background potential for multi-period activity.

## **CHRONOLOGICAL SUMMARY**

### **Prehistoric**

- 13.4.11. The findspot of a Palaeolithic axe is recorded at Walberton Lane, 1.2km to the north-east of the Site. A small number of flints of Mesolithic date were found at Fontwell Avenue, 800m north of the Site. Finds of Mesolithic flint flakes at Norton Spinney, 1km south-west of the Site, and at Croft Cottages, 1.1km south-west of the Site, might represent flint working sites.
- 13.4.12. A single flint flake fragment of late prehistoric date was found in the western part of the Site, during geoarchaeological monitoring. A trackway and ditches of possible prehistoric date were recorded during the geophysical survey.

### **Roman**

- 13.4.13. The Site lies approximately 950m to the south of the Roman road from Chichester to Arundel. A fragment of CBM was found in the western part of the Site, during archaeological monitoring of a geotechnical investigation. Based on the thickness and surface treatment this was thought to be a fragment of Roman tegula tile (roof tile). A trackway and ditches of possible Roman date were recorded during the geophysical survey.
- 13.4.14. Within the study area, a gully of Roman data was found at Barnham Manor, 200m to the south-east of the Site.

### **Early Medieval (Saxon)**

- 13.4.15. Early settlement at Eastergate is thought to have been in the area of St. George's Church, 700m to the south-west of the Site. Saxo-Norman features were recorded at Westergate Community College, 750m to the south-west of the Site. Saxo-Norman pits, ditches and pottery were revealed at 23–27 Ivy Lane, 800m to the south-west of the Site. The Site was probably open fields or woodland to the north of the settlement at Eastergate throughout the early medieval period.

### **Later Medieval**

- 13.4.16. The focus of later medieval settlement was around St George's Church, 700m to the south-west of the Site. The Northfield, between Barnham Road and Fontwell Avenue, which would likely have included the area of the Site, was open fields during the later medieval period.
- 13.4.17. Within the study area, later medieval features were recorded at Westergate Community College, 650m to the south-west of the Site. At 23–27 Ivy Lane, 850m to the south-west of the Site, features dating for the 11th/12th centuries to the 14th century were recorded. Ditches containing pottery dated to the 11th to 13th centuries were revealed at Church Lane, 500m south-west of the Site. At Arundel Road, 1.2km north of the Site, later medieval pottery was recorded. Medieval green-glazed pottery was found on the surface of a ploughed field south of Eastergate Church, 1.2km to the south of the Site.
- 13.4.18. The Site was probably in open fields away from the centre of settlement throughout the later medieval period.

### **Post-Medieval**

- 13.4.19. Historic mapping shows that the majority of the Site in fields throughout the post-medieval period. The Eastergate Workhouse was located in the eastern part of the Site in the late 18th to early 19th century. Any footings of the workhouse are likely to have been removed by later quarrying. Farm buildings (two of which are still extant) belonging to Follyfoot Farm were located in the eastern part of the Site, to the south of the workhouse.
- 13.4.20. From the early to mid-20th century orchards were planted over the majority of the Site. The orchards were removed in the late 20th century.
- 13.4.21. Post-medieval field boundaries were recorded during the geophysical survey.

### **FACTORS AFFECTING SURVIVAL**

- 13.4.22. Past ground disturbance on the Site from late 19th and 20th century developments may have compromised archaeological survival, e.g. building foundations or quarrying, identified primarily from historic maps, site walkover survey, and information on the likely depth of deposits.
- 13.4.23. Archaeological survival across the Site is anticipated to be moderate to high across the majority of the Site. Apart from the small farm buildings in the western part of the Site, there has been no construction on the Site. Any remains will have been removed in the area of 19th century quarrying in the western part of the Site.
- 13.4.24. Much of the Site was occupied by orchards planted in the 20th century. The root action of the trees will have caused localised disturbance to any archaeological remains present.

### **FUTURE BASELINE**

- 13.4.25. **Chapter 2 – The Existing Site**, sets out the future details of the surrounding area from a planning perspective. Schedule 4 of the EIA Regulations requires consideration of the likely evolution of the current baseline in the absence of the Scheme.
- 13.4.26. For buried heritage assets within the Site, the future baseline is expected to be the same as the present. Such remains are a static resource, which have reached equilibrium with their environment and do not change (i.e., decay or grow) unless their environment changes as a result of human or natural intervention.



## SENSITIVE RECEPTORS

13.4.27. The following potential sensitive receptors have been assessed:

- A moderate to high potential for Prehistoric remains, of isolated stone tools or pottery or cut features such as pits and ditches. The significance of isolated stone tools or pottery would be Low. Cut features would be of Medium significance, or High significance if extensive settlement remains were found; and
- A moderate potential for Roman remains, of isolated pottery finds or agricultural cut features. The significance of isolated pottery finds would be Low. Cut features would be of Medium significance.

## 13.5. ASSESSMENT OF EFFECTS, MITIGATION AND RESIDUAL EFFECTS

13.5.1. The following sections considers the potential effects of the Scheme on below ground assets during the construction phase. As stated previously, consideration of effects during the operational phase has been scoped out.

### CONSTRUCTION PHASE

13.5.2. **Table 13-8** sets out the potential effects of the Scheme on archaeology during the construction phase.

**Table 13-8 - Assessment of Effects, Mitigation and Residual Effects (Construction)**

Assessment Component	Commentary
Prehistoric remains	<p>There could be impacts on prehistoric remains from site preparation, road construction, excavation for attenuation ponds, services/drainage and possible planting.</p> <p>The significance of any prehistoric remains is considered to be Low Medium or High, and the magnitude of impact prior to mitigation, is considered to be High. Therefore, there is likely to be a direct, long-term major adverse effect on the prehistoric remains (significant) prior to the implementation of mitigation measures.</p>
Roman remains	<p>There could be impacts on prehistoric remains from site preparation, road construction, excavation for attenuation ponds, services/drainage and possible planting.</p> <p>The significance of any Roman remains is considered to be Low or Medium, and the magnitude of impact prior to mitigation, is considered to be High. Therefore, there is likely to be a direct, long-term moderate to major adverse effect on the prehistoric remains (significant) prior to the implementation of mitigation measures.</p>
Secondary mitigation	<p>Archaeological investigation will be required prior to construction in order to clarify the nature, survival and significance of any archaeological assets that may be affected. The local authority's archaeological advisor has suggested that the most appropriate investigation strategy is an archaeological trial trench evaluation. A geophysical survey has already been undertaken. A draft Written Scheme of Investigation (WSI) for an archaeological trial trench evaluation, and an Outline Archaeological Mitigation Strategy are included in Appendix 13.4 and 13.3 of the Environmental Statement.</p> <p>The results of the evaluation would allow an informed decision to be made in respect of an appropriate mitigation strategy for any significant archaeological</p>

Assessment Component	Commentary
	<p>assets. Mitigation normally comprises preservation by record: advancing understanding of asset significance through targeted archaeological excavation in advance of development. This might be combined with a watching brief during ground works for remains of lesser significance. In the unlikely event that nationally important remains are present, preservation in situ may be required (i.e. through redesign/avoidance).</p> <p>As an alternative to trial trenching, followed by archaeological mitigation, a preliminary site strip, in the form of Strip, Map and Sample may be undertaken under archaeological direction during the construction phase. Regardless of the option, a Post-Excavation Assessment Report would be prepared.</p> <p>Any archaeological work would need to be undertaken in consultation with the local authority's archaeological advisor, in accordance with an approved archaeological Written Scheme of Investigation (WSI).</p>
Residual effects and monitoring (prehistoric remains)	There is likely to be a negligible residual effect (not significant) following the implementation of mitigation measures.
Residual effects and monitoring (Roman remains)	There is likely to be a negligible residual effect (not significant) following the implementation of mitigation measures.

## 13.6. LIMITATIONS AND ASSUMPTIONS

- 13.6.1. The main limitation to the assessment is the nature of the archaeological resource - buried and not visible - which means it can be difficult to predict the presence and likely significance of buried assets accurately, and consequently the impact upon them, based primarily on a desk-based sources. The principle sources of information is the Historic Environment Record (HER), which list all known archaeological sites and finds. The information provides an initial indication of archaeological potential rather than a definitive list of all potential buried heritage assets, because the full extent of a buried heritage resource cannot be known prior to site-specific archaeological field investigation.
- 13.6.2. Notwithstanding this limitation, the methodology is robust, utilising reasonably available information, and conforms to the requirements of local and national guidance and planning policy. Typically, appropriate standard archaeological prospection and evaluation techniques are utilised to reduce the uncertainties inherent in any desk-based assessment, as part of an overall EIA mitigation strategy.

## 13.7. SUMMARY

- 13.7.1. There are no designated assets on the Site. The Site is not in a conservation area or an Archaeological Notification Area.
- 13.7.2. Archaeological survival across the Site is anticipated to be moderate to high. Apart from the small farm buildings and quarrying in the western part of the Site, there has been no construction on the Site, although the former use of much of the Site as an orchard is likely to have caused some disturbance through root action.

- 13.7.3. There would be impact from site preparation (topsoil stripping is assumed to be site-wide), excavation for road construction and excavation for attenuation ponds and services/drainage and possibly planting.
- 13.7.4. There is potential for prehistoric remains, of isolated stone tools or pottery or cut features such as pits and ditches. The significance of isolated stone tools or pottery would be Low. Cut features would be of Medium significance, or High significance if extensive settlement remains were found.
- 13.7.5. There is potential for Roman remains, of isolated pottery finds or agricultural cut features. The significance of isolated pottery finds would be Low. Cut features would be of Medium significance.
- 13.7.6. The assessment of Archaeology and Heritage has established that the following secondary mitigation measures are required:
- Archaeological evaluation will be required prior to construction, in order to clarify the nature, survival and significance of any archaeological assets that may be affected. This would cover the footprint of the Scheme including associated drainage features and compound sites where topsoil stripping is required. The local authority's archaeological advisor has suggested that the archaeological evaluation should comprise a trial trench evaluation, in accordance with an approved Written Scheme of Investigation;
  - The results of the evaluation would allow an informed decision to be made in respect of an appropriate mitigation strategy for any significant archaeological assets. A draft Archaeological Mitigation Strategy is attached as **Appendix 13.3**. Mitigation normally comprises preservation by record: advancing understanding of asset significance through targeted archaeological excavation in advance of development. This might be combined with a watching brief during ground works for remains of lesser significance. In the unlikely event that nationally important remains are present, preservation in situ may be required (i.e. through redesign/ avoidance);
  - As an alternative to trial trenching, followed by archaeological mitigation, a preliminary site strip, in the form of Strip, Map and Sample may be undertaken under archaeological direction during the construction phase; and
  - Whichever option is adopted , a Post-Excavation Assessment Report would be prepared.
- 13.7.7. Any archaeological work would need to be undertaken in consultation with the local authority's archaeological advisor, in accordance with an approved archaeological written scheme of investigation.
- 13.7.8. The **Table 13-9**, provides a summary of the findings of the assessment

**Table 13-9 - Summary of Effects Table for Archaeology**

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				
Site preparation (topsoil stripping is assumed to be site-wide). Excavation for road construction; for attenuation ponds; for services/ drainage and construction compounds	Prehistoric	Major -/P/D/LT	Archaeological trial trench evaluation will be required prior to construction, in order to clarify the nature, survival and significance of any archaeological assets that may be affected. A draft Written Scheme of Investigation (WSI) for an archaeological trial trench evaluation, and an Outline Archaeological Mitigation Strategy are included in Appendix 13.4 and 13.3 of the Environmental Statement as requested by the WSCC Archaeological Advisor. The results of the evaluation would allow the formation of an appropriate mitigation strategy for any significant archaeological assets. Mitigation normally comprises preservation by record: advancing understanding of asset significance through targeted archaeological excavation in advance of development. This might be combined with a watching brief during ground works for remains of lesser significance. In the unlikely event that nationally important remains are present, preservation in situ may be required (i.e. through redesign/avoidance). As an alternative to trial trenching a preliminary site strip, in the form of Strip, Map and Sample may be undertaken under archaeological direction during the construction phase. Regardless of the option, a Post-Excavation Assessment Report would be prepared.	Negligible
	Roman remains	Moderate to Major -/P/D/LT		Negligible
Operational Phase – 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

## 13.8. REFERENCES

- Ref .13.1 MCHLG [Ministry of Housing, Communities and Local Government] (2019) National Planning Policy Framework
- Ref. 13.2 MCHLG [Ministry of Housing, Communities and Local Government] Planning Practice Guidance. [Online] Accessed via <https://www.gov.uk/government/collections/planning-practice-guidance>
- Ref. 13.3 West Sussex County Council (2005) West Sussex County Council Structure Plan 2001–2016
- Ref. 13.4 Arun District Council (2018) Local Plan 2011–2031
- Ref. 13.5 Chartered Institute for Archaeologists (2014a) Standards and guidance for commissioning work or providing consultancy advice on archaeology and the historic environment, Reading
- Ref. 13.6 Chartered Institute for Archaeologists (2014b) Standard and Guidance for Historic Environment Desk-Based Assessment, Reading
- Ref. 13.7 Historic England (2008) Conservation Principles, Policies and Guidance. Swindon
- Ref. 13.8 Historic England (2017) Conservation principles, policies and guidance. Consultation Draft. Swindon

## 14. CUMULATIVE EFFECTS

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### 14.1. INTRODUCTION

- 14.1.1. This chapter reports the likely cumulative environmental effects (both effect interactions and in-combination effects) associated with the Scheme.
- 14.1.2. The term cumulative is not defined in either the EIA Directive (Ref 14.1) or the EIA Regulations (Ref 14.2). Therefore, for the purpose of this assessment, the definition from Volume 11, Section 2, Part 5 of the DMRB (Ref 14.3) has been used. This definition identifies two types of cumulative impact:
- “Cumulative impacts from a single project; and
  - Cumulative impacts from different projects (in combination with the project being assessed).”
- 14.1.3. In the first type (intra-project impacts from a single project), the impact arises from the combined action of a number or different environmental topic-specific impacts upon a single receptor/resource.
- 14.1.4. In the second type (inter-project effects from different projects, in combination with the project being assessed), the impact may arise from the combined action of a number of different projects, in combination with the project being assessed, on a single receptor/resource. This can include multiple impacts of the same or similar type from a number of projects upon the same receptor/resource

### 14.2. SCOPE AND METHODOLOGY FOR ASSESSMENT

- 14.2.1. This section should be read in conjunction with the cumulative effects section of **Chapter 5: Approach to EIA**.
- 14.2.2. At present, there is no widely accepted methodology or best practice for the assessment of cumulative effects although there are a number of guidance documents available. The approach to this assessment is based on previous experience and professional judgement, the types of receptors being assessed, the nature of the Scheme and the environmental information available to inform the assessment.
- 14.2.3. The effect interactions and in-combination assessment are based on DMRB guidance (Ref. 14.3). Based on this guidance, the assessments cover the most likely significant effects rather than all potential effects. The criteria outlined in Table 2.6 of the DMRB guidance has been used alongside consultation with environmental specialists, professional judgement and past project experience to determine the significance of effects in the in-combination and effect interactions assessments.
- 14.2.4. A future baseline assessment has not been carried out. For the purpose of this assessment the in-combination assessment presents future baseline conditions as part of the assessment process.

## INTRA-PROJECT CUMULATIVE EFFECTS

- 14.2.5. The approach to the assessment of interactions of environmental effect (effect interactions) considers the changes in baseline conditions at common sensitive receptors (i.e. those receptors that have been identified as experiencing likely residual effects by more than one technical topic) due to the Scheme. The assessment is based upon residual effects only (considered to be effects of minor or greater significance i.e. excluding neutral effects). The study area for the assessment is informed by the study areas for the individual topic assessments as set out in technical chapters 6 – 13.
- 14.2.6. The assessment of effect interactions has been undertaken in following steps:
- Step A: Identification of receptors or resources considered in more than one technical chapter, and therefore having the potential to be affected by more than one environmental factor. It is during this step that exclusions were identified to avoid overlap with information reported in technical chapters; and
  - Step B: For receptors or resources identified in Step A, the significance of the residual effect from each relevant technical chapter were identified. Consideration was then given to whether there would be a cumulative effect between each individual effect and if so whether the cumulative effect would be of the same or greater significance of the component effects.

## INTER-PROJECT CUMULATIVE EFFECTS

- 14.2.7. The approach to the assessment of inter-project (in-combination) effects considers the deviation from the baseline conditions at common sensitive receptors as a result of changes brought about as a result of the Scheme in combination with one or more other committed developments.
- 14.2.8. For the purposes of this assessment, committed development is defined as those developments meeting one or more of the following criteria:
- The committed development is subject to a planning application;
  - The committed development has been, or is currently being consulted upon;
  - The committed development has been identified as a local plan commitment;
  - The committed development has planning permission;
  - The committed development has a concurrent construction and/or operational phase with the Scheme; and
  - The committed development is within a relevant geographical boundary (defined in **Table 14-8**) with common sensitive receptors.
- 14.2.9. The assessment of the inter-project effects has been based upon the residual effects that have been identified in technical chapters 6 – 13 as well as available environmental information for the committed developments.
- 14.2.10. Through analysis of Arun District Council (ADC) and West Sussex County Council (WSCC) online planning portal and the list of potential committed developments outlined in the EIA Scoping Report, a long-list of committed developments have been identified, these are presented in **Appendix 14.1**. Agreement upon the long-list was sought from ADC and WSCC (both being contacted on the 29/04/2020).



- 14.2.11. On 20/05/2020 a response was received from ADC and WSCC which approved of the committed developments listed and provided details on the committed developments to be developed.
- 14.2.12. Following agreement from WSCC and ADC planning officers on the proposed long-list, the 'long-list' has been refined to a 'short-list' (presented in **Table 14-1**) and assessed in this Chapter. The short-list contains a list of developments aligned against the Zone of Influence defined in Table 14-7 that were considered for the assessment of Inter-Project effects with the Scheme.
- 14.2.13. As well as the developments presented in **Appendix 14.1**, a series of land allocations were considered from the Arun Local Plan (Policy EMP SP3, H SP1 and H SP2) (Ref. 14.4). Of the allocated sites, the following are deemed of a nature to warrant further consideration (also included in Table 14-1):
- SD5 – Barnham / Eastergate / Westergate; and
  - SD7 – Yapton.
- 14.2.14. The consideration of in-combination effects has been approached on a topic by topic basis, dependent upon the availability of relevant information. Where environmental information is not presented within the available documents relating to the committed development, a high-level appraisal using publicly available sources has been undertaken to supplement the available information to enable a qualitative assessment of in-combination effects. If insufficient information is available in the public domain, this is clearly outlined.

**Table 14-1 – Short-list of Committed Developments**

Reference	Name of Committed Development	Status	Distance from Site	Description of the Committed Development
1	Land east of Tye Lane Walberton	Approved	1.8 km north-east	Erection of up to 175 dwellings new vehicular access, together with associated car parking, landscaping and community facilities to include allotments, play space and community facilities to include allotments, play space and community orchard. This application is a Departure from the development plan and may affect the character and appearance of the Walberton Village Conservation Area at Land east of Tye Land Walberton.
2	Land East of Fontwell Avenue	Approved	0.6 km north	Erection of up to 400 new dwellings, up to 500 m <sup>2</sup> of non-residential floorspace (A1, A2, A3, D1 and / or D2), 5000 m <sup>2</sup> of light industrial floorspace (B1 (b)/(c)) and associated works including access, internal road network, highway network, highway works, landscaping, selected tree removal, informal and formal open space and play areas, pedestrian and cyclist infrastructure, car and cycle parking and waste storage.
3	Bonhams Field	Approved	2.6 km south-east	Erection of 56 dwellings with associated open space and creation of new access. This application is a departure from the development plan and affects the character and appearance of the Yapton (Main Road) Conservation Area at Bonhams Field Main Road Yapton.
4	Land at Former Eastergate Fruit Farm	Approved	0.3 km west	Erection of 60 residential dwellings with new vehicular access, open space and other ancillary works at Land at former Eastergate Fruit Farm.
5	Pollards Nursery Lake	Approved	1.3 km south-east	Erection of up to 107 residential units (this application is a departure from the Development Plan) at Pollards Nursery Lake Lane.

Reference	Name of Committed Development	Status	Distance from Site	Description of the Committed Development
6	Land West of Westergate Street and East of Hook Lane	Approved	1.4 km south-west	Erection of 79 dwellings, public open space, children's play areas, landscaping, drainage measures, sub-station, pumping station and all other associated works at Land West of Westergate Street and East of Hook Lane.
7	Angels Nursery	Approved	1.3 km south-east	95 dwellings together with access, landscaping open space and associated works at Angels Nursery.
8	Barnfield House	Approved	1.3 km north	22 dwellings involving demolition of Barnfield House and existing outbuildings.
9	Lillies	Approved	1.4 km south-east	38 dwellings including open space, landscaping and new access.
10	Land South of Arundel Road	Approved	1.3 km north	Erection of eight dwellings with garaging and open resident and visitor parking, with a new access from Arundel Road, provision of hard and soft landscaping and open space, foul and surface water drainage systems and other works.
11	Former Lanes End House Adjacent to West Walberton Lane & Arundel Lane	Approved	1.1 km north	Construction of six detached houses with detached garages.
12	Land adjacent to Sunny Corner Copse Lane	Approved	1.3 km north-east	Construction of nine dwellings with associated car parking, bin storage and landscaping and creation of a new access road from existing access onto West Walberton Lane.
13	Land at Ford Airfield	Undecided	3.9 km south-east	Construction of up to 1,500 dwellings, a 60-bed care home, 9,000 m <sup>2</sup> of employment floorspace, 2,350 m <sup>2</sup> local centre, 1,450 m <sup>2</sup> community / leisure space, allotments, a two-form entry primary school, sports pitches, drainage, parking and associated access, infrastructure and landscaping.

Reference	Name of Committed Development	Status	Distance from Site	Description of the Committed Development
14	Wings Nursey Lidsey Road, Woodgate, PO20 3SU	Approved	2.1 km south-west	Erection of 55 dwellings, access arrangements, sustainable drainage measures, landscaping and public open space.
15	Oldlands Farm, Steyning Way, Bersted, PO22 9NW	Approved	3.5 km south	Construction of up to 20,453 m <sup>2</sup> of general industrial floorspace and warehousing.
16	Land west of Fontwell Avenue	Undecided	0.2 km north	Demolition of existing structures and erection of 42 dwellings with access, parking, landscaping and associated works.
17	Arun District Strategic Housing Allocation – SD5	n/a	Adjacent / within the Site	Site allocated for housing development. Arun Local Plan 2018; Arun Local Plan 2018 Policy Map 2. Masterplan includes provision of two schools and 4,300 homes.
18	Arun District Strategic Housing Allocation – SD7	n/a	2.8 km south-east	Site allocated for housing development. Arun Local Plan 2018; Arun Local Plan 2018 Policy Map 2.
19	Barratts Development – “Adjacent Proposed Scheme”	n/a	Adjacent to Site	The Barratts David Wilson Homes development, which is located to the south and west of the Scheme, is expected to comprise approximately 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.

### 14.3. DETERMINING SIGNIFICANT EFFECTS

14.3.1. There is no formal guidance on the criteria for determining significance of cumulative effects. The following principles have been considered when assessing the significance of cumulative effects in relation to both intra-project and in-combination effects:

- The nature of the receptors/resources affected;
- How the impacts identified combine to affect the condition of the receptor/resource;
- The probabilities of the impacts occurring in relation to each other in such as way so as to produce a cumulative effect; and
- The ability of the receptor/resource to absorb further effects.

14.3.2. The determination of significance for the purposes of this assessment is therefore made on a receptor basis, taking account of the assessments in technical chapters 6 – 13, available environmental information, industry best practice, professional judgement and experience. Levels of significance were made in accordance with the definitions set out in **Chapter 5: Approach to EIA**. It is noted that for a cumulative effect to be significant (moderate or large) the effect must be determined to increase the magnitude of overall effect beyond that of the Scheme in isolation or environmental topic receptor with the largest residual effect.

### 14.4. ASSESSMENT OF CUMULATIVE EFFECTS

#### INTRA-PROJECT EFFECTS

##### Step A

14.4.1. The Step A assessment identified receptors and resources which could be affected by more than one environmental topic, and therefore more than one residual effect. These receptors are referred to as ‘Common Receptors’.

14.4.2. The review of technical chapters identified a set of common receptors. These common receptors are listed below in **Table 14-2**. **Tables 14-3** and **14-4** identify the residual effects on each common receptor identified in the technical chapters. Receptors that are adversely affected by two or more residual effects (Slight Adverse and Above), have been identified with the potential for a residual effect interaction as a result of the construction and/or operation of the Scheme.

14.4.3. There are a number of interactions between topics that are taken into account in each of the technical chapters where multiple types of impact are already considered within the technical chapter in question. These topics are not considered further in the intra-project effects assessment:

- Chapter 9: Ecology and Nature Conservation; and
- Chapter 13: Archaeology and Heritage.

14.4.4. In addition, all effects from **Chapter 12: Geology and Soils**, are not considered in this assessment as this topic has been scoped out of the ES.

**Table 14-2 – Common Receptors**

Common Receptor	Environmental Factors
Residential Receptors	Noise and Vibration (construction and operation)

Common Receptor	Environmental Factors
	Landscape and Visual (construction and operation) Flood Risk (construction and operation)
Non-Motorised Users	Transport and Access (construction) Landscape and Visual (construction and operation) Flood Risk (operation)
Motorised Road Users	Transport and Access (construction) Landscape and Visual (construction and operation) Flood Risk (operation)
Community/Commercial Receptors	Noise and Vibration (operation) Landscape and Visual (operation)

### Step B

- 14.4.5. **Tables 14-3** and **14-4** comprise of summary matrices for the construction and operational phases of the Scheme showing the residual significance on common receptors for environmental topics, following the implementation of the required mitigation measures set out in technical chapters 6 – 13. This enables a qualitative assessment of the interactions of residual effects outlining the overall significance to the identified common sensitive receptors. The results of the assessment of effect interactions are subsequently shown in **Table 14-5** and **14-6**.
- 14.4.6. In the case of the operational residual effects for **Chapter 10: Landscape and visual**, the range of residual effects is reported for Opening Year and 15 years after opening year together. This reporting presents the worst case scenario for both reporting years to be considered in the assessments for **Table. 14-6**.
- 14.4.7. For the purpose of this assessment, residual effects that have been identified in technical chapters 6 - 13 that do not affect the common sensitive receptors identified have not been presented below, as no effects interactions are anticipated. Furthermore, neutral residual effects have not been considered during the assessment of interactions but are included for completeness.



**Table 14-3 – Construction Phase Residual Significance**

Receptor	Noise and Vibration	Transport and Access	Landscape and Visual	Water Resources and Flood Risk	Overall Intra-Project Effect
<b>Residential Receptors</b>	Moderate Adverse (significant) – Noise; and  Minor (not significant) to Moderate Adverse (significant) - Vibration	n/a	Moderate Adverse to Large Adverse (significant)	Slight Adverse (not significant)	Adverse effects are anticipated on residential receptors from different environmental topics. These identified adverse effects will be of a temporary nature and in the case of noise and vibration, be intermittent. Additionally, where adverse effects to residents have been identified, the nature of the effects varies depending on the receptor location. <b>Minor Adverse (not significant)</b> effect interactions are anticipated due to the lack of significant residual effects from environmental topics other than Landscape and Visual and Noise and Vibration, and the intermittent nature of the Noise and Vibration effects.
<b>Non-Motorised Users</b>	n/a	Slight Adverse (not significant)	Moderate Adverse to Large Adverse (significant)	n/a	Adverse effects are anticipated on motorised road users from different environmental topics. These effects will be temporary and depends on location. A <b>Neutral (not significant)</b> effect interaction is anticipated due to the non-significant effects or Transport and Access not having potential to increase the adverse effects of Landscape and Visual compared to said effects in isolation.
<b>Motorised Users</b>	n/a	Slight Adverse (not significant)	Slight Adverse (not significant) to Moderate Adverse (significant)	n/a	Adverse effects are anticipated on motorised road users from different environmental topics. These effects will be temporary and depends on location. A <b>Neutral (not significant)</b> effect interaction is anticipated due to the non-significant effects or Transport and Access not having potential to increase the adverse effects of

Receptor	Noise and Vibration	Transport and Access	Landscape and Visual	Water Resources and Flood Risk	Overall Intra-Project Effect
					Landscape and Visual compared to said effects in isolation.

**Table 14-4 – Operational Phase Residual Significance**

Receptor	Noise and Vibration	Landscape and Visual	Water Resources and Flood Risk	Overall Intra-Project Effect
<b>Residential Properties</b>	Neutral to Minor Adverse (not significant)	Slight Adverse (not significant) to Large Adverse (significant)	Slight Adverse (not significant)	Adverse effects are anticipated on residential receptors from different environmental topics. Of these effects, only Landscape and Visual are anticipated to see significant effects. The slight adverse effects as a result of Noise and Vibration and Water Resources and Flood Risk have the potential to result in a residual effect interaction but this effect interaction would not be significant. This is due to the weighting of the up to Large Adverse effects as a result of Landscape and Visual meaning these effects would not be magnified by effect interactions of minor adverse from other environmental topics. As a result, a <b>Minor Adverse (not significant)</b> effect interaction is anticipated on residential receptors.
<b>Non-Motorised Users</b>	n/a	Neutral (not significant) to	Slight Adverse (not significant)	Adverse effects are anticipated on non-motorised users from different environmental topics. Of these effects, only Landscape and Visual are anticipated to see significant effects. The slight adverse effects as a result of





Receptor	Noise and Vibration	Landscape and Visual	Water Resources and Flood Risk	Overall Intra-Project Effect
		Large Adverse (significant)		Water Resources and Flood Risk have the potential to result in a residual effect interaction but this effect interaction would not be significant. This is due to the weighting of the up to Large Adverse effects as a result of Landscape and Visual meaning these effects would not be magnified by effect interactions of minor adverse from other environmental topics. As a result, a <b>Minor Adverse (not significant)</b> effect interaction is anticipated on residential receptors.
<b>Motorised Users</b>	n/a	Neutral (not significant) to Moderate Adverse (significant)	Slight Adverse (not significant)	Adverse effects are anticipated on motorised users from different environmental topics. Of these effects, only Landscape and Visual are anticipated to see significant effects. The slight adverse effects as a result of Water Resources and Flood Risk have the potential to result in a residual effect interaction but this effect interaction would not be significant. This is due to the weighting of the up to Large Adverse effects as a result of Landscape and Visual meaning these effects would not be magnified by effect interactions of minor adverse from other environmental topics. As a result, a <b>Minor Adverse (not significant)</b> effect interaction is anticipated on residential receptors.
<b>Community / Commercial Receptors</b>	Minor Adverse (not significant)	Moderate to Large Adverse (significant)	n/a	Adverse effects are anticipated on community/commercial receptors from different environmental topics. Of these effects, only Landscape and Visual are anticipated to see significant effects. The slight adverse effects as a result of Noise and Vibration have the potential to result in a residual effect interaction. As a result, a <b>Minor Adverse (not significant)</b> effect interaction is anticipated on residential receptors.

## Summary

### Construction

- 14.4.8. Of the assessed common receptors, only residential receptors are anticipated to experience a residual effect interaction. This effect interaction is anticipated to be Minor Adverse (not significant) and no further mitigation measures are required.

### Operation

- 14.4.9. Of the assessed common receptors all anticipated to experience a residual effect interaction. These effect interactions are all anticipated to be Minor Adverse (not significant) and no further mitigation measures are required.

## INTER-PROJECT EFFECTS

### Zone of Influence

- 14.4.10. Each individual environmental has a defined study area for the assessment of effects and in which an in-combination effect can occur. These spatial areas are known as a topic's 'Zone of Influence' (ZOI) and is informed by institutional guidelines and specialist judgement (as described in the corresponding technical chapters). In determining the ZOI for committed developments that could give rise to in-combination effects when interacting with the Scheme, each development needs to be considered on a case by case basis and topic by topic. **Table 14-5** shows the defined ZOI for each environmental topic. Each committed development on the Short-List of committed developments is assessed according to each environmental topic ZOI in which it is present.

**Table 14-5 – ZOI for the Assessment of In-combination Effects**

Environmental Topic	Zone of Influence
Noise and Vibration	<p>Receptors were considered for assessment within 300m of the Scheme for noise and 100m for vibration during the construction phase.</p> <p>Noise and vibrations receptors were considered for assessment within 600m of the Scheme for the operational phase.</p> <p>The assessment also considered receptors within 50m of the connected road network. This area is defined in Figure 7.1 (Appendix 7.1) and extends over Barnham Lane and West Walberton Lane.</p>
Transport and Access	<p>The Study area is defined as local roads which are susceptible to changes in traffic as a result of the Scheme. These roads are the A29 (between the A27 in the north and Bognor Regis in the south) and the B223 (Nyton Road, Barnham Road and Yapton Road).</p>
Ecology and Nature Conservation	<p>Designated sites and habitats were considered for assessment within 10km of the Scheme for EU designated site and 2km for UK statutory, non-statutory, ancient woodland and Habitats of Principal Importance (HPI) sites.</p> <p>Species were considered for assessment within 2km of the Scheme for Species of Principal Importance (SPI) and 5km for Bats.</p>

Environmental Topic	Zone of Influence
Landscape and Visual	<p>Landscape receptors were considered within 2km of the Scheme.</p> <p>Visual receptors were considered within the Zone of Theoretical Visibility (ZTV) defined in Appendix 10.1 of the EIA. The ZTZ extends outside of 2km in certain areas, all visual receptors are within 1km of the Scheme.</p>
Water Resources and Flood Risk	Water and flood risk receptors were considered within 1km of the Scheme.

14.4.11. For the purposes of this assessment, as phasing details relating to the construction of some of the identified committed developments are currently unknown, it is assumed that the construction and operational phases could overlap.

#### Assessment

14.4.12. **Tables 14-6** and **14-7** present the findings of the assessment of the potential inter-project cumulative effects for each committed development for the construction and operational phase respectively. **Tables 14-8** and **14-9** identify the overall potential for in-combination effects for the committed developments and the Scheme, classified by each environmental topic. For the purposes of this assessment, only the residual effects that have been identified as minor or greater in technical chapters 6 – 13 have been considered, as no cumulative effects are anticipated where there are not likely to be residual effects greater than neutral as a result of the Scheme. Therefore, neutral residual effects have not been considered within the assessment of in-combination effects.

14.4.13. Each committed development listed in the Short-List (**Table 14-1**) that falls within the ZOI for a respective environmental topic is assessed. As not all committed developments are within these ZOI, not all are assessed for each environmental topic.

14.4.14. Some chapters, or elements of chapters, are not included in the assessment. This is due to the assessment results being neutral or beneficial for all assessed residual effects. The excluded elements due to this are as follows:

- Chapter 6: Air Quality;
- Chapter 8: Transport and Access – Operational Phase;
- Chapter 9: Ecology and Nature Conservation – Operational Phase;
- Chapter 12: Geology and Soils; and
- Chapter 13: Archaeology and Heritage.

**Table 14-6 – Assessment of Construction Phase In-combination Effects**

Technical Topic	Potential In-combination Effects	Mitigation Requirements
<b>1 – Land east of Tye Lane Walberton</b>		
Ecology and Nature Conservation	<p>As discussed in Chapter 9: Ecology and Nature Conservation, the Scheme will have adverse residual effects of <b>Neutral to Slight Adverse</b> in the construction phase. Those residual effects of <b>Slight Adverse</b> relate to badgers, birds, HPIs, bats, reptiles, invertebrates and other SPI.</p> <p>Construction activities have the potential to kill, injure or otherwise disturb protected and notable species. As the committed development would increase the volume and spatial extent of construction activities in comparison to the Scheme in isolation there is the potential for an in-combination effect to occur. The committed development construction activities are assumed to adhere to consistent mitigation measures as the Scheme. As a result, a <b>Slight Adverse (not significant)</b> in-combination effect is anticipated.</p>	None required.
Landscape and Visual	<p>As discussed in Chapter 10: Landscape and Visual, the Scheme will have a range of adverse effects on Landscape and Visual receptors. These effects are <b>Moderate Adverse</b> on Landscape Character Areas and <b>Slight to Large Adverse</b> effects on visual receptors.</p> <p>The committed development is a moderately sized residential project and will see construction phase activities of a similar nature to the Scheme taking place in the same Landscape Character Areas of the Scheme. These activities would be visible to visual receptors affected by the Scheme and significantly alter the Landscape Character Area, and result in an in-combination effect, anticipated to be <b>Moderate Adverse (significant)</b>.</p>	A significant in-combination effect is anticipated. However additional mitigation is not appropriate as landscape mitigation would be incorporated into the design of the Scheme and the committed development separately.

Technical Topic	Potential In-combination Effects	Mitigation Requirements
<b>2 – Land east of Fontwell Avenue</b>		
Ecology and Nature Conservation	<p>As discussed in Chapter 9: Ecology and Nature Conservation, the Scheme will have adverse residual effects of <b>Neutral to Slight Adverse</b> in the construction phase. Those residual effects of <b>Slight Adverse</b> relate to badgers, birds, HPIs, bats, reptiles, invertebrates and other SPI.</p> <p>Construction activities have the potential to kill, injure or otherwise disturb protected and notable species. As the committed development would increase the volume and spatial extent of construction activities in comparison to the Scheme in isolation there is the potential for an in-combination effect to occur. The committed development construction activities are assumed to adhere to consistent mitigation measures as the Scheme. As a result, a <b>Slight Adverse (not significant)</b> in-combination effect is anticipated.</p>	None required.
Landscape and Visual	<p>As discussed in Chapter 10: Landscape and Visual, the Scheme will have a range of adverse effects on Landscape and Visual receptors. These effects are <b>Moderate Adverse</b> on Landscape Character Areas and <b>Slight to Large Adverse</b> effects on visual receptors.</p> <p>The committed development is a moderately sized residential project and will see construction phase activities of a similar nature to the Scheme taking place in the same Landscape Character Areas of the Scheme. These activities would be visible to visual receptors affected by the Scheme, and result in an in-combination effect, anticipated to be <b>Slight Adverse (not significant)</b>.</p>	None required.
Water Resources and Flood Risk	<p>As discussed in Chapter 11: Water Resources and Flood Risk, the Scheme will have <b>Neutral to Slight Adverse</b> residual effects on water and flood risk receptors. Effects with <b>Slight Adverse</b> residual effects are effects on surface water bodies, groundwater, water quality and flood risk.</p> <p>Construction activities associated with the committed development would increase the regional area of construction works, and the subsequent risk of flood risk. The nature of these activities would likely be similar in nature and as a result have similar residual effects associated with them such as accidental leaks and spillages to surface water. These effects are not anticipated to increase the significance of residual effects beyond the Scheme in isolation. As a result, a <b>Neutral (not significant)</b> in-combination effect is anticipated.</p>	None required.

Technical Topic	Potential In-combination Effects	Mitigation Requirements
Transport and Access	<p>As discussed in Chapter 10: Transport and Access, the Scheme will have a Slight Adverse residual effect on local road users and non-motorised users as a result of construction traffic and PRoW diversions.</p> <p>Construction activities associated with the committed development would increase the volume of construction traffic using the roads and may lead to additional diversions to PRoW. Given the scale of the committed development, these effects are anticipated to result in an in-combination effect. This effect is anticipated to be <b>Slight Adverse</b> (not significant).</p>	None required.
<b>3 – Bonhams Field</b>		
Ecology and Nature Conservation	<p>As discussed in Chapter 9: Ecology and Nature Conservation, the Scheme will have adverse residual effects of <b>Neutral to Slight Adverse</b> in the construction phase. Those residual effects of <b>Slight Adverse</b> relate to bats.</p> <p>Construction activities have the potential to kill, injure or otherwise disturb bats. As the committed development would increase the volume and spatial extent of construction activities in comparison to the Scheme in isolation there is the potential for an in-combination effect to occur. The committed development construction activities are assumed to adhere to consistent mitigation measures as the Scheme. As a result, a <b>Slight Adverse (not significant)</b> in-combination effect is anticipated.</p>	None required.
Transport and Access	<p>As discussed in Chapter 10: Transport and Access, the Scheme will have a Slight Adverse residual effect on local road users and non-motorised users as a result of construction traffic and PRoW diversions.</p> <p>Construction activities associated with the committed development would increase the volume of construction traffic using the roads and may lead to additional diversions to PRoW. Given the scale of the committed development, these effects are not anticipated to a significant increase of effect compared to the Scheme in isolation. As a result, a <b>Neutral (Not Significant)</b> in-combination effect is anticipated.</p>	None required.
<b>4 – Land at former Eastergate Fruit Farm</b>		
Noise and Vibration	<p>As discussed in Chapter 7: Noise and Vibration, the Scheme will have a <b>Moderate Adverse</b> effect as a result of construction noise and a <b>Minor to Moderate Adverse</b> effect as a result of construction vibration.</p>	None required.

Technical Topic	Potential In-combination Effects	Mitigation Requirements
	<p>The committed development is likely to result in construction traffic noise and vibration as well as noise and vibration as a result of construction activities. Due to the proximity of the committed development to the Scheme this is likely to result in an in-combination effect. Based on this, a <b>Minor Adverse (not significant)</b> in-combination effect is anticipated.</p>	
<p>Ecology and Nature Conservation</p>	<p>As discussed in Chapter 9: Ecology and Nature Conservation, the Scheme will have adverse residual effects of <b>Neutral to Slight Adverse</b> in the construction phase. Those residual effects of <b>Slight Adverse</b> relate to badgers, birds, HPIs, bats, reptiles, invertebrates and other SPI.</p> <p>Construction activities have the potential to kill, injure or otherwise disturb SPI. As the committed development would increase the volume and spatial extent of construction activities in comparison to the Scheme in isolation there is the potential for an in-combination effect to occur. The committed development construction activities are assumed to adhere to consistent mitigation measures as the Scheme. As a result, a <b>Slight Adverse (not significant)</b> in-combination effect is anticipated.</p>	<p>None required.</p>
<p>Landscape and Visual</p>	<p>As discussed in Chapter 10: Landscape and Visual, the Scheme will have a range of adverse effects on Landscape and Visual receptors. These effects are <b>Moderate Adverse</b> on Landscape Character Areas and <b>Slight to Large Adverse</b> effects on visual receptors.</p> <p>The committed development is a minor sized residential project and will see construction phase activities of a similar nature to the Scheme taking place in the same Landscape Character Areas of the Scheme. These activities would be visible to visual receptors affected by the Scheme, and result in an in-combination effect, anticipated to be <b>Slight Adverse (not significant)</b>.</p>	<p>None required.</p>
<p>Water Resources and Flood Risk</p>	<p>As discussed in Chapter 11: Water Resources and Flood Risk, the Scheme will have <b>Neutral to Slight Adverse</b> residual effects on water and flood risk receptors. Effects with <b>Slight Adverse</b> residual effects are effects on surface water bodies, groundwater, water quality and flood risk.</p> <p>Construction activities associated with the committed development would increase the regional area of construction works, and the subsequent risk of flood risk. The nature of these activities would likely be similar in nature and as a result have similar residual effects associated with them such as accidental leaks and spillages to surface water. These effects are not anticipated to increase the significance of residual effects beyond the Scheme in isolation. As a result, a <b>Neutral (not significant)</b> in-combination effect is anticipated.</p>	<p>None required.</p>

Technical Topic	Potential In-combination Effects	Mitigation Requirements
<b>5 – Pollards Nursery Lake</b>		
Ecology and Nature Conservation	<p>As discussed in Chapter 9: Ecology and Nature Conservation, the Scheme will have adverse residual effects of <b>Neutral to Slight Adverse</b> in the construction phase. Those residual effects of <b>Slight Adverse</b> relate to badgers, birds, HPis, bats, reptiles, invertebrates and other SPI.</p> <p>Construction activities have the potential to kill, injure or otherwise disturb protected and notable species. As the committed development would increase the volume and spatial extent of construction activities in comparison to the Scheme in isolation there is the potential for an in-combination effect to occur. The committed development construction activities are assumed to adhere to consistent mitigation measures as the Scheme. As a result, a <b>Slight Adverse (not significant)</b> in-combination effect is anticipated.</p>	None required.
Landscape and Visual	<p>As discussed in Chapter 10: Landscape and Visual, the Scheme will have a range of adverse effects on Landscape and Visual receptors. These effects are <b>Moderate Adverse</b> on Landscape Character Areas and <b>Slight to Large Adverse</b> effects on visual receptors.</p> <p>The committed development is a moderately sized residential project and will see construction phase activities of a similar nature to the Scheme taking place in the same Landscape Character Areas of the Scheme. These activities would be visible to visual receptors affected by the Scheme, and result in an in-combination effect, anticipated to be <b>Slight Adverse (not significant)</b>.</p>	None required.
Water Resources and Flood Risk	<p>As discussed in Chapter 11: Water Resources and Flood Risk, the Scheme will have <b>Neutral to Slight Adverse</b> residual effects on water and flood risk receptors. Effects with <b>Slight Adverse</b> residual effects are effects on surface water bodies, groundwater, water quality and flood risk.</p> <p>Construction activities associated with the committed development would increase the regional area of construction works, and the subsequent risk of flood risk. The nature of these activities would likely be similar in nature and as a result have similar residual effects associated with them such as accidental leaks and spillages to surface water. These effects are not anticipated to increase the significance of residual effects beyond the Scheme in isolation. As a result, a <b>Neutral (not significant)</b> in-combination effect is anticipated.</p>	None required.



Technical Topic	Potential In-combination Effects	Mitigation Requirements
<b>6 – Land west of Westergate Street and east of Hook Lane</b>		
Ecology and Nature Conservation	<p>As discussed in Chapter 9: Ecology and Nature Conservation, the Scheme will have adverse residual effects of <b>Neutral to Slight Adverse</b> in the construction phase. Those residual effects of <b>Slight Adverse</b> relate to badgers, birds, HPIs, bats, reptiles, invertebrates and other SPI</p> <p>Construction activities have the potential to kill, injure or otherwise disturb protected and notable species. As the committed development would increase the volume and spatial extent of construction activities in comparison to the Scheme in isolation there is the potential for an in-combination effect to occur. The committed development construction activities are assumed to adhere to consistent mitigation measures as the Scheme. As a result, a <b>Slight Adverse (not significant)</b> in-combination effect is anticipated.</p>	None required.
Landscape and Visual	<p>As discussed in Chapter 10: Landscape and Visual, the Scheme will have a range of adverse effects on Landscape and Visual receptors. These effects are <b>Moderate Adverse</b> on Landscape Character Areas and <b>Slight to Large Adverse</b> effects on visual receptors.</p> <p>The committed development is a minor sized residential project and will see construction phase activities of a similar nature to the Scheme taking place in the same Landscape Character Areas of the Scheme. These activities would be visible to visual receptors affected by the Scheme, and result in an in-combination effect, anticipated to be <b>Slight Adverse (not significant)</b>.</p>	None required.
Transport and Access	<p>As discussed in Chapter 10: Transport and Access, the Scheme will have a Slight Adverse residual effect on local road users and non-motorised users as a result of construction traffic and PRoW diversions.</p> <p>Construction activities associated with the committed development would increase the volume of construction traffic using the roads and may lead to additional diversions to PRoW. Given the scale of the committed development, these effects are not anticipated to a significant increase of effect compared to the Scheme in isolation. As a result, a <b>Neutral (Not Significant)</b> in-combination effect is anticipated.</p>	None required.
<b>7 – Angels Nursery</b>		

Technical Topic	Potential In-combination Effects	Mitigation Requirements
Ecology and Nature Conservation	<p>As discussed in Chapter 9: Ecology and Nature Conservation, the Scheme will have adverse residual effects of <b>Neutral to Slight Adverse</b> in the construction phase. Those residual effects of <b>Slight Adverse</b> relate to badgers, birds, HPs, bats, reptiles, invertebrates and other SPI.</p> <p>Construction activities have the potential to kill, injure or otherwise disturb protected and notable species. As the committed development would increase the volume and spatial extent of construction activities in comparison to the Scheme in isolation there is the potential for an in-combination effect to occur. The committed development construction activities are assumed to adhere to consistent mitigation measures as the Scheme. As a result, a <b>Slight Adverse (not significant)</b> in-combination effect is anticipated.</p>	None required.
Landscape and Visual	<p>As discussed in Chapter 10: Landscape and Visual, the Scheme will have a range of adverse effects on Landscape and Visual receptors. These effects are <b>Moderate Adverse</b> on Landscape Character Areas and <b>Slight to Large Adverse</b> effects on visual receptors.</p> <p>The committed development is a moderately sized residential project and will see construction phase activities of a similar nature to the Scheme taking place in the same Landscape Character Areas of the Scheme. These activities would be visible to visual receptors affected by the Scheme, and result in an in-combination effect, anticipated to be <b>Slight Adverse (not significant)</b>.</p>	None required.
<b>8 – Barnfield House</b>		
Ecology and Nature Conservation	<p>As discussed in Chapter 9: Ecology and Nature Conservation, the Scheme will have adverse residual effects of <b>Neutral to Slight Adverse</b> in the construction phase. Those residual effects of <b>Slight Adverse</b> relate to badgers, birds, HPs, bats, reptiles, invertebrates and other SPI.</p> <p>Construction activities have the potential to kill, injure or otherwise disturb protected and notable species. As the committed development would increase the volume and spatial extent of construction activities in comparison to the Scheme in isolation there is the potential for an in-combination effect to occur. The committed development construction activities are assumed to adhere to consistent mitigation measures as the Scheme. As a result, a <b>Slight Adverse (not significant)</b> in-combination effect is anticipated.</p>	None required.

Technical Topic	Potential In-combination Effects	Mitigation Requirements
Landscape and Visual	<p>As discussed in Chapter 10: Landscape and Visual, the Scheme will have a range of adverse effects on Landscape and Visual receptors. These effects are <b>Moderate Adverse</b> on Landscape Character Areas and <b>Slight to Large Adverse</b> effects on visual receptors.</p> <p>The committed development is a minor sized residential project and will see construction phase activities of a similar nature to the Scheme taking place in the same Landscape Character Areas of the Scheme. These activities would be visible to visual receptors affected by the Scheme, and result in an in-combination effect, anticipated to be <b>Slight Adverse (not significant)</b>.</p>	None required.
<b>9 – Lillies</b>		
Ecology and Nature Conservation	<p>As discussed in Chapter 9: Ecology and Nature Conservation, the Scheme will have adverse residual effects of <b>Neutral to Slight Adverse</b> in the construction phase. Those residual effects of <b>Slight Adverse</b> relate to badgers, birds, HPis, bats, reptiles, invertebrates and other SPI.</p> <p>Construction activities have the potential to kill, injure or otherwise disturb protected and notable species. As the committed development would increase the volume and spatial extent of construction activities in comparison to the Scheme in isolation there is the potential for an in-combination effect to occur. The committed development construction activities are assumed to adhere to consistent mitigation measures as the Scheme. As a result, a <b>Slight Adverse (not significant)</b> in-combination effect is anticipated.</p>	None required.
Landscape and Visual	<p>As discussed in Chapter 10: Landscape and Visual, the Scheme will have a range of adverse effects on Landscape and Visual receptors. These effects are <b>Moderate Adverse</b> on Landscape Character Areas and <b>Slight to Large Adverse</b> effects on visual receptors.</p> <p>The committed development is a minor sized residential project and will see construction phase activities of a similar nature to the Scheme taking place in the same Landscape Character Areas of the Scheme. These activities would be visible to visual receptors affected by the Scheme, and result in an in-combination effect, anticipated to be <b>Slight Adverse (not significant)</b>.</p>	None required.
<b>10 – Land south of Arundel Road</b>		

Technical Topic	Potential In-combination Effects	Mitigation Requirements
Ecology and Nature Conservation	<p>As discussed in Chapter 9: Ecology and Nature Conservation, the Scheme will have adverse residual effects of <b>Neutral to Slight Adverse</b> in the construction phase. Those residual effects of <b>Slight Adverse</b> relate to badgers, birds, HPs, bats, reptiles, invertebrates and other SPI.</p> <p>Construction activities have the potential to kill, injure or otherwise disturb protected and notable species. The committed development would have similar construction activities, though due to the small scale of the committed developments these are not anticipated to alter the significance of the residual effects beyond the Scheme in isolation. As a result, a <b>Neutral (not significant)</b> in-combination effect is anticipated.</p>	None required.
Landscape and Visual	<p>As discussed in Chapter 10: Landscape and Visual, the Scheme will have a range of adverse effects on Landscape and Visual receptors. These effects are <b>Moderate Adverse</b> on Landscape Character Areas and <b>Slight to Large Adverse</b> effects on visual receptors.</p> <p>The committed development is a very minor sized residential project and will see construction phase activities of a similar nature to the Scheme taking place in the same Landscape Character Areas of the Scheme. These activities would be visible to visual receptors affected by the Scheme but be off a small enough scale to not result in a residual in-combination effect compared to the Scheme in isolation. As such, a <b>Neutral (not significant)</b> in-combination effect is anticipated.</p>	None required.
<b>11 – Former Lanes End House adjacent to West Walberton Lane &amp; Arundel Lane</b>		
Ecology and Nature Conservation	<p>discussed in Chapter 9: Ecology and Nature Conservation, the Scheme will have adverse residual effects of <b>Neutral to Slight Adverse</b> in the construction phase. Those residual effects of <b>Slight Adverse</b> relate to badgers, birds, HPs, bats, reptiles, invertebrates and other SPI.</p> <p>Construction activities have the potential to kill, injure or otherwise disturb protected and notable species. The committed development would have similar construction activities, though due to the small scale of the committed developments these are not anticipated to alter the significance of the residual effects beyond the Scheme in isolation. As a result, a <b>Neutral (not significant)</b> in-combination effect is anticipated.</p>	None required.

Technical Topic	Potential In-combination Effects	Mitigation Requirements
Landscape and Visual	<p>As discussed in Chapter 10: Landscape and Visual, the Scheme will have a range of adverse effects on Landscape and Visual receptors. These effects are <b>Moderate Adverse</b> on Landscape Character Areas and <b>Slight to Large Adverse</b> effects on visual receptors.</p> <p>The committed development is a very minor sized residential project and will see construction phase activities of a similar nature to the Scheme taking place in the same Landscape Character Areas of the Scheme. These activities would be visible to visual receptors affected by the Scheme but be off a small enough scale to not result in a residual in-combination effect compared to the Scheme in isolation. As such, a <b>Neutral (not significant)</b> in-combination effect is anticipated.</p>	None required.
<b>12 – Land adjacent to Sunny Corner Copse Lane</b>		
Ecology and Nature Conservation	<p>As discussed in Chapter 9: Ecology and Nature Conservation, the Scheme will have adverse residual effects of <b>Neutral to Slight Adverse</b> in the construction phase. Those residual effects of <b>Slight Adverse</b> relate to badgers, birds, HPis, bats, reptiles, invertebrates and other SPI.</p> <p>Construction activities have the potential to kill, injure or otherwise disturb protected and notable species. The committed development would have similar construction activities, though due to the small scale of the committed developments these are not anticipated to alter the significance of the residual effects beyond the Scheme in isolation. As a result, a <b>Neutral (not significant)</b> in-combination effect is anticipated.</p>	None required.
Landscape and Visual	<p>As discussed in Chapter 10: Landscape and Visual, the Scheme will have a range of adverse effects on Landscape and Visual receptors. These effects are <b>Moderate Adverse</b> on Landscape Character Areas and <b>Slight to Large Adverse</b> effects on visual receptors.</p> <p>The committed development is a very minor sized residential project and will see construction phase activities of a similar nature to the Scheme taking place in the same Landscape Character Areas of the Scheme. These activities would be visible to visual receptors affected by the Scheme but be off a small enough scale to not result in a residual in-combination effect compared to the Scheme in isolation. As such, a <b>Neutral (not significant)</b> in-combination effect is anticipated.</p>	None required.
<b>13 – Land at Ford Airfield</b>		

Technical Topic	Potential In-combination Effects	Mitigation Requirements
Ecology and Nature Conservation	<p>As discussed in Chapter 9: Ecology and Nature Conservation, the Scheme will have adverse residual effects of <b>Neutral to Slight Adverse</b> in the construction phase. Those residual effects of <b>Slight Adverse</b> relate to bats.</p> <p>Construction activities have the potential to kill, injure or otherwise disturb bats. As the committed development would increase the volume and spatial extent of construction activities in comparison to the Scheme in isolation there is the potential for an in-combination effect to occur. The committed development construction activities are assumed to adhere to consistent mitigation measures as the Scheme. As a result, a <b>Slight Adverse (not significant)</b> in-combination effect is anticipated.</p>	None required.
<b>14 – Wings Nursery Lidsey Road, Woodgate, PO20 3SU</b>		
Ecology and Nature Conservation	<p>As discussed in Chapter 9: Ecology and Nature Conservation, the Scheme will have adverse residual effects of <b>Neutral to Slight Adverse</b> in the construction phase. Those residual effects of <b>Slight Adverse</b> relate to bats.</p> <p>Construction activities have the potential to kill, injure or otherwise disturb bats. As the committed development would increase the volume and spatial extent of construction activities in comparison to the Scheme in isolation there is the potential for an in-combination effect to occur. The committed development construction activities are assumed to adhere to consistent mitigation measures as the Scheme. As a result, a <b>Slight Adverse (not significant)</b> in-combination effect is anticipated.</p>	None required.
Transport and Access	<p>As discussed in Chapter 10: Transport and Access, the Scheme will have a Slight Adverse residual effect on local road users and non-motorised users as a result of construction traffic and PRoW diversions.</p> <p>Construction activities associated with the committed development would increase the volume of construction traffic using the roads. Given the scale of the committed development, these effects are not anticipated to a significant increase of effect compared to the Scheme in isolation. As a result, a <b>Neutral (Not Significant)</b> in-combination effect is anticipated.</p>	None required.
<b>15 – Oldlands Farm, Steyning Way, Bersted, PO22 9NW</b>		

Technical Topic	Potential In-combination Effects	Mitigation Requirements
Ecology and Nature Conservation	<p>As discussed in Chapter 9: Ecology and Nature Conservation, the Scheme will have adverse residual effects of <b>Neutral to Slight Adverse</b> in the construction phase. Those residual effects of <b>Slight Adverse</b> relate to bats.</p> <p>Construction activities have the potential to kill, injure or otherwise disturb bats. As the committed development would increase the volume and spatial extent of construction activities in comparison to the Scheme in isolation there is the potential for an in-combination effect to occur. The committed development construction activities are assumed to adhere to consistent mitigation measures as the Scheme. As a result, a <b>Neutral (not significant)</b> in-combination effect is anticipated.</p>	None required.
Transport and Access	<p>As discussed in Chapter 10: Transport and Access, the Scheme will have a Slight Adverse residual effect on local road users and non-motorised users as a result of construction traffic and PRoW diversions.</p> <p>Construction activities associated with the committed development would increase the volume of construction traffic using the roads. Given the scale of the committed development, these effects are not anticipated to a significant increase of effect compared to the Scheme in isolation. As a result, a <b>Neutral (Not Significant)</b> in-combination effect is anticipated.</p>	None required.
<b>16 – Land west of Fontwell Avenue</b>		
Noise and Vibration	<p>As discussed in Chapter 7: Noise and Vibration, the Scheme will have a <b>Moderate Adverse</b> effect as a result of construction noise and a <b>Minor to Moderate Adverse</b> effect as a result of construction vibration.</p> <p>The committed development is likely to result in construction traffic noise and vibration as well as noise and vibration as a result of construction activities and demolition activities. Due to the proximity of the committed development to the Scheme this is likely to result in an in-combination effect. Based on this, a <b>Minor Adverse (not significant)</b> in-combination effect is anticipated.</p>	None required.
Ecology and Nature Conservation	<p>As discussed in Chapter 9: Ecology and Nature Conservation, the Scheme will have adverse residual effects of <b>Neutral to Slight Adverse</b> in the construction phase. Those residual effects of <b>Slight Adverse</b> relate to badgers, birds, HPIs, bats, reptiles, invertebrates and other SPI.</p> <p>Construction activities have the potential to kill, injure or otherwise disturb protected and notable species. As the committed development would increase the volume and spatial extent of construction activities in comparison to the</p>	None required.

Technical Topic	Potential In-combination Effects	Mitigation Requirements
	Scheme in isolation there is the potential for an in-combination effect to occur. The committed development construction activities are assumed to adhere to consistent mitigation measures as the Scheme. As a result, a <b>Slight Adverse (not significant)</b> in-combination effect is anticipated.	
Landscape and Visual	<p>As discussed in Chapter 10: Landscape and Visual, the Scheme will have a range of adverse effects on Landscape and Visual receptors. These effects are <b>Moderate Adverse</b> on Landscape Character Areas and <b>Slight to Large Adverse</b> effects on visual receptors.</p> <p>The committed development is a minor sized residential project and will see construction phase activities of a similar nature to the Scheme taking place in the same Landscape Character Areas of the Scheme. These activities would be visible to visual receptors affected by the Scheme, and result in an in-combination effect, anticipated to be <b>Slight Adverse (not significant)</b>.</p>	None required.
Water Resources and Flood Risk	<p>As discussed in Chapter 11: Water Resources and Flood Risk, the Scheme will have <b>Neutral to Slight Adverse</b> residual effects on water and flood risk receptors. Effects with <b>Slight Adverse</b> residual effects are effects on surface water bodies, groundwater, water quality and flood risk.</p> <p>Construction activities associated with the committed development would increase the regional area of construction works, and the subsequent risk of flood risk. The nature of these activities would likely be similar in nature and as a result have similar residual effects associated with them such as accidental leaks and spillages to surface water. These effects are not anticipated to increase the significance of residual effects beyond the Scheme in isolation. As a result, a <b>Neutral (not significant)</b> in-combination effect is anticipated.</p>	None required.
Transport and Access	<p>As discussed in Chapter 10: Transport and Access, the Scheme will have a Slight Adverse residual effect on local road users and non-motorised users as a result of construction traffic and PRoW diversions.</p> <p>Construction activities associated with the committed development would increase the volume of construction traffic using the roads and may lead to additional diversions to PRoW. Given the scale of the committed development, these effects are not anticipated to a significant increase of effect compared to the Scheme in isolation. As a result, a <b>Neutral (Not Significant)</b> in-combination effect is anticipated.</p>	None required.



Technical Topic	Potential In-combination Effects	Mitigation Requirements
<b>17 – Arun District Strategic Housing Allocation – SD5</b>		
Noise and Vibration	<p>As discussed in Chapter 7: Noise and Vibration, the Scheme will have a <b>Moderate Adverse</b> effect as a result of construction noise and a <b>Minor to Moderate Adverse</b> effect as a result of construction vibration.</p> <p>At this time no residential development is proposed for the site. Any future potential development is likely to result in construction traffic noise and vibration as well as noise and vibration as a result of construction activities. Due to the proximity of the development to the Scheme this is likely to result in an in-combination effect. Based on this, a <b>Slight Adverse (not significant)</b> in-combination effect is anticipated.</p>	None required.
Ecology and Nature Conservation	<p>As discussed in Chapter 9: Ecology and Nature Conservation, the Scheme will have adverse residual effects of <b>Neutral to Slight Adverse</b> in the construction phase. Those residual effects of <b>Slight Adverse</b> relate to badgers, birds, HPis, bats, reptiles, invertebrates and other SPI.</p> <p>Construction activities have the potential to kill, injure or otherwise disturb protected and notable species. As the committed development would increase the volume and spatial extent of construction activities in comparison to the Scheme in isolation there is the potential for an in-combination effect to occur. The committed development construction activities are assumed to adhere to consistent mitigation measures as the Scheme. As a result, a <b>Slight Adverse (not significant)</b> in-combination effect is anticipated.</p>	None required.
Landscape and Visual	<p>As discussed in Chapter 10: Landscape and Visual, the Scheme will have a range of adverse effects on Landscape and Visual receptors. These effects are <b>Moderate Adverse</b> on Landscape Character Areas and <b>Slight to Large Adverse</b> effects on visual receptors.</p> <p>The committed development is a moderately sized residential project and will see construction phase activities of a similar nature to the Scheme taking place in the same Landscape Character Areas of the Scheme. These activities would be visible to visual receptors affected by the Scheme and significantly alter the Landscape Character Area, and result in an in-combination effect, anticipated to be <b>Moderate Adverse (significant)</b>.</p>	A significant in-combination effect is anticipated. However additional mitigation is not appropriate as landscape mitigation would be incorporated into the design of the Scheme and the committed

Technical Topic	Potential In-combination Effects	Mitigation Requirements
		development separately.
Water Resources and Flood Risk	<p>As discussed in Chapter 11: Water Resources and Flood Risk, the Scheme will have <b>Neutral to Slight Adverse</b> residual effects on water and flood risk receptors. Effects with <b>Slight Adverse</b> residual effects are effects on surface water bodies, groundwater, water quality and flood risk.</p> <p>Construction activities associated with the committed development would increase the regional area of construction works, and the subsequent risk of flood risk. The nature of these activities would likely be similar in nature and as a result have similar residual effects associated with them such as accidental leaks and spillages to surface water. These effects are not anticipated to increase the significance of residual effects beyond the Scheme in isolation. As a result, a <b>Neutral (not significant)</b> in-combination effect is anticipated.</p>	None required.
Transport and Access	<p>As discussed in Chapter 10: Transport and Access, the Scheme will have a Slight Adverse residual effect on local road users and non-motorised users as a result of construction traffic and PRoW diversions.</p> <p>Construction activities associated with the committed development would increase the volume of construction traffic using the roads and may lead to additional diversions to PRoW. Given the scale of the committed development, these effects are anticipated to result in an in-combination effect. This effect is anticipated to be <b>Slight Adverse</b> (not significant).</p>	None required.
<b>18 – Arun District Strategic Allocation – SD7</b>		
Ecology and Nature Conservation	<p>As discussed in Chapter 9: Ecology and Nature Conservation, the Scheme will have adverse residual effects of <b>Neutral to Slight Adverse</b> in the construction phase. Those residual effects of <b>Slight Adverse</b> relate to bats.</p> <p>Construction activities have the potential to kill, injure or otherwise disturb bats. As the committed development would increase the volume and spatial extent of construction activities in comparison to the Scheme in isolation there is the potential for an in-combination effect to occur. The committed development construction activities are assumed to adhere to consistent mitigation measures as the Scheme. As a result, a <b>Slight Adverse (not significant)</b> in-combination effect is anticipated.</p>	None required.

Technical Topic	Potential In-combination Effects	Mitigation Requirements
<b>19 – Barratts Development</b>		
Noise and Vibration	<p>As discussed in Chapter 7: Noise and Vibration, the Scheme will have a <b>Moderate Adverse</b> effect as a result of construction noise and a <b>Minor to Moderate Adverse</b> effect as a result of construction vibration.</p> <p>The committed development is likely to result in construction traffic noise and vibration as well as noise and vibration as a result of construction activities and demolition activities. Due to the proximity of the committed development to the Scheme this is likely to result in an in-combination effect on nearby receptors. Based on this, a <b>Minor Adverse (not significant)</b> in-combination effect is anticipated.</p>	None required.
Ecology and Nature Conservation	<p>As discussed in Chapter 9: Ecology and Nature Conservation, the Scheme will have adverse residual effects of <b>Neutral to Slight Adverse</b> in the construction phase. Those residual effects of <b>Slight Adverse</b> relate to badgers, birds, HPis, bats, reptiles, invertebrates and other SPI.</p> <p>Construction activities have the potential to kill, injure or otherwise disturb protected and notable species. As the committed development would increase the volume and spatial extent of construction activities in comparison to the Scheme in isolation there is the potential for an in-combination effect to occur. The committed development construction activities are assumed to adhere to consistent mitigation measures as the Scheme. As a result, a <b>Slight Adverse (not significant)</b> in-combination effect is anticipated.</p>	None required.
Landscape and Visual	<p>As discussed in Chapter 10: Landscape and Visual, the Scheme will have a range of adverse effects on Landscape and Visual receptors. These effects are <b>Moderate Adverse</b> on Landscape Character Areas and <b>Slight to Large Adverse</b> effects on visual receptors.</p> <p>The committed development is a moderately sized residential project and will see construction phase activities of a similar nature to the Scheme taking place in the same Landscape Character Areas of the Scheme. These activities would be visible to visual receptors affected by the Scheme, and result in an in-combination effect, anticipated to be <b>Slight Adverse (not significant)</b>.</p>	None required.
Water Resources	<p>As discussed in Chapter 11: Water Resources and Flood Risk, the Scheme will have <b>Neutral to Slight Adverse</b> residual effects on water and flood risk receptors. Effects with <b>Slight Adverse</b> residual effects are effects on surface water bodies, groundwater, water quality and flood risk.</p>	None required.

Technical Topic	Potential In-combination Effects	Mitigation Requirements
and Flood Risk	Construction activities associated with the committed development would increase the regional area of construction works, and the subsequent risk of flood risk. The nature of these activities would likely be similar in nature and as a result have similar residual effects associated with them such as accidental leaks and spillages to surface water. These effects are not anticipated to increase the significance of residual effects beyond the Scheme in isolation. As a result, a <b>Neutral (not significant)</b> in-combination effect is anticipated.	
Transport and Access	As discussed in Chapter 10: Transport and Access, the Scheme will have a Slight Adverse residual effect on local road users and non-motorised users as a result of construction traffic and PRow diversions.  Construction activities associated with the committed development would increase the volume of construction traffic using the roads and may lead to additional diversions to PRow. Given the scale of the committed development, these effects are anticipated to result in an in-combination effect. This effect is anticipated to be <b>Slight Adverse</b> (not significant).	None required.

**Table 14-7 – Assessment of Operational Phase In-combination Effects**

Technical Topic	Potential In-combination Effects	Mitigation Requirements
<b>1 – Land east of Tye Lane Walberton</b>		
Landscape and Visual	As discussed in Chapter 10: Landscape and Visual, the Scheme will have a range of adverse effects on Landscape and Visual receptors. These effects are <b>Slight to Moderate Adverse</b> effect on Landscape Character Areas (year 1 and year 15) and <b>Neutral to Large Adverse</b> on visual receptors.	None required.

Technical Topic	Potential In-combination Effects	Mitigation Requirements
	<p>The committed development is a moderate scale residential development which would introduce significant built form to the landscape, extending the urban footprint of settlement and altering views of the landscape. The committed development as a result will have an in-combination effect, anticipated to be <b>Slight Adverse (not significant)</b>.</p>	
<b>2 – Land east of Fontwell Avenue</b>		
Noise and Vibration	<p>As discussed in Chapter 7: Noise and Vibration, the Scheme will have a <b>Neutral to Slight Adverse</b> effect as a result of road traffic noise associated with the operational Scheme.</p> <p>The committed development is likely to result in an increase in road traffic, this increase is not anticipated to result in a significant effect beyond the Scheme in isolation. As a result, a <b>Neutral (not significant)</b> in-combination effect is anticipated.</p>	None required.
Landscape and Visual	<p>As discussed in Chapter 10: Landscape and Visual, the Scheme will have a range of adverse effects on Landscape and Visual receptors. These effects are <b>Slight to Moderate Adverse</b> effect on Landscape Character Areas (year 1 and year 15) and <b>Neutral to Large Adverse</b> on visual receptors.</p> <p>The committed development is a moderate scale residential development which would introduce significant built form to the landscape, extending the urban footprint of settlement and altering views of the landscape. The committed development as a result will have an in-combination effect, anticipated to be <b>Moderate Adverse (significant)</b>.</p>	A significant in-combination effect is anticipated. However, additional mitigation is not appropriate as landscape mitigation would be incorporated into the design of the Scheme and the committed development separately.
Water Resources and Flood Risk	<p>As discussed in Chapter 11: Water Resources and Flood Risk, the Scheme will have <b>Neutral to Slight Adverse</b> residual effects on water and flood risk receptors. Effects with <b>Slight Adverse</b> residual effects are that of contamination of surface water bodies, effects on water quality and flood risk.</p>	None required.

Technical Topic	Potential In-combination Effects	Mitigation Requirements
	<p>The operational committed development will see increased vehicle traffic and numbers as well as an increased impermeable surface with implications on flood risk. As a result of the scale of the committed development, these effects are anticipated to result in a <b>Slight Adverse (not significant)</b> in-combination effect.</p>	
<b>4 – Lane at former Eastergate Fruit Farm</b>		
Noise and Vibration	<p>As discussed in Chapter 7: Noise and Vibration, the Scheme will have a <b>Neutral to Slight Adverse</b> effect as a result of road traffic noise associated with the operational Scheme.</p> <p>The committed development is likely to result in an increase in road traffic, this increase is not anticipated to result in a significant effect beyond the Scheme in isolation. As a result, a <b>Neutral (not significant)</b> in-combination effect is anticipated.</p>	None required.
Landscape and Visual	<p>As discussed in Chapter 10: Landscape and Visual, the Scheme will have a range of adverse effects on Landscape and Visual receptors. These effects are <b>Slight to Moderate Adverse</b> effect on Landscape Character Areas (year 1 and year 15) and <b>Neutral to Large Adverse</b> on visual receptors.</p> <p>The committed development is a minor scale residential development which would introduce significant built form to the landscape, extending the urban footprint of settlement and altering views of the landscape. The committed development as a result will have an in-combination effect, anticipated to be <b>Slight Adverse (not significant)</b>.</p>	None required.
Water Resources and Flood Risk	<p>As discussed in Chapter 11: Water Resources and Flood Risk, the Scheme will have <b>Neutral to Slight Adverse</b> residual effects on water and flood risk receptors. Effects with <b>Slight Adverse</b> residual effects are that of contamination of surface water bodies, effects on water quality and flood risk.</p> <p>The operational committed development will see increased vehicle traffic and numbers as well as an increased impermeable surface with implications on flood risk. These effects are of a nature and scale to not result in a significant increase in residual effects compared to the Scheme in isolation. As such, a <b>Neutral (not significant)</b> in-combination effect in anticipated.</p>	None required.

Technical Topic	Potential In-combination Effects	Mitigation Requirements
<b>5 – Pollards Nursery Lane</b>		
Landscape and Visual	<p>As discussed in Chapter 10: Landscape and Visual, the Scheme will have a range of adverse effects on Landscape and Visual receptors. These effects are <b>Slight to Moderate Adverse</b> effect on Landscape Character Areas (year 1 and year 15) and <b>Neutral to Large Adverse</b> on visual receptors.</p> <p>The committed development is a moderate scale residential development which would introduce significant built form to the landscape, extending the urban footprint of settlement and altering views of the landscape. The committed development as a result will have an in-combination effect, anticipated to be <b>Slight Adverse (not significant)</b>.</p>	None required.
Water Resources and Flood Risk	<p>As discussed in Chapter 11: Water Resources and Flood Risk, the Scheme will have <b>Neutral to Slight Adverse</b> residual effects on water and flood risk receptors. Effects with <b>Slight Adverse</b> residual effects are that of contamination of surface water bodies, effects on water quality and flood risk.</p> <p>The operational committed development will see increased vehicle traffic and numbers as well as an increased impermeable surface with implications on flood risk. These effects are of a nature and scale to not result in a significant increase in residual effects compared to the Scheme in isolation. As such, a <b>Neutral (not significant)</b> in-combination effect is anticipated.</p>	None required.
<b>6 – Land west of Westergate Street and east of Hook Lane</b>		
Landscape and Visual	<p>As discussed in Chapter 10: Landscape and Visual, the Scheme will have a range of adverse effects on Landscape and Visual receptors. These effects are <b>Slight to Moderate Adverse</b> effect on Landscape Character Areas (year 1 and year 15) and <b>Neutral to Large Adverse</b> on visual receptors.</p> <p>The committed development is a moderate scale residential development which would introduce significant built form to the landscape, extending the urban footprint of settlement and altering views of the landscape. The committed development as a result will have an in-combination effect, anticipated to be <b>Slight Adverse (not significant)</b>.</p>	None required.
<b>7 – Angels Nursery</b>		

Technical Topic	Potential In-combination Effects	Mitigation Requirements
Landscape and Visual	<p>As discussed in Chapter 10: Landscape and Visual, the Scheme will have a range of adverse effects on Landscape and Visual receptors. These effects are <b>Slight to Moderate Adverse</b> effect on Landscape Character Areas (year 1 and year 15) and <b>Neutral to Large Adverse</b> on visual receptors.</p> <p>The committed development is a moderate scale residential development which would introduce significant built form to the landscape, extending the urban footprint of settlement and altering views of the landscape. The committed development as a result will have an in-combination effect, anticipated to be <b>Slight Adverse (not significant)</b>.</p>	None required.
<b>8 – Barnfield House</b>		
Landscape and Visual	<p>As discussed in Chapter 10: Landscape and Visual, the Scheme will have a range of adverse effects on Landscape and Visual receptors. These effects are <b>Slight to Moderate Adverse</b> effect on Landscape Character Areas (year 1 and year 15) and <b>Neutral to Large Adverse</b> on visual receptors.</p> <p>The committed development is a minor scale residential development which would introduce significant built form to the landscape, extending the urban footprint of settlement and altering views of the landscape. The committed development as a result will have an in-combination effect, anticipated to be <b>Slight Adverse (not significant)</b>.</p>	None required.
<b>9 – Lillies</b>		
Landscape and Visual	<p>As discussed in Chapter 10: Landscape and Visual, the Scheme will have a range of adverse effects on Landscape and Visual receptors. These effects are <b>Slight to Moderate Adverse</b> effect on Landscape Character Areas (year 1 and year 15) and <b>Neutral to Large Adverse</b> on visual receptors.</p> <p>The committed development is a minor scale residential development which would introduce significant built form to the landscape, extending the urban footprint of settlement and altering views of the landscape. The committed development as a result will have an in-combination effect, anticipated to be <b>Slight Adverse (not significant)</b>.</p>	None required.
<b>10 – Land South of Arundel Road</b>		



Technical Topic	Potential In-combination Effects	Mitigation Requirements
Landscape and Visual	<p>As discussed in Chapter 10: Landscape and Visual, the Scheme will have a range of adverse effects on Landscape and Visual receptors. These effects are <b>Slight to Moderate Adverse</b> effect on Landscape Character Areas (year 1 and year 15) and <b>Neutral to Large Adverse</b> on visual receptors.</p> <p>The committed development is a very minor scale residential development which would introduce built form to the landscape, extending the urban footprint of settlement and altering views of the landscape. These changes are not anticipated to result in a significant change to landscape and visual receptors compared to the Scheme in isolation, a <b>Neutral (not significant)</b> in-combination effect is anticipated.</p>	None required.
<b>11 – Former Lanes End House adjacent to West Walberton Lane &amp; Arundel Lane</b>		
Landscape and Visual	<p>As discussed in Chapter 10: Landscape and Visual, the Scheme will have a range of adverse effects on Landscape and Visual receptors. These effects are <b>Slight to Moderate Adverse</b> effect on Landscape Character Areas (year 1 and year 15) and <b>Neutral to Large Adverse</b> on visual receptors.</p> <p>The committed development is a very minor scale residential development which would introduce built form to the landscape, extending the urban footprint of settlement and altering views of the landscape. These changes are not anticipated to result in a significant change to landscape and visual receptors compared to the Scheme in isolation, a <b>Neutral (not significant)</b> in-combination effect is anticipated.</p>	None required.
<b>12 – Land Adjacent to Sunny Corner Copse Lane</b>		
Landscape and Visual	<p>As discussed in Chapter 10: Landscape and Visual, the Scheme will have a range of adverse effects on Landscape and Visual receptors. These effects are <b>Slight to Moderate Adverse</b> effect on Landscape Character Areas (year 1 and year 15) and <b>Neutral to Large Adverse</b> on visual receptors.</p> <p>The committed development is a very minor scale residential development which would introduce built form to the landscape, extending the urban footprint of settlement and altering views of the landscape. These changes are not anticipated to result in a significant change to landscape and visual receptors compared to the Scheme in isolation, a <b>Neutral (not significant)</b> in-combination effect is anticipated.</p>	None required.
<b>16 – Land west of Fontwell Avenue</b>		

Technical Topic	Potential In-combination Effects	Mitigation Requirements
Noise and Vibration	<p>As discussed in Chapter 7: Noise and Vibration, the Scheme will have a <b>Neutral to Slight Adverse</b> effect as a result of road traffic noise associated with the operational Scheme.</p> <p>The committed development is likely to result in an increase in road traffic, this increase is not anticipated to result in a significant effect beyond the Scheme in isolation. As a result, a <b>Neutral (not significant)</b> in-combination effect is anticipated.</p>	None required.
Landscape and Visual	<p>As discussed in Chapter 10: Landscape and Visual, the Scheme will have a range of adverse effects on Landscape and Visual receptors. These effects are <b>Slight to Moderate Adverse</b> effect on Landscape Character Areas (year 1 and year 15) and <b>Neutral to Large Adverse</b> on visual receptors.</p> <p>The committed development is a minor scale residential development which would introduce significant built form to the landscape, extending the urban footprint of settlement and altering views of the landscape. The committed development as a result will have an in-combination effect, anticipated to be <b>Slight Adverse (not significant)</b>.</p>	None required.
Water Resources and Flood Risk	<p>As discussed in Chapter 11: Water Resources and Flood Risk, the Scheme will have <b>Neutral to Slight Adverse</b> residual effects on water and flood risk receptors. Effects with <b>Slight Adverse</b> residual effects are that of contamination of surface water bodies, effects on water quality and flood risk.</p> <p>The operational committed development will see increased vehicle traffic and numbers as well as an increased impermeable surface with implications on flood risk. These effects are of a nature and scale to not result in a significant increase in residual effects compared to the Scheme in isolation. As such, a <b>Neutral (not significant)</b> in-combination effect in anticipated.</p>	None required.
<b>17 – Arun District Strategic Housing Allocation – SD5</b>		
Noise and Vibration	As discussed in Chapter 7: Noise and Vibration, the Scheme will have a <b>Neutral to Minor Adverse</b> effect as a result of road traffic noise associated with the operational Scheme.	None required.

Technical Topic	Potential In-combination Effects	Mitigation Requirements
	<p>The committed development is likely to result in an increase in road traffic, this increase is not anticipated to result in a significant effect beyond the Scheme in isolation. As a result, a <b>Neutral (not significant)</b> in-combination effect is anticipated.</p>	
Landscape and Visual	<p>As discussed in Chapter 10: Landscape and Visual, the Scheme will have a range of adverse effects on Landscape and Visual receptors. These effects are <b>Slight to Moderate Adverse</b> on Landscape Character Areas and <b>Neutral to Large Adverse</b> effects on visual receptors.</p> <p>At this time no residential development is proposed for the site. Any future potential development would be a moderate scale development and will see construction phase activities of a similar nature to the Scheme taking place in the same Landscape Character Areas of the Scheme. These activities would be visible to visual receptors affected by the Scheme and have the potential to alter the Landscape Character Area, and result in an in-combination effect, anticipated to be <b>Slight Adverse (not significant)</b>.</p>	None required.
Water Resources and Flood Risk	<p>As discussed in Chapter 11: Water Resources and Flood Risk, the Scheme will have <b>Neutral to Slight Adverse</b> residual effects on water and flood risk receptors. Effects with <b>Slight Adverse</b> residual effects are that of contamination of surface water bodies, effects on water quality and flood risk.</p> <p>The operational committed development will see increased vehicle traffic and numbers as well as an increased impermeable surface with implications on flood risk. These effects are of a nature and scale to not result in a significant increase in residual effects compared to the Scheme in isolation. As such, a <b>Neutral (not significant)</b> in-combination effect is anticipated.</p>	None required.
<b>19 – Barratts Development</b>		
Noise and Vibration	<p>As discussed in Chapter 7: Noise and Vibration, the Scheme will have a <b>Neutral to Slight Adverse</b> effect as a result of road traffic noise associated with the operational Scheme.</p> <p>The committed development is likely to result in an increase in road traffic, this increase is not anticipated to result in a significant effect beyond the Scheme in isolation. As a result, a <b>Neutral (not significant)</b> in-combination effect is anticipated.</p>	None required.

Technical Topic	Potential In-combination Effects	Mitigation Requirements
Landscape and Visual	<p>As discussed in Chapter 10: Landscape and Visual, the Scheme will have a range of adverse effects on Landscape and Visual receptors. These effects are <b>Slight to Moderate Adverse</b> effect on Landscape Character Areas (year 1 and year 15) and <b>Neutral to Large Adverse</b> on visual receptors.</p> <p>The committed development is a moderate scale residential development which would introduce significant built form to the landscape, extending the urban footprint of settlement and altering views of the landscape. The committed development as a result will have an in-combination effect, anticipated to be <b>Moderate Adverse (significant)</b>.</p>	A significant in-combination effect is anticipated. However, additional mitigation is not appropriate as landscape mitigation would be incorporated into the design of the Scheme and the committed development separately.
Water Resources and Flood Risk	<p>As discussed in Chapter 11: Water Resources and Flood Risk, the Scheme will have <b>Neutral to Slight Adverse</b> residual effects on water and flood risk receptors. Effects with <b>Slight Adverse</b> residual effects are that of contamination of surface water bodies, effects on water quality and flood risk.</p> <p>The operational committed development will see increased vehicle traffic and numbers as well as an increased impermeable surface with implications on flood risk. As a result of the scale of the committed development, these effects are anticipated to result in a <b>Slight Adverse (not significant)</b> in-combination effect.</p>	None required.

## Summary

14.4.15. **Tables 14-8** and **14-9** below summarise the Inter-Project effects in each phase of the Scheme. An overall in-combination effect is given for each environmental topic. This overall in-combination effect is based on the assumption that all committed developments were constructed.

**Table 14-8 – Summary of Construction Phase Inter-Project Effects**

<b>Environmental Topic</b>	<b>Inter-Project Effects range for committed developments</b>	<b>Overall Inter-Project effects</b>	<b>Mitigation Requirements</b>
Noise and Vibration	Committed developments 4, 16-17 and 19 - Slight Adverse	Slight Adverse (not significant)	None required.
Ecology and Nature Conservation	Committed developments 1-9, 13-14 and 16-19 – Slight Adverse  Committed developments 10-13 and 15 – Neutral	Slight Adverse (not significant)	None required.
Landscape and Visual	Committed developments 1 and 17 – Moderate Adverse  Committed developments 2, 4-9, 16 and 19 – Slight Adverse  Committed developments 10-12 - Neutral	Large Adverse (significant)	A significant in-combination effect is anticipated. However additional mitigation is not appropriate as landscape mitigation would be incorporated into the design of the Scheme and the committed development separately.
Water Resources and Flood Risk	Committed developments 2, 4-5, 16 and 19 – Neutral  Committed development 17 – Slight Adverse	Slight Adverse (not significant)	None required.
Transport and Access	Committed Development 3, 6, 14, 15 and 16 - Neutral  Committed Developments 2, 17 and 19 – Slight Adverse	Slight Adverse (not significant)	None required.

**Table 14-9 – Summary of Operational Phase Inter-Project Effects**

<b>Environmental Topic</b>	<b>Inter-Project Effects range for committed developments</b>	<b>Overall Inter-Project effects</b>	<b>Mitigation Requirements</b>
Noise and Vibration	Committed developments 2, 4, 16, 17 and 19 - Neutral	Neutral (not significant)	None required.
Landscape and Visual	Committed developments 1, 4-9 and 16-17 – Slight Adverse Committed developments 2 and 19 – Moderate Adverse Committed developments 10-12 - Neutral	Large Adverse (significant)	A significant in-combination effect is anticipated. However additional mitigation is not appropriate as landscape mitigation would be incorporated into the design of the Scheme and the committed development separately.
Water Resources and Flood Risk	Committed developments 2 and 19 – Slight Adverse Committed developments 4-5 and 16-17 - Neutral	Slight Adverse (not significant)	None required.

## 14.5. ADDITIONAL MITIGATION REQUIREMENTS

14.5.1. The assessment of inter-project and intra-project effects has confirmed that no additional mitigation is required for the Scheme as a result of cumulative effects.

## 14.6. LIMITATIONS AND ASSUMPTIONS

14.6.1. Intra-Project Effects:

- The assessment of intra-project effect interactions resulting from the Scheme has considered the residual effects on common sensitive receptors in both the construction and operational phases. There is an assumption that mitigation measures outlined in the respective chapters will be fully incorporated to mitigate the corresponding adverse effects resulting from the Scheme.

14.6.2. Inter-Project Effects

- The assessment of inter-project effects has been limited to publicly available information at the time of writing and information obtained and highlighted as a result of consultation with ADC;
- When considering the Scheme, the assessment took into consideration the ES only, no other planning application documentation was considered;

- For the purposes of the assessment, professional judgement and a 'worst case scenario' were used when there was a lack of certainty and information relating to committed development; and
- In the absence of information and assessments of committed developments, it was assumed that the developers would implement similar mitigation measures to that of the Scheme.

## 14.7. REFERENCES

- Reference 14.1 – The Environmental Impact Assessment Directive (85/337/EEC) 2009 (as amended)
- Reference 14.2 – The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017
- Reference 14.3 – Standards for Highways (2008) Design Manual for Roads and Bridges (DMRB) Volume 11, Section 2 Part 5 (HA 205.08)
- Reference 14.4 – Arun District Council (2018) Arun Local Plan 2018 [available at: <https://www.arun.gov.uk/adopted-local-plan/>]



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