

# Regional Investment Programme A2 Bean and Ebbsfleet Junction Improvements Preliminary Environmental Information Report - Summary 19/02/18

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Environmental Context Plan

## 1. Introduction

### 1.1 What is the purpose of the Preliminary Environmental Information Report?

- 1.1.1 Highways England has prepared this summary of the **Preliminary Environmental Information Report**, referred to as the “PEIR”, as part of the Development Consent Order (DCO) pre-application consultation material for the A2 Bean Ebbsfleet Junction Improvements Scheme, referred to as “the Scheme”.
- 1.1.2 The purpose of the PEIR is to enable specialist and non-specialist consultees from the community and consultation bodies to understand the potential pre-mitigation environmental effects of the Scheme. Effects have been predicted at this time for each environmental assessment topic, to inform consultee responses at this DCO pre-application consultation stage.
- 1.1.3 It should be noted that the Scheme design is currently being developed and baseline environmental information, such as surveys, is still being assembled. The information contained within the PEIR should be regarded as a preliminary account of the principal environmental issues. It includes a number of uncertainties and assumptions, and may be subject to change as the environmental impact assessment of the Scheme progresses.
- 1.1.4 The PEIR has been divided for the purpose of the DCO pre-application consultation as follows:
- PEIR Volumes 1-3 ([www.highways.gov.uk/a2be](http://www.highways.gov.uk/a2be))
- PEIR Volume 1: Main text that includes Scheme information, alternatives considered, environmental assessments for each environmental topic, glossary and references;
  - PEIR Volume 2: Appendices that describe the study areas, planning legislation and policy, methodology and relevant tables for each environmental topic; and
  - PEIR Volume 3: Figures that include Scheme and outline environmental design drawings, and plans to inform each environmental assessment topic chapter in the PEIR Volume 1.
- PEIR Summary ([www.highways.gov.uk/a2be](http://www.highways.gov.uk/a2be))
- PEIR Summary – A separate document that summarises the environmental assessment and current preliminary findings for each topic. Further information on the Scheme, alternatives considered and the preliminary environmental impact assessment can be found in the relevant chapters in Volumes 1-3 of the PEIR.
- 1.1.5 An environmental context plan and environmental definitions of technical terms relevant to the PEIR summary are included in the back of this document. A full glossary is included in the PEIR Volume 1.

### 1.2 What happens after consultation?

- 1.2.1 Following consultation, Highways England will take account of all comments and suggestions received from the consultees in relation to the proposed

development and the PEIR, including this summary. Highways England will integrate them into further environmental impact assessment work that will be documented in an Environmental Statement (ES) and will be submitted as part of the DCO application to the Planning Inspectorate towards the end of 2018.

- 1.2.2 The DCO application will also include a Consultation Report that will document the outcomes of the consultation and how this has informed the design development of the final proposal. A flow diagram setting out the Preliminary Design DCO pre-application process is included in the PEIR Volume 2.

### **1.3 What are the environmental objectives of the Scheme?**

- 1.3.1 The environmental objectives of the Scheme include:

- Minimising environmental impact as measured in accordance with Design Manual for Roads and Bridges (DMRB); and
- Where possible improving air quality with regard to vehicle emission generally and specifically at the existing declared Air Quality Management Areas (AQMAs).

- 1.3.2 Further objectives and benefits of the Scheme are included in the DCO pre-application consultation brochure.

- 1.3.3 Alongside the objectives for the Scheme, Highways England sets out its own approach to meeting the key performance indicators identified within the RIS of “no net loss of biodiversity by 2020”. The Highways England Delivery Plan 2015-2020 also sets targets to mitigate noise in at least 1,150 Noise Important Areas (NIAs) between 2015/2016 and 2019/2020. This document also demonstrates the ability of the project to meet the requirements within Highways England licence, specifically in relation to the environment.

- 1.3.4 Highways England published ‘The Road to Good Design’ in January 2018, which sets out design principles with view to delivering the aspiration to *‘deliver safer, better, beautiful roads which connect people and connect our country’*.

### **1.4 What are the key environmental constraints?**

- 1.4.1 The A2 was built in the 1970s and links London to Dover. In 2008 the road east of Bean Junction was widened to 4 lanes. It follows the existing undulating topography, falling east from Bean to a low point at the B262 Pepper Hill Junction.

- 1.4.2 West of Bean Junction, the A2 Bean Hill cutting is enclosed by Darenth Wood, which is ancient woodland, and designated a Site of Special Scientific Interest (SSSI). Darenth Wood retains a medieval boundary that is a scheduled monument abutting the highway boundary of the A2.

- 1.4.3 At Bean Junction highway planting merges with existing mature vegetation, including The Thrift and two other areas of ancient woodland and the semi-mature planting around Bluewater Retail Park. This planting helps to buffer receptors from the A2 including: adjacent housing; and, the undulating arable farmland and Bean village that lies within the Green Belt to the south of the A296 Watling Street (Roman Road) and A2.

- 1.4.4 To the north of A2 and A296 Watling Street (Roman Road), the quarried landscape, shaped by the former cement industry in this area, is defined by

steep chalk cliffs and mature vegetation along the A296 Watling Street (Roman Road). This area is in a state of transformation with new housing and mixed-use areas being developed as part of Ebbsfleet Garden City.

- 1.4.5 At Ebbsfleet Junction, the wide verges and structured planting associated with the Ebbsfleet Junction form what is considered to be the vehicular ‘entrance gateway’ to the Ebbsfleet Valley. Expansive open views from the A2 and junction approaches look across the rural landscape to the Kent Downs. The numerous transmission lines and railway infrastructure are dominant and detracting features.
- 1.4.6 An area around the A2 is known to have dated back to the Romano-British period and includes the Springhead Roman Settlement scheduled monument that lies immediately adjacent to the A2 at Ebbsfleet Junction as well as prehistoric remains from the Palaeolithic and Neolithic periods.
- 1.4.7 Other designations within 1 km of the Scheme include:
- Swanscombe Skull Site SSSI approximately 900 m north of the Scheme, and Baker’s Hole SSSI approximately 500 m north of the Scheme;
  - Five Grade II listed buildings - Stone Castle, Lower Bean Farmhouse, Barn south east of Lower Bean Farmhouse, Swanscombe Cutting footbridge crossing A2 (east of Bean Junction), and Blue House;
  - Country Parks include Swanscombe Heritage Park to the north, Beacon Wood to the south and Darenth Country Park to the west of the Scheme; and,
  - Four Local Wildlife Sites (LWS).
- 1.4.8 Of the eleven Air Quality Management Areas (AQMAs) identified; four are designated by Dartford Borough Council and seven designated by Gravesham Borough Council. Dartford AQMA No.4 is located at Bean Junction and Gravesham A2 AQMA is located on the A2 east of Ebbsfleet Junction. Seven Defra Noise Important Areas (NIAs) are located within 1 km of the Scheme, on stretches of the A2 between Bean and Ebbsfleet Junctions, the B262, and Watling Street (Roman Road).
- 1.4.9 There are seven source protection zones (SPZs) within the study area. There are also two groundwater abstraction points east of Ebbsfleet Junction within the Scheme limits. Flood Zones 2 and 3 to the north east of Ebbsfleet Junction along the River Ebbsfleet.
- 1.4.10 The geology and the number of disused landfill sites that accepted inert waste in the study area means that the area is sensitive to pollution incidents.
- 1.4.11 An environmental context plan is included at the end of this document.

## 1.5 What is Environmental Impact Assessment (EIA)?

- 1.5.1 EIA is the process for identifying the likely environmental effects (positive and negative) of proposed developments, and their significance, before development consent is granted. The aim of EIA is to ensure that the following are undertaken:
- Assessment of likely effects of a proposed development on the environment;
  - Consideration of mitigation measures and alternatives in light of potential environmental effects; and

- Assessment of the cumulative effects of proposed development.

1.5.2 Through this process, the development should include measures to prevent, reduce or offset any significant, adverse environmental effects of the proposals, and enhance the positive impacts. The assessments in the PEIR are based on established methodologies set out in Highways England’s Design Manual for Roads and Bridges alongside agreed industry best practice.

1.5.3 The following chapters set out the preliminary information for the following environmental topics:

Air Quality	Geology and Soils
Noise and Vibration	Cultural Heritage
Biodiversity	Materials and Waste
Water Environment	People and Communities
Landscape	Climate
Cumulative Effects	

## 2. Air Quality

### 2.1 What is the existing environment like?

2.1.1 There are currently two Air Quality Management Areas (AQMAs – areas where air pollutants are exceeding national air quality objectives) – through which the Scheme passes). Dartford AQMA No.4 is located at Bean Interchange, and the other, Gravesham A2 AQMA, is along the A2 east of Ebbsfleet Junction. There are also a number of other AQMAs within both Dartford and Gravesham, which could be affected, depending on changes in traffic within these areas as a result of the Scheme.

2.1.2 There are a number of monitoring sites in the area of the Scheme, which measure air pollution. Monitored concentrations of nitrogen dioxide (NO<sub>2</sub>), a key pollutant associated with traffic, are currently exceeding the long-term annual average objective at Ightham Cottages near the Bean northern roundabout (north of the A2). There are also exceedances at a number of other roadside sites close to the Scheme, although these other roadside sites are not representative of exposure over an annual period. The short-term 1-hour objective for NO<sub>2</sub> has also been exceeded at the Bean northern roundabout at the roadside in recent years. However, concentrations of fine particulate matter (PM<sub>10</sub>), another pollutant associated with traffic, are currently meeting the air quality objectives.

### 2.2 What aspects of the Scheme will potentially impact on air quality, and how can these impacts be reduced?

2.2.1 The Scheme has the potential to affect air quality both during construction and once the Scheme is complete and operational.

2.2.2 During construction, various activities within the site could lead to an increase in emissions of dust in the absence of appropriate mitigation. There is therefore the potential for dust deposition at properties near to the site boundary, such as near to the Bean Junction, the Ebbsfleet Junction and others near the A2, where

construction activities are taking place. Furthermore, there could be changes to air quality arising from changes to traffic during the construction period, resulting from both additional vehicles travelling to and from the construction site bringing materials and labour, and from any traffic management measures required, such as speed changes or diversions. Implementation of best practice mitigation measures will generally control construction dust and minimise any short-term adverse effects.

- 2.2.3 Once the Scheme is complete, air quality will be affected by any changes in traffic conditions, both positively (e.g. as a result of reduced congestion) and negatively (e.g. as a result of increases in traffic flows). Where roads need to be realigned this could also affect air quality at nearby receptors, with an increase in concentrations where the road source is brought closer, and a decrease where the road is moved further away.

## **2.3 What are the key receptors that will potentially be affected?**

- 2.3.1 The key receptors that can be affected by changes in air quality are human health receptors such as residential properties, schools and nurseries, hospitals and residential care homes, and ecological receptors, such as Sites of Special Scientific Interest (SSSIs). The air quality assessment looks at the effect on receptors within 200 m of any road expected to have a change in traffic in line with criteria given in Highways England's guidance.

### What benefits will the Scheme bring to the receptors affected by air quality?

- 2.3.2 There are expected to be small decreases in pollutant concentrations at receptors close to the A296 Watling Street (Roman Road), this is due to an expected decrease in traffic with the Scheme on this road. In addition, there are expected to be decreases in nitrogen oxides (NO<sub>x</sub>) concentrations at the Darent Wood SSSI as a result of improved traffic flows along this section of the A2.

### What are the potential adverse effects of the Scheme?

- 2.3.3 There are expected to be small increases in pollutant concentrations south of the A2, at some of the Hope Cottages on Bean Road, arising as a result of an expected small increase in traffic on the B255 and Bean southern roundabout. The previous design showed that the roundabout was expected to be relocated closer to the properties, however the design has now been revised and will largely remain in the same position as it is currently, thus negating any larger increases in air pollution as a result of the relocation. Concentrations at the receptors are expected to be below the relevant air quality objectives in the opening year, both with and without the Scheme.

## **2.4 How will the other proposed development change the adverse effects and benefits of the Scheme?**

- 2.4.1 The traffic model incorporates traffic flow changes from committed developments in the area, so the air quality assessment already includes the effects from these other developments.



## **2.5 What are the limitations and assumptions of the current information?**

- 2.5.1 The information presented here is currently based on the work undertaken at the Options Selection Stage. The traffic model for the Scheme is currently being updated to take into account the latest available information. The air quality assessment will then be updated in the ES that may result in possible variations from the current findings.

## **3. Noise and Vibration**

### **3.1 What is the existing environment like?**

- 3.1.1 In the Scheme, the busy A2 itself is a major source of noise. This section of the A2 serves as one of the main routes linking the port of Dover with the rest of the UK.
- 3.1.2 Other local roads may also have some influence on the noise climate, along with the High Speed 1 (HS1), the Channel Tunnel Rail Link (CTRL), and the Ebbsfleet International station, plus there is also potential for some influence from industrial premises in the area and aircraft noise associated with the flight paths of London City Airport.
- 3.1.3 The Department for Environment, Food, and Rural Affairs (Defra) have identified many “Noise Important Areas” (NIAs), which are the locations where the 1% of the population most affected by the highest noise levels from major roads and railways are located. The locations of the NIAs are shown on the environmental context plan at the end of this document.

### **3.2 What aspects of the Scheme will potentially impact on noise and vibration, and how can these impacts be reduced?**

- 3.2.1 The Scheme has the potential to have an impact on noise during both the construction phase and once the scheme is complete and operational.
- 3.2.2 The construction noise impact will be dependent on the construction methods used, and the proximity of the works to residential properties and other noise sensitive buildings.
- 3.2.3 Where feasible, high levels of construction noise could be reduced through alternative construction methods, temporary noise barriers and best practicable means.
- 3.2.4 Good relationships between the contractors and the residents are essential. The contractor will be expected to keep residents and other affected parties informed of the progress of the works, including when and where the noisiest activities will be taking place and how long they are expected to last. It is expected that all noise complaints will be effectively recorded, investigated and addressed.
- 3.2.5 Once the Scheme is complete, the noise levels in the area could be affected by changes in road layout, traffic flows, vehicle types, and speeds on the A2 and other local roads especially at those properties nearby.
- 3.2.6 Highways England anticipate introducing low noise surfacing on the A2 as part of the Scheme. Existing environmental noise barriers are located near Bean Junction and will be retained and reinstated if affected by construction. The

potential for further noise barriers will be investigated following the noise assessment of the current Scheme.

### **3.3 What are the key receptors that will potentially be affected?**

3.3.1 In the surrounding area of the Scheme there are residential properties within Bean, Betsham, Gravesend, Greenhithe, Swanscombe and new development as part of Ebbsfleet Green.

3.3.2 A number of these residential properties are located within “Noise Important Areas” (NIAs). These include Hope Cottages on Bean Lane, and properties on Sandy Lane, Springhead Road, and along Pepper Hill and Roman Road on the edge of Gravesend.

3.3.3 A number of other notable noise sensitive receptors have been identified within 1 km of the Scheme, plus a number of ecological receptors including Darenth Wood Site of Special Scientific Interest (SSSI), and Ebbsfleet Marshes and Beacon Wood Country Park Local Wildlife Sites (LWS).

#### What benefits will the Scheme bring to the receptors affected by noise and vibration?

3.3.4 The noise assessment at the Options Selection Stage predicted that up to 28 properties mainly to the east of Ebbsfleet Junction would experience a minor decrease in noise of between 3 to 5 dB in the long term, including one of the NIAs on Springhead Road, and the NIA and a number of properties along Pepper Hill and Roman Road on the edge of Gravesend.

3.3.5 The new alignment of the Bean southern roundabout is expected to minimise the potential increase in noise levels at Hope Cottages, with most benefit to the properties furthest from the A2.

#### What are the potential adverse effects of the Scheme?

3.3.6 This assessment predicted that the Scheme would cause a minor increase in noise of between 1 to 3 dB at just four properties spread across the Scheme, in the short term, of the 2200 residential properties assessed.

3.3.7 It is not anticipated that the proposed design will lead to a significant impact on noise.

### **3.4 How will the other proposed developments change the adverse effects and benefits of the Scheme**

3.4.1 The traffic model incorporates traffic flow changes from committed developments in the area, so the noise and vibration assessment already includes the effects from these other developments.

### **3.5 What are the limitations and assumptions of the current information?**

3.5.1 At the Options Selection Stage, all impacts were considered to be minor as no properties experienced an increase in noise of 3 dB or more in the short term, and 5 dB or more in the long term. These were not considered significant, and did not take into consideration existing noise levels. In the ES, any increases in

NIAs and increases of more than 1dB for properties already exceeding the daytime threshold, will be considered significant in the short and long term. This change in threshold may identify additional properties where these smaller increases in noise are now considered significant. If this is the case, and where feasible, additional noise mitigation will be included in the Scheme.

- 3.5.2 The noise assessment will be carried out for a study area which is at least 600 m, and no more than 1 km, from the Scheme.
- 3.5.3 The existing road surfaces and existing noise barriers will be modelled based on the data available from Highways England.

## 4. Biodiversity

### 4.1 What is the existing environment like?

- 4.1.1 Three sites designated for their importance for nature conservation are in proximity to the Scheme: Darenth Wood Site of Special Scientific Interest (SSSI) and Ebbsfleet Marshes Local Wildlife Site (LWS), both adjacent to the Scheme, and Beacon Wood Country Park LWS 370 m south of the Scheme.
- 4.1.2 In addition, six parcels of ancient woodland, recorded as ancient semi-natural woodland (ASNW) on the Ancient Woodland Inventory, are in proximity to the Scheme: Darenth Wood (also SSSI), The Thrift and two unnamed areas, all adjacent to the Scheme, Parkhill Wood 20 m south of the Scheme, and Beacon Wood 700 m south of the Scheme.
- 4.1.3 Notable habitats of conservation interest within and surrounding the Scheme comprise broadleaved semi-natural woodland, and smaller areas of unimproved neutral grassland (including areas supporting man orchid, a priority species), semi-improved (species-rich) grassland, semi-improved calcareous grassland, hedgerows, field margins, running water and ponds. Habitats adjacent to the River Ebbsfleet support wet woodland and reedbed. Other habitats present of supporting value include young plantation woodland, semi-improved (species-poor) grassland, scattered and dense scrub, improved and amenity grassland, and arable farmland.
- 4.1.4 Notable species of conservation interest and legally protected species have been confirmed present within and adjacent to the Scheme: badgers, bats, birds, hazel dormice, and reptiles (widespread species). Other species have potential to be present, including notable terrestrial and aquatic invertebrates, great crested newts, other amphibians (widespread species), otter and water vole. The potential presence of these will be confirmed through the results of surveys

### 4.2 What aspects of the Scheme will potentially impact on biodiversity, and how can these impacts be reduced?

- 4.2.1 The Scheme has the potential to cause direct and indirect impacts on designated sites, ancient woodland, notable habitats, notable and protected species prior to mitigation during construction and operation.
- 4.2.2 Impacts during construction may arise from vegetation clearance within the DCO pre-application boundary. This could result in very localised habitat loss from the edge of two small areas of ancient woodland adjacent to the A2. However, existing data indicates that ancient woodland loss can be avoided. This will be

confirmed as the design progresses with the aim of avoiding the loss of ancient woodland and minimising vegetation clearance as far as possible. It is acknowledged that as an irreplaceable habitat if the loss of ancient woodland cannot be avoided, compensation such as newly planted broadleaved woodland and the implementation of an ongoing management regime to ensure successful establishment would be required.

- 4.2.3 Potential indirect impacts resulting from air, water, groundwater and noise pollution, and accidental incursion during construction and operation will be avoided and reduced by pollution control measures, sensitive working practices, and through design to protect Darenth Wood SSSI, Ebbsfleet Marshes LWS, ancient woodlands and notable habitats.
- 4.2.4 Potential direct and indirect impacts from vegetation clearance and disturbance to notable and protected species during construction will be avoided and minimised through the refinement of plans based on results of further surveys, protection of habitats (including retained trees) outside the working area, and using sensitive working practices that will be implemented under licence for protected species.
- 4.2.5 During operation potential indirect impacts on notable and protected species resulting from disturbance will be minimised by the design of sensitive mitigation, including lighting and environmental barriers.

### **4.3 What are the key receptors that will be potentially affected?**

- 4.3.1 The Scheme has the potential to affect designated sites (i.e. Darenth Wood SSSI and Ebbsfleet Marshes LWS), notable habitats (i.e. including ancient woodland and notable habitats), and notable and protected species (i.e. badgers, bats, birds, hazel dormice, and reptiles) prior to mitigation. The potential for the Scheme to affect other notable and protected species will be confirmed through the results of further surveys.

#### What benefits will the Scheme bring to the receptors affected by biodiversity?

- 4.3.2 The initial air quality assessment indicates that improved traffic flows near Darenth Wood SSSI may improve air quality adjacent to the designated site, ancient woodland and notable habitat during operation of the Scheme (see PEIR Summary Chapter 2 Air Quality).
- 4.3.3 Highways England aim to avoid protected and notable species and improve their habitats where possible (examples include dormouse and ancient woodland).

#### What are the potential adverse effects of the Scheme?

- 4.3.4 As described in Section 4.2 above the implementation of measures to avoid and protect the key receptors as defined above will minimise significant effects as a result of the Scheme.
- 4.3.5 The Scheme has the potential to have a slight adverse effect on notable habitats and populations of notable and protected species (e.g. hazel dormice). However, it is anticipated that this will reduce over time and be neutral in the long-term once replacement habitats have been established and vegetation matures adjacent to the Scheme.

#### **4.4 How will other proposed development change the adverse effects and benefits of the Scheme?**

4.4.1 Other proposed developments are likely to add to habitat loss within the local area. However, it is assumed that mitigation and compensation measures would be incorporated into the detailed designs to avoid and/or minimise impacts to biodiversity receptors. There are opportunities to strengthen habitat connectivity and provide better links to the wider landscape.

#### **4.5 What are the limitations and assumptions of the current information?**

4.5.1 Ecological survey work is seasonally constrained and subject to land and environmental conditions, as well as permitted and safe access. Therefore, further surveys are required in 2018 to update and complete existing data for the Scheme and to inform the assessment in the ES.

### **5. Road Drainage and the Water Environment**

#### **5.1 What is the existing environment like?**

5.1.1 Two Main Rivers have been identified within the study area. These are:

- River Ebbsfleet - the only designated Main River; and
- River Thames - located approximately 1.2 km north of the Scheme (Water Framework Directive (WFD) waterbody 'Thames Middle').

5.1.2 In addition, there are the following features:

- Eastern Quarry, and Bluewater Retail Park;
- A number of attenuation/ infiltration ponds that form part of the surface water drainage systems that serve the existing highways;
- Several un-named surface water drains and ditches that are likely to receive local drainage and form tributaries to the main watercourses;
- Groundwater abstractions. No surface water abstractions have been identified;
- Several Source Protection Zones (SPZs), where groundwater is sensitive; and
- Flood Zones 1-3.

5.1.3 Most of the site is in Flood Zone 1 (low risk). There is a narrow area of Flood Zone 3 (high risk) along the upstream reach of the River Ebbsfleet, which intersects with the Scheme approximately 500 m east of the A2 Ebbsfleet Junction.

5.1.4 The risk of flooding from surface water (i.e. excessive rainfall) is generally very low. However, there are some areas of low, medium and high risk; including the highway corridor and around the River Ebbsfleet crossing of the A2.

## **5.2 What aspects of the Scheme will potentially impact on road drainage and the water environment, and how can these impacts be reduced?**

- 5.2.1 Pre-mitigation, impacts during construction have the potential to affect water quality through uncontrolled site runoff; the excavation of materials, and the subsequent deposition of soils, sediment, or other construction materials; the spillage of fuels or other contaminating liquids; and the mobilisation of contamination following the disturbance of contaminated ground or groundwater.
- 5.2.2 The risk of surface water flooding during construction is most likely to arise from heavy rainfall when runoff may pond, potentially resulting in flooding of working areas and excavations.
- 5.2.3 These potential impacts and the risk of surface water flooding will be mitigated by following procedures that will be outlined in the Construction Environment Management Plan (CEMP) and included as part of the ES.
- 5.2.4 Any below ground works may allow some contamination to migrate to the SPZs. The risk to controlled waters will be reviewed during the design phase and appropriate mitigation put in place if required.
- 5.2.5 During the operational phase, the new hard standing areas could increase road runoff and drainage, affecting the water quality through the discharge of pollutants. However, mitigation measures embedded within the Scheme design will lead to appropriate drainage control/interpretation prior to discharge which is anticipated to lead to a reduction of pollution entering the watercourses.
- 5.2.6 New impermeable areas created, could increase surface water flood risk. Drainage of cuttings may increase receiving stream flows and impact on the flow conveyance and capacity of surface water receptors and flood risk. However, the Scheme drainage design incorporates sustainable drainage to deliver attenuation of surface water runoff rates, such that greenfield rates are not exceeded. Drainage from cuttings would also be made in accordance with relevant consent parameters.
- 5.2.7 Potential impacts on groundwater are most likely to arise from increased areas of hardstanding and subsequent increased runoff and drainage and/or spills from accidents and/or leaks which have the potential to impact the SPZs. These impacts will all be mitigated as required.

## **5.3 What are the key receptors that will be potentially affected?**

- 5.3.1 Key receptors that could be affected include, River Ebbsfleet, River Thames (indirectly), surface water drains and ditches that are likely to receive local drainage and form tributaries to the main watercourses and SPZs.

### What benefits will the Scheme bring to the receptors affected by road drainage and the water environment?

- 5.3.2 With the Scheme and mitigation measures in place, there is potential to benefit water quality as the mitigation is likely to be better than existing for road drainage. The Scheme will improve safety and reduce the risk of an accident and resulting spillage occurring and the risk of contamination as a result.

## What are the potential adverse effects of the Scheme?

- 5.3.3 Likely impacts from road construction activities are typically temporary and can be mitigated through good engineering practices. During operation mitigation measures embedded within the Scheme design as described in Section 5.2 above will mitigate potential adverse impacts. With mitigation measures in place, no adverse significant effects are anticipated.

## **5.4 How will the other proposed development change the adverse effects and benefits of the Scheme?**

- 5.4.1 Cumulatively, with other proposed developments in the area, it is anticipated that there would be a neutral effect from other developments, as each development will be subject to compliance with legislation and best practice guidance that should prevent pollution and safeguard the water environment.

## **5.5 What are the limitations and assumptions of the current information?**

- 5.5.1 The assessment has relied upon the accuracy and level of detail of the documented data sources.
- 5.5.2 A qualitative assessment has been undertaken. Quantitative assessments will be undertaken when the data are available. Impacts are therefore not yet quantified and the potential mitigation is still being developed.
- 5.5.3 Although the preliminary environmental information currently excludes the assessment of groundwater level and flow direction, a groundwater WFD assessment and a flood risk assessment (FRA) these assessments will be available and referred to in the ES.
- 5.5.4 The balance of surface water and groundwater influence on standing water bodies, such as ponds is not certain. Therefore, indirect impacts as a result of changes to hydrological catchments, such as drainage of ponds is not fully known.
- 5.5.5 The study area is 1 km. This is assumed to be large enough to capture water receptors that could be affected by the scheme. Should the design change, then the study area could change.

## **6. Landscape**

### **6.1 What is the existing environment like?**

- 6.1.1 An area known as the Bean Triangle lies between the A296 Watling Street (Roman Road) and the A2. This is an area of mature woodland including ancient woodland and is designated as Green Belt. Land-uses within this wooded triangle include mixed businesses and yards, a café, residential properties including Ightham Cottages and the Spirits Rest Horse Sanctuary.
- 6.1.2 The land use immediately north of the A296 Watling Street (Roman Road) and A2 is largely identified for residential and mixed-use development that has planning permission and forms part of the Ebbsfleet Garden City. Two large chalk quarries, with dramatic cliffs are dominant features in the landscape, the western one has been occupied by the Bluewater Retail Park since 2000 and in

Eastern Quarry, work has started on the mixed-use development that forms part of the Ebbsfleet Garden City. Existing settlements include Swanscombe, Northfleet and Greenhithe

- 6.1.3 The land to the south of the A2 is rural and designated as Green Belt. It contains the settlements of Bean, Betsham and Southfleet. There is a network of public Rights of Way (PRoW) across the landscape.
- 6.1.4 The landscape around Bean Junction is characterised by woodland, including Darenth Woods, the Thrift and Beacon Wood Country Park, which are also ancient woodland. The rising landform allows for some very long-range views across the Thames Estuary in places, although generally woodland and landform curtail short range views. The agricultural land use is of varied scale including medium to large arable fields as well as remnants of old orchards. Distracting features include electricity pylons.
- 6.1.5 The landscape around the Ebbsfleet Junction in contrast to the Bean Junction is comprised of large arable fields in a more open landscape. There are long range views of the A2 and the electricity pylons are a very apparent distracting feature in the landscape. Vegetation is limited to remnant hedgerows and shelterbelts.

## **6.2 What aspects of the Scheme will potentially impact on landscape, and how can these impacts be reduced?**

- 6.2.1 Post mitigation, potential impacts have the potential to arise due to site clearance to facilitate the new road layout, structures, earthworks, drainage, gantries, signage, lighting and construction access within the DCO pre-application boundary. These site operations could open up views to the highway and traffic affecting nearby receptors, and change the landscape character particularly around Bean Junction. Ightham Cottages and part of the Spirits Rest Horse Sanctuary would be lost to the larger Bean northern roundabout on the north side of the junction.
- 6.2.2 The design development aims to minimise the construction footprint and subsequent vegetation clearance. The proposed design for the Bean southern roundabout aims to retain some of the screen planting in front of the southernmost properties at Hope Cottages.
- 6.2.3 Additional measures and sensitive working practices will be undertaken to protect adjacent vegetation. Where clearance is necessary new native woodland would be implemented to reinstate the screening effect of highway planting once established.
- 6.2.4 The environmental design comprising trees, shrubs, seeded areas and some wetland around attenuation ponds, will be developed to reinstate the landscape and integrate the Scheme to reflect the adjacent rural character at Bean Junction and the 'Gateway' landscape at Ebbsfleet Junction.
- 6.2.5 Once completed, during operation there could be potential impacts resulting from views of the highway, earthworks and structures, including new lighting and gantries in the short term, while new planting is establishing. As best practice, Highways England aim for the lighting design throughout the Scheme to minimise light spill. The use of an LED light source and good lighting design potentially provide a reduction of the environmental impact of the proposed lighting that will be considered in the assessment in the ES.



## 6.3 What are the key receptors that will be potentially affected?

6.3.1 Key receptors that could be affected include:

- The landscape character around Bean Junction; and
- Visual receptors comprising:
  - Residents of Hope Cottages, Lower Bean Farm, Thrift Cottage, Woodbine Cottage and residents in the northern part of Bean village;
  - Users of Public Rights of Way (PRoW) such as the public footpath DR19 between Bean Lane, the B255, and The Thrift woodland; and
  - Residents of the newly completed and proposed developments as part of Ebbsfleet Garden City are potential receptors and will be included in the visual assessments in the ES.

### What benefits will the Scheme bring to the receptors affected by landscape?

6.3.2 The proposed planting to the east and south east of the Bean southern roundabout would potentially increase the extent of woodland in the landscape and increase biodiversity in this area, whilst in the longer-term screening views of traffic on the A2 and B255 from properties in Bean and users of footpath DR19.

6.3.3 The proposed design at Ebbsfleet Junction will retain the 'gateway' landscape character to Ebbsfleet Valley, forming part of the Ebbsfleet Garden City.

### What are the potential adverse effects of the Scheme?

6.3.4 The potential adverse effects include the loss of screen planting, some of which is mature or reaching maturity and some just starting to become effective from previous improvement schemes.

6.3.5 Changes to the earthworks along the A2 mainline and Bean Junction slip roads could remove screening affecting nearby receptors. The new on-slip east bound could result in loss of screening to residents and businesses in the Bean Triangle and the new embankments to the Bean southern roundabout are likely to remove the existing planting, which screens the junction and A2 from residents of Bean, Hope Cottages and the users of PRoW.

6.3.6 Existing screen planting could also be removed due to the relocation of gantries, potentially affecting views from Lower Bean Farm House and Woodbine Cottage.

6.3.7 These effects would last up to 10-15 years while the replacement planting implemented to replace these losses establishes and matures.

6.3.8 Loss of mature existing vegetation at Bean could alter the landscape character and affect localised views of the A2, B255 and traffic.

## 6.4 How will the other proposed development change the adverse effects and benefits of the Scheme?

6.4.1 It is not envisaged that the other proposed developments would change the adverse effects or benefits of the Scheme. This is because of the existing planting outside of the Scheme boundary. In addition, Highways England aim to retain as much of the existing highway planting as possible and establish new native planting to provide screening.

## 6.5 What are the limitations and assumptions of the current information?

- 6.5.1 Further investigations and surveys, which are being carried out in the coming months, are required to complete the earthworks design. The assessment in the ES will consider the impact that changes to the existing slopes would have on the vegetation loss. Although it is currently assumed that any design refinements would not affect the ancient woodland either side of the A2. It will also consider the design development, including drainage and lighting, and construction information such as soil storage areas and haul routes as this information becomes available.
- 6.5.2 The landscape and visual assessments will be carried out late winter and early summer 2018.

## 7. Geology and Soils

### 7.1 What is the existing environment like?

- 7.1.1 The Scheme is mainly underlain by sand and chalk bedrock, although mudstone and silt/sand deposits are present in the centre of the Scheme associated with an area of higher ground. Deposits of gravel, sand and clay, are mapped in localised pockets above the bedrock within the Scheme extents.
- 7.1.2 Identified potential pre-existing geological stability hazards that will be taken into account as part of the Scheme design include:
- Compressible ground adjacent to the River Ebbsfleet;
  - Landslide risk to the east of Ebbsfleet Junction;
  - Running sands at both Ebbsfleet and Bean Junctions; and
  - Dissolution risk where chalk is present.
- 7.1.3 Soils present at the site are deep, well drained, often stoneless, coarse loamy and sandy.
- 7.1.4 The chalk bedrock is designated as a Principal Aquifer, SPZ 1, 2 and 3 are also present across the majority of the Scheme, these are associated with public water supply boreholes to the south of the Scheme. Secondary A Aquifers associated with overlying geological units are also present within the area.
- 7.1.5 Open space, agricultural land, woodland (including ancient woodland and Darenth Wood SSSI), and mixed-use developments including residential and commercial / industrial land uses and associated activities and infrastructure, including schools, surround the Scheme. Historical man-made mining cavities comprising deneholes, pits and quarries and a number of landfills and areas of infilled land and water bodies are also present within or in proximity to the Scheme. One Local Geological Site (LGS), Beacon Wood Country Park, is present in proximity to the Scheme.

## **7.2 What aspects of the Scheme will potentially impact on Geology and Soils, and how can these impacts be reduced?**

7.2.1 Pre-mitigation, construction phase activities which have the potential to impact upon soils and geology include: piling; penetrative ground improvement activities; earthworks; dewatering; the construction of confined spaces such as manholes and service chambers/ducts; the construction of or upgrade of soakaways; and the additional land requirements of the Scheme. Dissolution of chalk via soakaways and the migration of contamination or ground gas via below ground services also has the potential to impact on soils and geology in the operational phase.

7.2.2 Where necessary and as required, mitigation measures will be implemented through detailed design and through the construction phase to take into account the potential pre-existing geological stability hazards identified in paragraph 7.1.2 to ensure there are no significant impacts on the area. Not least, the development and operation of the Scheme will be in accordance with the relevant regulations and best practice guidance in applying Best Available Techniques and pollution prevention.

## **7.3 What are the key receptors that will be potentially affected?**

7.3.1 Pre-mitigation, the Scheme has the potential to impact the following receptors:

- Environmental (controlled waters, ecology and property) and human health from the mobilisation of contamination;
- Increasing the risk from potential pre-existing geological hazards (see paragraph 7.1.2 above);
- Degradation of soil quality; and
- Sterilisation of mineral resources from land take.

### What benefits will the Scheme bring to the receptors affected geology and soils?

7.3.2 When considering land contamination an overall betterment of land is expected as a result of the Scheme development with the implementation of mitigation when compared to baseline. Where contamination has the potential to adversely affect the environment or human health, assessments will be undertaken and appropriate remediation or mitigation undertaken.

### What are the potential adverse effects of the Scheme?

7.3.3 Pre-mitigation, potential impacts associated with the construction and operational phases include:

- The sterilisation of mineral resources;
- Adverse effects on human health, controlled waters, ecology or property receptors associated with the potential mobilisation of existing contamination, exposing areas of contamination if present, or the introduction of either new sources of contamination, new pathways for the migration of contamination or new receptors;

- Physical effects arising from changes in either topography, physical properties (associated with soil erosion or a reduction in soil quality); and
- Risk to the Scheme associated with potential aggressive ground conditions or ground stability hazards.

7.3.4 It is anticipated that risks associated with potential pre-existing geological hazards (see paragraph 7.1.2) will be mitigated through design to ensure the stability of the Scheme.

7.3.5 No significant effects are anticipated with the effective application of mitigation and design measures.

## **7.4 How will the other proposed development change the adverse effects and benefits of the Scheme?**

7.4.1 Other proposed development will not overlap the proposed scheme footprint and therefore it is anticipated that the proposed developments will not impact on the contamination, soil quality or geological stability of the Scheme.

## **7.5 What are the limitations and assumptions of the current information?**

7.5.1 The assessment of baseline ground conditions and potential impacts has been assessed to date through desk-based means only. This means that the assessment has considered the reasonable worst-case, the real risks and consequently the impacts that the Scheme has on soils and geology will be assessed through the ground investigation work that is currently being planned.

# **8. Cultural Heritage**

## **8.1 What is the existing environment like?**

8.1.1 The cultural heritage resource within and surrounding the Scheme boundary is well represented both in terms of archaeological sites, historic buildings and structures and remnants of historic landscape. Archaeological sites range from Scheduled Monuments such as Springhead Roman settlement to 20th Century quarry sites. The area is also rich in prehistoric environmental remains, with sites like the Ebbsfleet Mammoth found to the north of the Scheme.

## **8.2 What aspects of the Scheme will impact on cultural heritage, and how can these impacts be reduced?**

8.2.1 The Scheme has the potential to affect heritage assets during the construction phase and once it is operational. For example, where excavations impact on buried archaeological remains or where new infrastructure and traffic could have an additional impact on the setting of built heritage and scheduled monuments. Where feasible, archaeological excavation and recording will be undertaken to mitigate construction impacts. In addition, setting impacts to heritage assets may be reduced through appropriate screening.

8.2.2 During construction where feasible, impacts on designated heritage assets will be avoided, by siting construction compounds, haulage routes and storage areas

outside the extent of Scheduled Monuments or important associated archaeological remains.

- 8.2.3 Further assessment and archaeological investigations will be undertaken to fully understand the risks to cultural heritage resources and appropriate changes to design made to avoid significant impacts that may become apparent from the Scheme.

### **8.3 What are the key receptors that will be affected?**

- 8.3.1 Key receptors include Scheduled Monuments, Listed Buildings and potential archaeological and palaeoenvironmental remains of high significance at Ebbsfleet and Bean Junctions.

- 8.3.2 A full list of all heritage assets considered to be affected by the Scheme can be found in Tables 11.5 and 11.6 in the PEIR Volume 2.

#### What benefits will the Scheme bring to the receptors affected by cultural heritage?

- 8.3.3 At this early stage in the assessment it is considered that the Scheme is unlikely to bring any benefits to receptors. Although the archaeological investigations will provide additional knowledge on the archaeological remains of this area.

#### What are the potential adverse effects of the Scheme?

- 8.3.4 There is potential to partially or wholly remove important archaeological remains associated with scheduled sites and important palaeoenvironmental remains dating back to the Pleistocene era, which ended approximately 11,700 years ago. Further assessment will be undertaken in order to enhance the knowledge of potential palaeoenvironmental remains within the Scheme boundary and its surrounding landscape.

### **8.4 How will the other proposed developments change the adverse effects and benefits of the Scheme?**

- 8.4.1 Further developments in the surrounding area will have a negative cumulative effect on cultural heritage in terms of potentially removing important archaeological remains and changes to the settings of archaeological sites, historic buildings and the wider historic landscape. The full extent of other developments within the wider area will be further considered, and how they may contribute to potential adverse cumulative effects over time.

### **8.5 What are the limitations and assumptions of the current information?**

- 8.5.1 Limitations of current information specifically relate to the understanding of the presence and significance of buried archaeological remains within the Scheme boundary where previous investigations have not been carried out before. Liaison with stakeholders will be undertaken to enhance the knowledge and to agree the scope of archaeological surveys required to inform the assessment in the ES.

## 9. Materials and Waste

### 9.1 What is the existing environment like?

- 9.1.1 The existing environment in terms of materials and waste is informed by the national demand for key construction materials, and the non-hazardous and hazardous waste generation and waste management capacity.
- 9.1.2 In 2014/15 the national demand for key construction materials (aggregate, concrete, steel etc) was 356,674,120 tonnes.
- 9.1.3 In 2015 Kent produced approximately 2,520,000 tonnes of waste and had capacity to manage 22,073,247 tonnes of waste.
- 9.1.4 Nationally there was 197,710 tonnes of hazardous waste produced and capacity to manage 9,271,631 tonnes.

### 9.2 What aspects of the Scheme will potentially impact on materials and waste, and how can these impacts be reduced?

- 9.2.1 Pre-mitigation, the Scheme has the potential to impact on materials and waste both during construction and operation.
- 9.2.2 Waste will be generated from any demolition works needed, as well as excavation. During construction, materials will be used and waste from packaging for materials and components and from the workforce themselves will be generated.
- 9.2.3 During operation there will be further material use and waste generation from planned and unplanned maintenance. Some waste will also be generated by road users in the form of litter.
- 9.2.4 Mitigation measures during construction and operation will aim to move waste up the hierarchy i.e. identifying where it is suitable to be reused or recycled on the scheme, to minimise the amount of materials needed to be imported and waste requiring disposal offsite.
- 9.2.5 Where waste is not suitable to be reused or recycled on the Scheme options it would then be explored offsite again to minimise the quantity of waste disposed of offsite.

### 9.3 What are the key receptors that will be potentially affected?

- 9.3.1 Receptors which have the potential to be impacted, with regards to materials and waste, are:
- The market for key construction materials, which are to be used throughout the Scheme;
  - The waste arisings baseline – the amount of waste that is predicted to be produced during the construction, demolition and excavation (CD&E) phases of the Scheme; and
  - The predicted capacity of waste infrastructure sites receiving, placing, treating, recycling, recovering and/ or disposing of waste both regionally

(non-hazardous and inert waste) and nationally (hazardous waste) which are anticipated to arise from the Scheme during the construction phase.

#### What benefits will the Scheme bring to the receptors affected by materials and waste?

- 9.3.2 There will be no benefits to materials and waste receptors from the Scheme, although all efforts will be made to reuse and recycle as much waste as possible to divert it from final disposal.

#### What are the potential adverse effects of the Scheme?

- 9.3.3 Pre-mitigation, the Scheme could cause adverse effects by using construction materials (i.e. depleting natural resources), like asphalt and concrete, and temporarily or permanently occupying capacity of regional and/or national waste infrastructure.
- 9.3.4 Mitigation measures during construction and operation will aim to move waste up the hierarchy i.e. identifying where it is suitable to be reused or recycled on the Scheme, to minimise the amount of materials needed to be imported and waste requiring disposal offsite.
- 9.3.5 Where waste is not suitable to be reused or recycled on the Scheme options, it would then be explored offsite again to minimise the quantity of waste disposed of offsite.

### **9.4 How will other proposed developments change the adverse effects and benefits of the Scheme?**

- 9.4.1 Although several large proposed developments, very few of them have data available on material use and waste generation.
- 9.4.2 From those which do, in a single construction year, it is estimated they would generate less than 1% of the regional construction waste arisings and less than 0.1% of regional construction waste capacity.
- 9.4.3 Therefore, it would have a negligible, short term impact.

### **9.5 What are the limitations and assumptions of the current information?**

- 9.5.1 Both the assessment of effects on materials and waste is based on design information being available. The assessment in the ES will refer to a bill of quantities or cost schedule prepared for the Scheme design. If for any reason this is not available, the assessment will be based on the worst-case scenario information from other similar schemes, rather than the specific details of this Scheme.

## **10. People and Communities**

### **10.1 What is the existing environment like?**

- 10.1.1 Private dwellings and community facilities are found in the main settlements of Northfleet, Ebbsfleet, Greenhithe, and in the smaller villages of Bean and Lane End. There are several isolated properties, including Ightham and Hope

Cottages at Bean Junction, and farms within the A2 corridor study area including two traveller sites. There are several public and private community receptors which include Darent Valley Hospital and many education facilities and open spaces including Darenth Country Park.

- 10.1.2 Bluewater Retail Park is a major retail destination for the immediate and wider area. There are smaller local businesses within and adjacent to the red line boundary, located at Bean and Ebbsfleet Junctions. The Ebbsfleet Garden City development proposes 15,000 new homes alongside 30,000 new jobs. A small portion of land in agricultural use is located along the A2.
- 10.1.3 The A2 currently acts as a barrier, limiting movement for Non-motorised Users (NMUs) ie pedestrians, cyclists and equestrians and other local journeys, from accessing services and facilities to the north and south. There are several PRow and NMU routes, including footpaths within the highway. Additional NMU routes cross the A2 including Wood Lane Footbridge, Sandy Lane Subway and the Swanscombe Cutting Footbridge. The study area also contains routes, which are suitable for cycling including National Cycle Routes 1 and 177, parallel to the A2, and cycleway adjacent to the B255. There are no PRow bridleways within the study area however, the Arrow Riding Centre, could generate equestrian trips within the vicinity.
- 10.1.4 The A2 carries high volumes of traffic at peak times and the intended growth of the area will bring significantly more traffic over and above existing conditions contributing to further driver stress. It is also susceptible to delays caused by frequent problems at the Dartford crossing and drivers seeking alternative routes across Dartford's road network. Traffic modelling has indicated that without improvement to both junctions the road network will become highly congested resulting in considerable delays.

## **10.2 What aspects of the Scheme will potentially impact on people and communities, and how can these impacts be reduced?**

- 10.2.1 It is considered that all aspects of the Scheme will impact people and communities, either temporarily or permanently. This includes, land take, severance of connectivity, access restrictions and effects to amenity.
- 10.2.2 The Scheme design aims to include a range of built in mitigation, for example ensuring affected NMU routes are reinstated and the provision of alternate access to property provided.

## **10.3 What are the key receptors that will be potentially affected?**

- 10.3.1 The Scheme has the potential to affect a range of receptors: dwellings, community facilities, local businesses, agricultural land, development land, NMU and vehicle travellers. Initial desk based research has identified potential receptors as shown on Figure 13.1 in the PEIR Volume 3 Figures.

### What benefits will the Scheme bring to the receptors affected by people and communities?

- 10.3.2 On operation it is anticipated there will be overall beneficial effects to NMUs due to the NMU improvements. It is proposed that the existing footpath to the east of



Bean Lane will be reinstated with changes created by new crossings. At the Ebbsfleet Junction, alterations to existing NMU routes due to widening of highways will be reinstated along similar alignments as at present.

- 10.3.3 There will be beneficial impacts to nearest properties in Bean Village due to improved access and screening once operational and established. Generally, during operation journey distance time, and amenity is assumed to be similar to that found prior to the Scheme. Beneficial impacts are predicted for community severance in relation to the existing communities to the south of the A2, such as Bean, Betsham and Southfleet, and the existing connections that cross the A2 (including National Cycle Route 1) and the services located to the north.
- 10.3.4 The Scheme is considered to facilitate the growth planned for the area resulting in beneficial impacts to development growth aspirations. It will ease congestion, reduce delays and driver stress caused by frequent problems at the Dartford crossing and drivers seeking alternative routes across Dartford's road network.

#### What are the potential adverse effects of the Scheme?

- 10.3.5 At Bean Junction, widening the Bean northern roundabout and slip road will result in the demolition of Ightham cottages and the potential loss of the Spirits Rest Horse Sanctuary. Additionally, the potential loss to curtilage, altered access arrangements and the likely loss of amenity to residents of Hope Cottages to enable the provision of a new bridge across the A2.
- 10.3.6 Potential loss of amenity to residents of new Ebbsfleet Green development and those in Northfleet during construction, with potential temporary access restrictions to properties due to realignment of Pepper Hill Link Road.
- 10.3.7 Construction of the Scheme has potential to have a negative impact on retail and other businesses through land take or alterations to access. Less than 1.3 ha of agricultural land is likely to be affected.
- 10.3.8 Scheme construction has the potential to generate temporary adverse effects to local communities including NMUs. This will also likely result in temporary increases to driver stress for vehicle travellers.

### **10.4 How will the other proposed development change the adverse effects and benefits of the Scheme?**

- 10.4.1 Other developments near to the Scheme such as the Ebbsfleet Garden City development have the potential to affect identified receptors during construction, with some effects being temporary and adverse.

### **10.5 What are the limitations and assumptions of the current information?**

- 10.5.1 The assessment provides a broad, high level indication of effects based on preliminary assessment. Further assessment of effects will be possible when more details concerning the Scheme design, in particular the construction of the Scheme, is available.
- 10.5.2 It is assumed that the Scheme boundary will include the likely locations of any engineering features, such as construction compounds, haul roads and attenuation ponds. Further assessment maybe required following detailed design should amendments to the Scheme boundary or design be necessary.

## 11. Climate

### 11.1 What is the existing environment like?

11.1.1 The subject of ‘effects on climate’ covers emissions of greenhouse gases from sources both directly and in-indirectly related to the Scheme. As such, the existing environment concerns the following:

- Direct emissions from vehicles using the road network covered by the Scheme;
- Direct emissions from vehicles using the adjacent road network; and
- In-direct emissions from operation and maintenance of the existing road network covered by the Scheme, including electricity for street lighting and signage, and emissions from supply chain and direct activities for inspection and maintenance works.

11.1.2 The condition of the existing environment is based on the quantity of emissions that are generated, but there is currently no data available for these. However, it is possible to understand the emissions in more detail based on data from other schemes, and by comparison to total UK emissions, and UK carbon reduction targets.

11.1.3 According to data from other road schemes, it is known that the direct vehicle emissions will account for more than 99% of the total annual greenhouse emissions. Further, on comparison with UK total emissions, any Scheme emissions will be extremely small. However, with consideration to the UK carbon reduction targets (which are 37% reduction by 2020, 51% by 2025, and 57% by 2030, based on 1990 levels) it is likely that the current Scheme is making no contribution to achieving these necessary reductions.

### 11.2 What aspects of the Scheme will potentially impact on Climate, and how can these impacts be reduced?

11.2.1 All aspects of the Scheme that directly or in-directly result in emissions of greenhouse gases will be of relevance to effects on climate. These are:

- Production and manufacturing of construction materials;
- Transportation of construction materials to site;
- Construction works, including, construction plant use, water use, waste transportation off-site, and off-site waste processing;
- Direct scheme operation, including, vehicles using the road network, street lighting, and signage;
- Scheme maintenance, including, inspection works, and maintenance and repair works; and
- Vehicles using the adjacent network, that is appreciably affected by the scheme (subject to reasonable distance limitations).

11.2.2 Again, there is currently no data to directly quantify these. However, based on other schemes it is known that emissions from construction will cause a one-off quantity of emissions that would equate to up to approximately 20% of the total

annual emissions from vehicle use on the road network covered by the scheme. Further, vehicle emissions will be the dominant source of operational emissions, as stated above for the existing environment conditions. This is regardless of any reduction of vehicle emissions that may be achieved.

### **11.3 What are the key receptors that will be potentially affected?**

11.3.1 There is only one receptor affected by greenhouse gas emissions, regardless of the source, and it is the atmosphere. Further, there is only one effect, which is global warming, which occurs with absolutely certainty for each kilogramme or tonne of greenhouse gas emitted.

#### What benefits will the Scheme bring to the receptors affected by climate?

11.3.2 The only benefit the Scheme could potentially bring is a significant reduction in emissions. However, this is considered unlikely due to there being no significant reduction in vehicle volumes.

#### What are the potential adverse effects of the Scheme?

11.3.3 The adverse effect of the Scheme regarding greenhouse gases emissions is that emissions are caused to be on-going at existing levels, they are increased, or they are not sufficiently reduced. These will be determined once the emissions can be quantified. However, based on the fact that construction activities will be undertaken, and that there will be on no significant reduction of traffic volumes it is anticipated that adverse effects will be caused, the extent of which will be determined when they can be quantified.

### **11.4 How will the other proposed development change the adverse effects and benefits of the Scheme?**

11.4.1 As outlined above, greenhouse gas emissions occur through construction, operation and maintenance activities. Given this, unless a development includes extensive renewable energy facilities, it is highly likely that the net emissions from other developments will contribute to increase of the adverse effects, i.e. increase in total emissions.

### **11.5 What are the limitations and assumptions of the current information?**

11.5.1 There is only one limitation of the current information, which is that without project specific data it is not possible to confirm that the effects are adverse or beneficial, or the level of these impacts.

11.5.2 The assumptions for the above are:

- Manufacturing and construction will be carried out using largely fossil fuel powered processes and plant; and
- The Scheme will not involve reduction of vehicles using the road network covered by the scheme. Therefore, vehicle emissions will continue to be produced, and at a level that causes them to be the dominant impact.

11.5.3 The 'vulnerability of the Scheme to climate change' will be considered in the ES. This assessment will consider aspects of the Scheme that are susceptible to

damage or disruption from climate-related hazards informed by ‘met office’ regional records for extreme weather conditions in the South-East and Central Southern England and UK climate projections.

## 12. Assessment of Cumulative Effects

### 12.1 What is the existing environment like?

- 12.1.1 Significant levels of development in Ebbsfleet Garden City and across Dartford are anticipated to put strain on the Bean and Ebbsfleet Junctions of the A2. Improving the capacity at the junctions is key to opening up development, in particular within the Swanscombe peninsula. The level to which these developments interact and have cumulative effects with the Scheme is dependent on a number of factors, for example, proximity to each other, size, scale and type of development, and how far the mitigation proposed reduces the various effects.
- 12.1.2 With an anticipated 15,000 homes and 30,000 jobs, it is essential that local connectivity and regional connectivity is improved to ensure the full potential of the growth is realised. Therefore, the A2 Bean and Ebbsfleet junction improvements are essential to facilitate meeting the development growth aspirations in the area.

### 12.2 What aspects of the Scheme will potentially impact on cumulative effects, and how can these impacts be reduced?

- 12.2.1 The following is considered as part of the cumulative assessment:
- Combined effects: impact is the result of the combined action of different environmental topic-specific effects acting upon a single receptor. For example, noise, dust and traffic may impact upon a residential property; and
  - Cumulative effects: impact results from the combined action of a number of different projects, in combination with the project being assessed, on a single receptor.
- 12.2.2 Cumulatively, the various developments at Ebbsfleet Garden City, growth in Dartford and Gravesham, alongside the A2 Bean and Ebbsfleet junction improvements will likely result in significant changes to the locality, and potentially to the wider region.

### 12.3 What are the key receptors that will be potentially affected?

- 12.3.1 The cumulative effects chapter considers all key environmental topics and therefore reflects all receptors assessed within the topic chapters.

#### What benefits will the Scheme bring to the receptors affected by cumulative effects?

- 12.3.2 There may be beneficial, neutral or negative cumulative effects on air quality (operational); noise and vibration; people and communities; landscape; and climate change, however these are yet to be assessed and will be considered in further detail in the ES.

### What are the potential adverse effects of the Scheme?

- 12.3.3 Cumulative negative effects on Air Quality and Noise during the construction phase may arise if development occurs concurrently with other nearby development at Eastern Quarry (ref: 12/01451/EQVAR); Ebbsfleet (ref: 96/00047/OUT); and two proposals at Ebbsfleet Green (ref: 05/00308/OUT and 16/01271/EDCCON).
- 12.3.4 Many of the potential impacts will be minimised through a combination of best practice and mitigation measures.

## **12.4 How will the other proposed development change the adverse effects and benefits of the Scheme?**

- 12.4.1 Each of the other developments will propose mitigation measures where necessary to reduce the impacts of that development. However, where residual effects remain, these may interact with the residual effects of this Scheme resulting in the overall effect (both positive and negative) being more significant or amplified.
- 12.4.2 Those developments in close proximity and that are larger scale projects are more likely to have cumulative effects. Key developments that have been identified as having potential cumulative effects include Ebbsfleet (ref: 96/00047/OUT), Eastern Quarry (ref: 12/01451/EQVAR), and Ebbsfleet Green (ref: 05/00308/OUT) and Former Northfleet Cement Works (ref: EDC/16/0004).

## **12.5 What are the limitations and assumptions of the current information?**

- 12.5.1 A high-level summary of anticipated effects has been provided for some environmental topics, however a full assessment of cumulative effects has not currently been undertaken, and therefore the full extent of combined and cumulative effects is not currently known.
- 12.5.2 Furthermore, the cumulative effects assessment is based on the list of 'Other Developments' which is produced at the time of assessment, however, as new applications come forward and extant applications are 'varied' the list may become outdated.
- 12.5.3 The list of development projects listed in the cumulative effects assessment will be updated as part of the assessment, in discussions with Gravesham and Dartford Borough Council's and Ebbsfleet Development Corporation.
- 12.5.4 This list will also be updated to breakdown the number of dwellings proposed, the number of jobs expected to be created and the anticipated phasing for the delivery of the development, where available.
- 12.5.5 A limitation of the assessment is that the development projects list is speculative and whilst the Local Planning Authorities and potentially developers will have been consulted on phasing, the developments may not be delivered in line with the assumptions.

## 13. Environmental Definitions

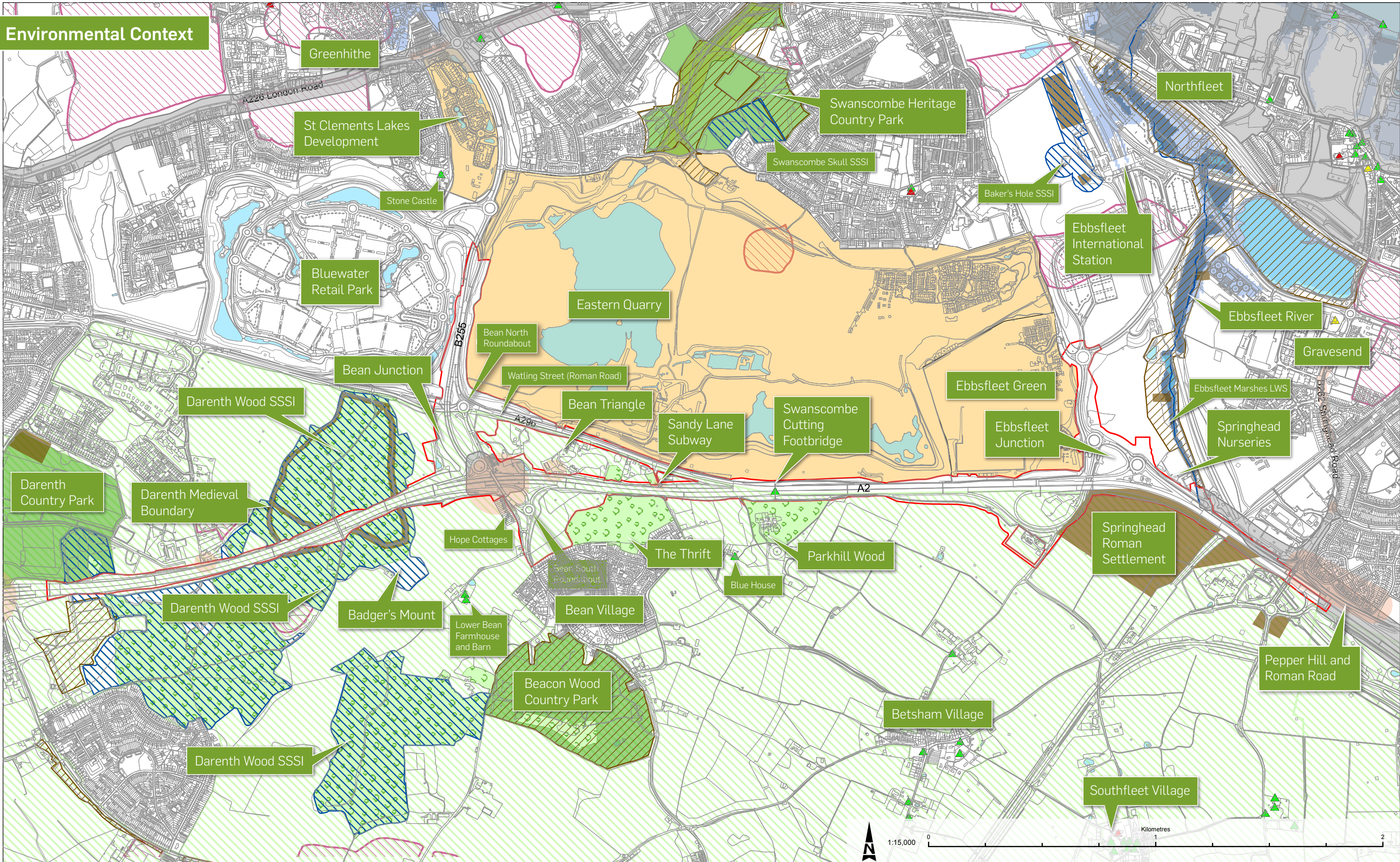
Acronyms, Abbreviations and	Description
AQMA	Air Quality Management Area
ASNW	Ancient Semi-Natural Woodland
CD&E	Construction, Demolition and Excavation
CTRL	Channel Tunnel Rail Link
dB	Decibel
Defra	Department for Environment, Food and Rural Affairs
EIA	Environmental Impact Assessment
ES	Environmental Statement
FRA	Flood Risk Assessment
LGS	Local Geological Site
LWS	Local Wildlife Site
NIA	Noise Important Area
NMU	Non-Motorised User
NO <sub>2</sub>	Nitrogen Dioxide
NO <sub>x</sub>	Nitrogen Oxide
PEIR	Preliminary Environmental Information Report
PM <sub>10</sub>	Particulate Matter with a diameter of 10 micrometres or less
PRoW	Public Right of Way
SPZ	Source Protection Zones
SSSI	Site of Special Scientific Interest
WFD	Water Framework Directive

Terms	Description
Air Quality Management Area	An area identified where the National Air Quality Objectives are not likely to be achieved. The Local Authority is required to produce a Local Air Quality Action Plan to plan how air quality in the area is to be improved.
Air Quality Objectives	The national air quality objectives are set by the UK Government for the protection of people's health. There are both long-term objectives (measured as an annual average) and short-term objectives (measured over an hour or a day), depending on the length of exposure to the pollutant.
DEFRA	DEFRA is the government department responsible for environmental protection, food production and standards, agriculture, fisheries and rural communities in the United Kingdom of Great Britain and Northern Ireland. Defra is a ministerial department, supported by 33 agencies and public bodies.
Local Geological Site	Are non-statutory sites that have been identified by local geoconservation groups as being of importance.
Local Wildlife Site	Local wildlife sites are non-statutory designated sites, given protection through policies in the Local Development Plan.
Non-Motorised User	Cyclists, pedestrians (including wheelchair users), and equestrians using the public highway.
Noise Important Area	Areas where the 1% of the population that are affected by the highest noise levels from major roads are located according to the results of Defra's strategic noise maps.
Priority Species	Species of Principal Importance for the Conservation of Biological Diversity on the England Biodiversity List are notified under Section 41 of the NERC Act 2006.
Public Right of Way	A way over which the public have a right to pass and repass. The route may be used on foot, on (or leading) a horse, on a pedal cycle or with a motor vehicle, depending on its status. Although the land may be owned by a private individual, the public may still gain access across that land along a specific route. Public rights of way are all highways in law.
Scheduled monument	A 'nationally important' archaeological site or historic building, given protection against unauthorised change and included in the Schedule of Monuments kept by the Secretary of State for Culture, Media and Sport. The protection given to scheduled monuments is given under the Ancient Monuments and Archaeological Areas Act 1979.
The Scheme	A2 Bean and Ebbsfleet Junction Improvements Scheme
Site of Special Scientific Interest	A conservation designation denoting to a protected area in the United Kingdom. The Sites are protected by law to conserve their wildlife or geology. Protected under the Wildlife and Countryside Act 1981 (as amended) and The Countryside and Rights of Way Act 2000.
Source Protection Zone	Areas of land around over 2000 groundwater sources such as wells, boreholes and springs used for public drinking water supply. The zones show the risk of contamination from any activities that might cause pollution in the area. The closer the activity, the greater the risk. There are three main zones (inner, outer and total catchment) and a fourth zone of special interest, which is occasionally applied to a groundwater source. The

Terms	Description
	zones are used in conjunction with the Groundwater Protection Policy to set up pollution prevention measures in areas which are at a higher risk, and to monitor the activities of potential polluters nearby.
Vulnerability	The quality or state of being exposed to the possibility of being attacked or harmed, either physically or emotionally.
Water Framework Directive	The Water Framework Directive (2000/60/EC) is a EU directive which aims to achieve good status of all water bodies (surface waters, groundwaters and the sites that depend on them, estuaries and near-shore coastal waters) and the prevent any deterioration. It has introduced a comprehensive river basin management planning system to protect and improve the ecological quality of the water environment. It is underpinned by the use of environmental standards.



# Environmental Context



## LEGEND

- |   |                              |                            |
|---|------------------------------|----------------------------|
| DCO Pre-Application Boundary                | Ancient Woodland             | Flood Zone 3               |
| Ebbsfleet Development Corporation (EDC)     | Country Parks                | Flood Zone 2               |
| Scheduled Monuments                         | Green Belt                   | River Network              |
| Historic Landfill Sites                     | Important Areas for Noise    | Listed Buildings Grade I   |
| Registered Park and Garden                  | Air Quality Management Areas | Listed Buildings Grade II* |
| Sites of Special Scientific Interest (SSSI) | Waterbodies                  | Listed Buildings Grade II  |
| Local Wildlife Sites (LWS)                  |                              |                            |



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