Regional Investment Programme A2 Bean and Ebbsfleet Junction Improvements Preliminary Environmental Information Report

Volume 2 – Appendices

19/02/18

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1. Appendix A. General Scheme Legislation and Policy

1.1 Key legislation and policy

Legislative framework

Planning Act 2008 and The Infrastructure Planning (Environment Impact Assessment) Regulations 2017

1.1.1 The Planning Act 2008 introduced a new approval route for Nationally Significant Infrastructure Projects (NSIPs). When promoting new schemes, the first step is to determine if a scheme meets the definition of a highways NSIP, that would then require Secretary of State consent through the Planning Inspectorate (PINS).

1.1.2 The definition of a highways NSIP is set out in Section 22 of the Planning Act 2008, as amended by the Highway and Railway (Nationally Significant Infrastructure Project) Order 2013, and includes construction of a highway where the Secretary of State will be the Highway Authority for the highway, or the highway is to be constructed for a purpose connected with a highway for which the Secretary of State is or will be the highway authority, and where the construction or alteration of the highway, other than a motorway, where the speed limit for any class of vehicle is expected to be 50 miles per hour or greater, is 12.5 hectares.

1.1.3 The A2 Bean and Ebbsfleet Highway Improvement Scheme fulfils these criteria and is therefore considered to be a NSIP.

1.1.4 In March 2014, the European Parliament voted to adopt substantive amendments to the EIA Directive 2011/92/EU. These amendments made by EIA Directive 2014/52/EU were transposed into UK legislation in May 2017 as the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 and are relevant to this Scheme and the environmental topic assessments. This is irrespective of the vote to leave the EU following the referendum on the UK's membership, as EU legislation will be incorporated into UK legislation in the short to medium term.

1.1.5 As the Scheme is likely to have significant environmental effects, an EIA will be undertaken and reported in a statutory ES to be submitted to the Planning Inspectorate with the DCO application for Scheme. A Regulation 6 Notification under the provisions of the Planning Act 2008 has been submitted to the Planning Inspectorate informing the Secretary of State that an ES will accompany the DCO application.

1.1.6 Under the Planning Act 2008 it is a mandatory requirement to seek a screening opinion from the Secretary of State or to notify the Secretary of State of the intent to undertake an Environmental Impact Assessment (EIA).

1.1.7 Schedule 3 of the EIA Regulations provides screening criteria which include the characteristics of the development, the location of the development with regard to environmentally sensitive receptors and characteristics of the potential impact. The Scheme is not a project where a mandatory EIA is required, as defined in Annex 1 of the EIA Directive or Schedule 1 of the EIA Regulations. However, it is

considered to be an Annex II (or Schedule 2) scheme where the need for a Statutory EIA and the publication of an ES is identified through an assessment of the significance of the likely environmental effects of a project.

Policy overview

1.1.8 Planning policy documents relevant to the Scheme are summarised in Table 1.1.

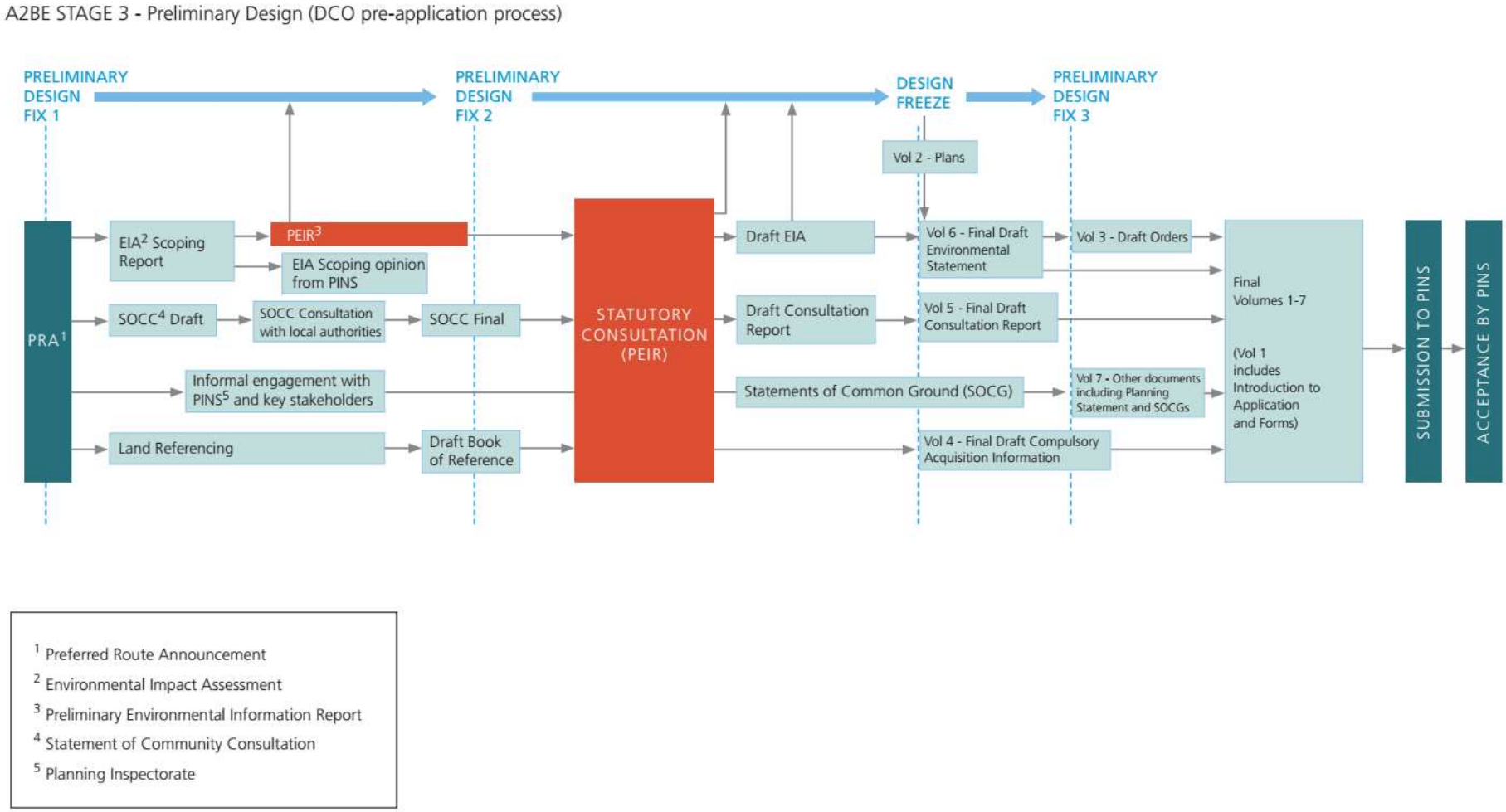
Table 1.1: Planning policy

Scale	Policy Document	Key Considerations for the Scheme
National	Road Investment Strategy (2014)	Promote safe movement, satisfy users of the network, support efficient movement, improved environmental outcomes, support local access and well-being and be demonstrably cost effective.
	National Networks National Policy Statement (NN NPS) (2014)	The Government has produced a series of National Policy Statements (NPS), including the NPS on National Networks (DfT, 2013), which includes roads, published on the 7th May 2014. The National Networks NPS sets out "*the Government's vision and policy for the future development of nationally significant infrastructure projects on the national road and rail networks*" and provides guidance for promoters of NSIPs. The NN NPS identifies that there is a critical need to address road congestion and provide safe, expeditious and resilient networks that should be designed to minimise social and environmental impacts and improve quality of life.
	National Planning Policy Framework (NPPF)	The NPPF sets out the Government's planning policies for England and requirements for the planning system. It provides a framework within which local authorities and residents can produce local and neighbourhood plans reflecting the needs and priorities of communities. The NPPF advises that local authorities should take account of the need for strategic infrastructure, including nationally significant infrastructure within their areas.
Local	Dartford Borough Council Core Strategy Local Plan (2011)	The Core Strategy Local Plan is a long-term plan to regenerate the Borough by outlining where, and how many, new homes, infrastructure and jobs will be created. The first policies of the plan identify locations for major development at Dartford Town Centre/ Northern Gateway, Ebbsfleet to Stone and the Thames Waterfront. Its objectives are also delivered through the Development Policies Plan 2017.
	Gravesham Borough Council Local Plan 2017	The Local Plan sets out a long-term vision for the future of the borough based on evidence of what is needed to support existing and future communities and what makes the borough a distinctive and attractive place in which to live and work. The Local Plan guides the amount, type, location and detailed design of future development and provides a consistent basis against which it can determine planning applications. Additionally, it supports other priorities such as regeneration proposals, investment in infrastructure, work to support local businesses and encourage job creation and efforts to promote healthy communities.
	Ebbsfleet Development Corporation (EDC)	The EDC was established in April 2015 and coordinates investment and new development to meet the needs of residents and businesses. It aims to catalyse development and regeneration of the garden city at Ebbsfleet. The corporation is the planning authority for Ebbsfleet Garden

Scale	Policy Document	Key Considerations for the Scheme
		City but refers to the policies contained in Dartford and Gravesham local plans when determining planning applications in this area.
The following plans and programmes, which support the Local Plans, are also in place:		
	Kent County Council, Kent Transport Plan (2016-2031)	To deliver safe and effective transport, ensuring that all Kent's communities and businesses benefit, the environment is enhanced and economic growth is supported. The County's close proximity to London, nationally important ports, and road and rail connections to the rest of the UK and continental Europe provide real opportunities for continued growth. But, the County is currently facing increased congestion, on both road and rail. Major routes such as the M20/A20, M2/A2 and A21 form important local and strategic links but when they are congested it results in delay on the local network, and can have an impact on the wider strategic network also.
	Kent Thameside Strategic Transport Programme (STP)	The STP will deliver key improvements to the strategic transport network, thereby enabling planned development to come forward. The STP is directly related to the Vision for Kent 2011-22 and actions in Bold Steps for Kent that aim to boost economic prosperity across the county.

2. Appendix B. Development Consent Order (DCO) pre-application process

Figure 2.1: Preliminary Design DCO pre-application process (indicative)



3. Appendix C. PINs Scoping Opinion Comments Log of Responses

3.1.1 The Environmental Scoping Report was published on the Planning Inspectorate (PINS) website in November 2017. A Scoping Opinion was received from PINS in January 2018 based on feedback from statutory consultation bodies. A response from Highways England to the Scoping Opinion comments from PINS is included in Table 3.1 below. Detailed feedback from the statutory consultation bodies included in the Scoping Opinion from PINS are being considered as part of this Preliminary Design Stage and will be addressed in the ES.

Table 3.1: PINS Scoping Opinion comments log with responses

Comment	Highways England Response
Chapter 2 The ES must include a description of the physical characteristics of the Proposed Development which clearly explains the dimensions, location and the horizontal and vertical alignments of the various project elements. Figures should be provided to support the description in the ES and depict the necessary detail.	Further detail will be provided in the ES
Chapter 2 As part of the description of the physical characteristics of the Proposed Development, the ES should provide a description of the volume of materials generated and used in the construction of the Proposed Development. It should also describe the demolition proposals. The ES should include a general construction programme for the development so it is clear how and when works will take place and how effects on the road network will be managed.	Further detail will be provided in the ES
Chapter 2 The Scoping Report states that both permanent and temporary land take will be required and that all land take lies within the DCO boundary shown on Figure A2 of the Scoping Report. Potential locations for construction compounds have been identified within the areas of temporary land. However, the Scoping Report does not include any figures showing which areas of land are likely to be required on a temporary basis or where construction compounds are likely to be located. The ES should provide a description of the land use requirements for both construction and operation phases. It should identify which areas of land are required permanently and which are required on a temporary basis.	For the PEIR the total areas of permanent and temporary land take are provided in hectares in paragraphs 2.4.21 and 2.4.22. More information will be included in the ES.
Chapter 3 The review of alternatives in Chapter 3 of the Scoping Report is welcomed. The ES should include a discrete section that provides details of the alternatives considered and the reasons to support the selection of the chosen option, including a comparison of the environmental effects. The reasons should also include any specific consideration given to support the need for acquisition and demolition of residential properties.	Further detail will be provided in the ES.

Comment	Highways England Response
Chapter 3 The Applicant should make every attempt to narrow the range of options and explain clearly in the ES which elements of the Proposed Development have yet to be finalised and provide the reasons. At the time of application, any Proposed Development parameters should not be so wide-ranging as to represent effectively different development. The development parameters will need to be clearly defined in the draft DCO (dDCO) and therefore in the accompanying ES. It is a matter for the Applicant, in preparing an ES, to consider whether it is possible to robustly assess a range of impacts resulting from a large number of undecided parameters. The description of the Proposed Development in the ES must not be so wide that it is insufficiently certain to comply with the requirements of Regulation 14 of the EIA Regulations.	The PEIR describes in paragraphs 2.4.1 - 2.4.7 areas of uncertainty and where design options are still being considered and consulted on as part of the pre-application consultation process.
Chapter 4 The Inspectorate recommends that in order to assist the decision-making process, the Applicant uses tables: a To demonstrate how the assessment has taken account of this Opinion; b To identify and collate the residual effects after mitigation for each of the aspect chapters, including the relevant interrelationships and cumulative effects; c To set out the proposed mitigation and/or monitoring measures including cross-reference to the means of securing such measures (e.g. a dDCO requirement); d To describe any remedial measures that are identified as being necessary following monitoring; and e To identify where details in the Habitats Regulations Assessment report (where relevant), such as descriptions of European sites and their locations, together with any mitigation or compensation measures, are to be found in the ES	a Table has been included in Volume 3 Appendix C. b This will be included in the ES. c This will be included in the ES. d This is included in the PEIR under each topic where relevant and will be included in the ES. e This is currently included in the PEIR in paragraph 4.12.1 and will also be reported in the ES: 4.12.1. In accordance with the requirements of PINS Advice Note 10: Habitat Regulations Assessment, screening was undertaken at the Options Selection Stage. The outcome was that a Habitat Regulations Assessment is not required for this project, which will be discussed and agreed with Natural England as part of this stage.
Chapter 4 The Inspectorate understands that traffic modelling will be used to underpin both the design of the Proposed Development and to assess its likely effects. The ES should clearly explain how traffic and transport modelling has been applied to the assessments in the ES. The Applicant should seek to agree the approach to traffic modelling with Kent County Council (KCC), Dartford Borough Council	This will be included in the ES.

Comment	Highways England Response
(DBC), Ebbsfleet Development Corporation (EDC) and Gravesham Borough Council (GBC).	
Chapter 4 The Inspectorate considers that where a DCO application includes works described as 'associated development', that could themselves be defined as an improvement of a highway, the Applicant should ensure that the ES accompanying that application distinguishes between; effects that primarily derive from the integral works which form the proposed (or part of the proposed) NSIP and those that primarily derive from the works described as associated development, for example through a suitably compiled summary table. This will have the benefit of giving greater confidence to the Inspectorate that what is proposed is not in fact an additional NSIP defined in accordance with s22 of the PA2008.	This is noted - the proposed development is described in the PEIR Chapter 2 and this will be included in the ES and written to reflect PINs requirements.
Chapter 4 Some of the text in the Scoping Report, particularly the legend for the figures in Appendix C, is small scale and difficult to read both on the paper and electronic copies. The Applicant is reminded that the information in the ES including any figures should be clear and accessible to readers.	Figures are now included in Volume 3 figures of the PEIR appendix so are clearer and more legible. The same approach will be included in the ES.
Chapter 4 - Baseline The ES should include a description of the baseline scenario with and without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge.	This is reported in PEIR section 4.5 and will be also reported in the ES.
Chapter 4 The consultation responses from DBC and GBC highlight concerns that the receptors identified in the Scoping Report do not recognise much of the development which is currently being implemented and occupied (see Appendix 2). The Applicant must ensure that the receptors considered in the EIA accurately reflect existing, current and future. DBC- It is disappointing that one of the reasons for the junction improvement is the new development in the area but there appears to be little consideration of such development which has already being implemented and is occupied,	An agreed list of development is being collated with inputs from DBC and GBC, and EDC and will be considered in the ES. The effects of the London Resort Scheme are not being assessed as there are no scenarios in which both projects will be built.

Comment	Highways England Response
particularly in terms of receptors. Instead the receptors seem to be based on a now out-dated baseline information and mapping. The Council would request that the Assessment is based on the developments that have been occupied recently and are continuing to be built out and will be occupied by the time the scheme is implemented. The Council considers that it is also important to note that growth in the area should be based on Core Strategy figures and is overall considerably more than the Ebbsfleet Garden City number often quoted through the document. GBC - The broad brush of the assessment process follows standard guidance and as such meets the overall objectives of the process, except for the points and additional information highlighted below. As a general point affecting a number of topics areas it is important that assessments in relation residential properties take account of properties for which planning permissions exist, as well as those which is currently on the ground. In Gravesham's case this is relevant to Springhead where development is proceeding. EDC/17/0151 contains the latest masterplan (EDC website).	
Chapter 4 The ES should contain the timescales upon which the surveys which underpin the technical assessments have been based. For clarity, this information should be provided either in the introductory chapters of the ES (with confirmation that these timescales apply to all chapters), or in each aspect chapter.	The surveys and timing will be included in the ES.
Chapter 4 The study areas used for the assessments in the ES should reflect the zone of influence for the Proposed Development. It is acknowledged that this will vary for different aspects of the environment but the ES must clearly explain the justification for the extent of each study area. The Applicant should seek to agree the study areas with the relevant stakeholders wherever possible.	The study area for each topic is defined in the PEIR that will be shared with the consultation bodies and local community at the pre-application consultation process.
Chapter 4 The comments from DBC and GBC (see Appendix 2) highlight concerns that the receptors identified in the Scoping Report do not include the occupants of new development which is in the process of being implemented, and in some cases, is already occupied. The assessments in the ES must include examples of the	An agreed list of development is being collated with inputs from DBC and GBC, and EDC and will be considered in the ES. The effects of the London Resort Scheme are not being assessed as there are no scenarios in which both projects will be built.

Comment	Highways England Response
full range of receptors likely to be significantly affected by the Proposed Development.	
Chapter 4 Strategic traffic modelling will underpin a number of assessments in the ES. It must be based on growth figures that take account of the permissions already being implemented, extant permissions yet to be implemented and the allocations in the relevant Local Plan documents. It should also take account of traffic growth associated with any other major developments such as the London Resort.	The ES will describe the strategic traffic baseline and modelling used to inform the assessment. An agreed list of development is being collated with inputs from DBC and GBC, and EDC and will be considered in the ES. The effects of the London Resort Scheme are not being assessed as there are no scenarios in which both projects will be built.
Chapter 4 The Inspectorate expects the ES to include a chapter setting out the overarching methodology for the EIA, which clearly states which effects are 'significant' and 'non-significant' for the purposes of the EIA. Any departure from that methodology should be described in individual aspect assessment chapters.	The EIA methodology is described in Chapter 4 of the PEIR and will also be included in the ES.
Chapter 4 The ES should include details of difficulties (for example technical deficiencies or lack of knowledge) encountered compiling the required information and the main uncertainties involved.	Can add section on this to ES- Scoping had 'Dealing with uncertainties' section but this has been removed from ES. We could add into PEIR if needed.
General Comment - Residues and emissions The EIA Regulations require an estimate, by type and quantity, of expected residues and emissions. Specific reference should be made to water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation and quantities and types of waste produced during the construction and operation phases, where relevant. This information should be provided in a clear and consistent fashion and may be integrated into the relevant aspect assessments. Commentary to be provided only if there is an issue or omission in relation to water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation and quantities and types of waste produced during the construction and operation phases or greenhouse gases (GHG). Specific areas to consider include impact on soil, farming production and field drainage.	Residues and Emissions will be assessed and reported in the ES.

Comment	Highways England Response
General Comment - Mitigation Any mitigation relied upon for the purposes of the assessment should be explained in detail within the ES. The likely efficacy of the mitigation proposed should be explained with reference to residual effects. The ES should also address how any mitigation proposed is secured ideally with reference to specific DCO requirements or other legally binding agreements. The Scoping Report identifies measures to be included in the Construction Environmental Management Plan as mitigation for effects on several aspects of the environment. If mitigation is being relied on to avoid significant effects then the ES should clearly state what these measures are and how their delivery would be secured.	A mitigation and residual effects section is included in each topic chapter of the PEIR that will also be included in the ES.
General Comment - Major accidents and disasters Section 4.13 of the Scoping Report states that the ES will consider the vulnerability of the Proposed Development to the risk of major accidents and/or disasters and any consequential changes in the predicted effects of it on aspects of the environment. The ES will define 'Major' events relevant to the Proposed Development using professional judgement and then describe the potential for any change in the significance of effects on aspects of the environment. Major events will be reported in the relevant ES topic chapters. The Inspectorate has had regard to the information in the Scoping Report and considers that this is appropriate given the nature and characteristics of the Proposed Development. However, where the assessments in the ES rely on professional judgement the reasoning behind it should be clearly explained and justified.	Added in section in Chapter 4 of the PEIR and this will be discussed further in the ES.
General Comment - Transboundary effects The Inspectorate considers that where Regulation 32 applies, this is likely to have implications for the examination of a DCO application. The Inspectorate recommends that the ES should identify whether the Proposed Development has the potential for significant transboundary impacts and if so, what these are and which EEA States would be affected.	This is reported in the PEIR under Section 4.11 and will also be included in the ES: Transboundary Screening EIA Regulation 32 requires PINS to notify other European Economic Area (EEA) States and publicise an application for development consent if it is of the view that the proposed development is likely to have significant effects on the environment of another EEA Member State, and where relevant to consult with the EEA State affected. No transboundary effects are

Comment	Highways England Response
	anticipated due to distance and the likely magnitude of impacts from the Scheme
Air Quality - Para 5.4.18- 19 (Receptors) Paragraph 5.12.2 indicates that three AQMAs are likely to be affected by the Proposed Development. The Scoping Report does not clearly explain how the impacts to the AQMA will be assessed. The assessment in the ES should be explicit in assessing impacts to the AQMA and explain how the Proposed development will/will not contribute to the achievement of any relevant AQMA Air Quality Action Plan. The Inspectorate notes the response from GBC that Figure A-1 of the Scoping Report does not show the correct boundaries for the A2 AQMA (see Appendix 2 of this Opinion). The ES must be based on the up to date boundaries of the relevant AQMA.	Receptors within the AQMAs will be included in the air quality assessment, and pollutant concentrations at these receptors will be estimated to show the change with the scheme. AQMA are identified on Figure 5.2 in Volume 3 of the PEIR and will be included in the ES.
Air Quality - Para 5.4.18-19 (Receptors) The list of receptors does not include Ebbsfleet Marshes Local Wildlife Site (LWS) or the areas of ancient woodland within 200m of the DCO boundary, despite the observation in the Biodiversity chapter of the Scoping Report that there is potential for these sites to be affected by dust these receptors should be assessed in the ES including the impacts from increased dust emission on the LWS and the ancient woodland.	If the sites are potentially sensitive to dust then these will be included within the ES as part of the construction dust assessment.
Air Quality - Para 5.6.1 and 5.7.5 (Assessment of construction vehicle emissions) Paragraph 5.6.1 of the Scoping Report states that quantitative assessment of construction traffic emissions will be undertaken if information on traffic levels and movements is available. However, paragraph 5.7.5 states that a quantitative assessment will be undertaken. The ES should include a quantitative assessment of the effects of construction traffic emissions	The air quality assessment will be included in the ES based on the traffic model and available traffic data available at that time. The two paragraphs are saying the same thing: paragraph 5.75 also notes that an assessment will be carried out based on the available information available at this stage.
Air Quality - Para 5.7.6 (operational impacts) The operational air quality assessment will consider PM10 and NOx. It is noted that impacts associated with fine particulate matter (PM2.5) would not be assessed as part of the air quality assessment. No evidence of the existing PM2.5 levels has been provided within the Scoping Report. The Inspectorate considers that the ES should include an assessment of impacts associated with increased PM2.5 resulting from the Proposed Development. In determining significance, the assessment should take into account performance against	Highways England periodically reviews the latest measured PM2.5 concentrations collected across the UK by the Department for Environment, Food and Rural Affairs (Defra). None of the measured PM2.5 concentrations were above the annual mean EU limit value of 25µg/m³ in 2017. The highest measured concentration, with sufficient data capture (90% or more) was 16µg/m³ at Camden roadside, substantively below the limit value.

Comment	Highways England Response
relevant target/limit values. GBC has also advised that the ES should consider the effects of PM2.5 (see Appendix 2).	Highways England has calculated an increase in PM2.5 associated with an example of a large increase in 10,000 vehicles a day at a point very close to the edge of a motorway (5m). This results in an approximate increase in PM2.5 of 0.5µg/m³, and even allowing for an uncertainty estimate of a factor of 2, would result in a maximum change 1µg/m³. Combining a maximum increase in road side PM2.5 of 1µg/m³ with the maximum measured PM2.5 concentration of 16µg/m³ in the UK, would result in a concentration of 17µg/m³, which is 8µg/m³ below the limit value. On this basis there is no risk that an individual scheme would exceed the PM2.5. EU limit value and consequently Highways England will not undertake an assessment of PM2.5 for this scheme."
Air Quality - Para 5.8 (vulnerability to major accidents and disasters) This section of the Scoping Report describes potential vulnerabilities and their likely effects on air quality. It does not explain if or how these events would be assessed in line with the approach described in section 4.13 of the Scoping Report. The ES should assess any significant effects on air quality from major accidents and disasters using the approach described in section 4.13 of the Scoping Report.	An assessment in line with Section 4.9 will be included in the ES.
Noise and vibration - Para 6.4.2-6 (Receptors) The Scoping Report lists various general categories of noise-sensitive receptors within 1km of the Proposed Development. It does not make any reference to the NIAs. The ES should clearly identify noise sensitive receptors. The receptors should include the NIAs or the ES should explain how the receptors that have been chosen take the NIAs into account.	Additional information included in methodology in PEIR Appendix E Volume 3. Table 6-1 TBC created to present the list of NIAs and more information on each one. Text in Section 6.4 in the PEIR updated to include more reference to NIAs. These amendments will be included in the ES.
Noise and vibration - Para 6.7.2 (Noise Modelling) The ES should explain how noise modelling of baseline conditions and the effects of the Proposed Development has been undertaken. It should provide a justification for the approach used and be agreed with relevant consultees wherever possible.	Text updated to include more details of the modelling in PEIR Appendix E Volume 3 and will be included in the ES.
Noise and vibration - Para 6.7.9 (Def of SOAEL and LOAEL) The Scoping Report states that the thresholds assigned will be based upon	Text updated to include additional information on methodology in PEIR Appendix E Volume 3 and will be included in the ES. Includes more

Comment	Highways England Response
prevailing guidance for environmental noise assessments and noise thresholds associated with impacts on human health. To be consistent with the Noise Policy Statement for England, SOAEL and LOAEL should be defined for all of the construction and operational noise and vibration matters assessed. The ES should explain how SOAEL and LOAEL have been defined, which standards have been relied on and why these standards are appropriate.	information on the SOAEL and LOAEL for operational noise, and mentions that construction noise thresholds will be based on baseline noise levels.
Noise and vibration - Para 6.7.16 (Mitigation in modelling) The Scoping Report states that detailed noise modelling will be undertaken with potential noise mitigation in place and the proposed measures will be reviewed based on the results of the noise modelling. While the iterative approach to developing mitigation is welcomed, the ES must clearly explain which specific mitigation measures have been taken into account in the noise modelling presented in the ES.	Text updated to include additional information on methodology in PEIR Appendix E Volume 3 and will be included in the ES.
Noise and vibration - Para 6.8 (vulnerability to major accidents and disasters) This section of the Scoping Report describes potential vulnerabilities and their likely effects on noise levels. It does not explain if or how these events would be assessed in line with the approach described in section 4.13 of the Scoping Report. The ES should assess any significant effects resulting from major accidents and disasters using the approach described in section 4.13 of the Scoping Report.	An assessment in line with Section 4.9 will be included in the ES. The assessment in the ES will use typical data predicted over a significant amount of time, and unless long term, these accidents and disasters would not affect this.
Noise and vibration - Para 6.9.1 (consultation) The Applicant should make efforts to agree the locations and methods for the collection baseline noise data and the choice of noise sensitive receptors with the councils.	Agreed. There are plans to consult with the LPA. As indicated in PEIR Section 6.3.
Biodiversity - Table 7-6 (Scoped Out - European sites and non-statutory Local Nature Reserves) Effects on these sites have been scoped out on the grounds that they are not within the EZoI for the Proposed Development. However, the Inspectorate has concerns about how the EZoI are defined and so does not agree at this stage that these sites can be scoped out. The definition of the EZoI appears to be based on the standard guidance within the DMRB. The Scoping Report states that these distances encompass all the predicted impacts of the Proposed Development but only provide limited justification to support this. The ES must clearly justify the EZoI and therefore the study area used for assessment purposes. This applies to all ecological	Clarification to NE comment sought and received with NE during meeting on 11/01/18. The EZoI is based on DMRB guidance (Vol 11, Section 4, Part 1, HD44/09). It is not anticipated that designated sites outside of the EZoI will need detailed assessment. However, if further traffic modelling and air quality assessment reveal potential impacts to any designated site, then detailed assessment will be provided in the ES.

Comment	Highways England Response
receptors. KCC, DBC and Natural England (NE) have also raised concerns about the adequacy of the study area in relation to effects on designated sites (see Appendix 2).	
Biodiversity - Table 7-6 (Scoped Out - Effects on aquatic invertebrates) Table 7-6 of the Scoping Report indicates that it is considered unlikely on the basis of the data collected to date, that notable aquatic invertebrates would be affected by the Proposed Development but that this will be confirmed during the Preliminary Design Stage. It is unclear therefore whether effects on aquatic invertebrates have been scoped out or not. On the basis of the evidence provided in the Scoping Report the Inspectorate does not agree to effects on aquatic invertebrates being scoped out of assessment in the ES.	It is not anticipated that aquatic invertebrates will need detailed assessment. Full data will be presented in the ES.
Biodiversity - Table 7-6 (Scoped Out - Effects on water vole and otter) The Scoping Report proposes to scope out effects on these species on the basis of data collected and because the Ebbsfleet River is hard engineered in the area surrounding the Proposed Development and culverted beneath the A2. As the Scoping Report does not identify the extent of the river that has been subject to hard engineering and does not include the data referred to in the Scoping Report, the Inspectorate does not agree to effects on these species being scoped out.	It is not anticipated that otter and water vole will need detailed assessment. Full data will be presented in the ES.
Biodiversity - General (Supporting info) Although Figure A-1 shows the location of the SSSI and the ancient woodland, it does not show the location of the LWS or other features of ecological value described in the Scoping Report. The ES must include plans or figures which show the locations of designated statutory and non-statutory wildlife sites, ancient woodland and habitats of principal importance within the EZoI.	LWS will be included on the Environmental Constraints Plan Figure 2.1 in the PEIR Volume 3. Ecological features will be shown on maps in the ES.
Biodiversity - Para 7.4 (Phase 1 habitat survey) The results of the Phase 1 habitat surveys are described in the Scoping Report but no plans or figures are provided. The ES should include the outputs of all the ecological survey work, including relevant plans and figures illustrating the location of all valuable ecological receptors within the EZoI for the Proposed Development (but note the advice on confidential information provided in section 3.4 of this Opinion).	A Phase 1 Survey Figure 7.1will be provided in the PEIR Volume 3. All survey maps will be provided in the ES.
Biodiversity - Para 7.5 (Potential impacts) The ES should assess impacts to valuable ecological receptors including ancient woodland. The Forestry Commission (FC) and NE in Appendix 2 have identified additional potential impacts on Darenth Wood SSSI and areas of	Potential indirect impacts from pollution are identified in paras 7.7.16-7.7.17 and 7.7.22 and table 7-7 TBC. Further detail and assessment will be provided in the ES.

Comment	Highways England Response
ancient woodland which are not discussed in the Scoping Report. These include: · changes to groundwater or surface water run-off which could disturb ancient woodland soils; and · the loss of woodland and scrub which is likely to be acting as an ecological buffer for the SSSI	
Biodiversity - Para 7.5.5 (Scheme design and ancient woodland) It is noted that the design of the Proposed Development is being developed with a view to avoiding impacts on ancient woodland but that this will depend on developing a departure from standard for the Bean junction. The ES must clearly explain which junction design has been used for the assessment of effects on ancient woodland. It should quantify the area of habitats, including ancient woodland, that will be directly lost.	The scheme being assessed will be described in the ES. Total areas of habitat to be lost will be provided in the ES.
Biodiversity - Para 7.7.2 (Habitats and species surveys) The ES should describe the methods used and the timing of surveys of habitats and species. If necessary, survey results should be updated to ensure that the assessments within the ES remain valid at the time any application is submitted.	Noted. This information will be provided in the ES.
Biodiversity - Para 7.7.6 (Use of professional judgement) While reliance on professional judgement is legitimate, the ES should provide an explanation of the reasoning and evidence that support conclusions based on professional judgement.	Noted. This information will be provided in the ES.
Biodiversity - Para 7.8.7 (List of proposed surveys) This list includes National Vegetation Classification surveys for species-rich grassland but not for any of the other notable habitats listed in the Scoping Report. In line with the advice from consultees (FC, KCC, DBC and NE) the ES should include Phase 2 surveys for the woodland areas within the EZoI.	Noted. Further surveys of woodland due to be impacted by the scheme will be added to the list of further surveys in the PEIR in Section 7.7. Survey results will be provided in the ES.
Biodiversity - Para 7.8.7 (List of proposed surveys) The list of proposed surveys does not include any surveys necessary for the arboricultural assessment referred to in paragraph 7.4.7. The ES should identify the location, species and condition of any veteran trees identified within the EZoI. The FC has also advised that the ES should identify any ancient or veteran trees likely to be affected by the Proposed Development.	Noted. An arboricultural assessment has been added to the list of further surveys in the PEIR in Paragraph 7.9.5. Survey results will be provided in the ES.
Biodiversity - Para 7.8.7 (List of proposed surveys) Any areas of land that are proposed for mitigation or compensation measures should also be subject to an appropriate level of survey to establish that their	Noted. Surveys of mitigation/compensation areas added to the list of further surveys in the PEIR in Section 7.4. Survey results will be provided in the ES.

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use for mitigation and compensation will not adversely affect other ecological features.	
Biodiversity - Para 7.9 (proposed consultation) The bodies listed do not include KCC, DBC or GBC. The Applicant should also consult these bodies on species surveys and findings, design and potential mitigation measures. The Applicant is advised to agree the scope of the surveys to be included in the ES with the consultees.	Noted. KCC, DBC and GBC will be added to the list of consultees in the PEIR in paragraph 7.3.3 and will be consulted on the scope of surveys to be included in the ES.
Biodiversity - Para 7.10 (potential mitigation measures) The ES should clearly explain how the 'avoid-mitigate-compensate' hierarchy has been applied to the assessment of effects of the Proposed Development, particularly in relation to effects on ancient woodland. Where compensation measures are proposed, the ES should clearly explain the evidence on the likely success of these measures	Noted. The mitigation hierarchy will be referenced in the PEIR and ES.
Biodiversity - Para 7.10.1 (potential mitigation measures) Translocation is proposed as a method to mitigate effects on man orchid populations. The ES should include evidence on the likely effectiveness of such a measure and, if necessary, measures to ensure the survival of the population after translocation.	Noted. The text in the PEIR will be amended to read that translocation will be considered as a method to preserve notable populations of man orchid adjacent to the Scheme. Further information will be provided in the ES.
Biodiversity - Para 7.11.2 (great crested newt surveys) Surveys have not been carried out for ponds where ecological data already exists. This data should only be relied on in the ES if it can be demonstrated that the data would still be up to date by the time the application is submitted and the surveys are sufficiently robust to be relied on, especially if the data is being relied on to determine an absence of great crested newts.	Noted. Data will be reviewed, updated if necessary, and results provided in the ES.
Biodiversity - Para 7.11.5 (Search for water bodies within 500m of the Proposed Development) Water bodies have been identified through the use of Ordnance Survey plans and aerial photographs. It is considered that even if additional water bodies are identified, the vast majority of water bodies will have been identified and this will be adequate to determine the approximate abundance of great crested newts. The proposed approach is not considered to be in line with good practice. The Inspectorate is concerned that this approach would also limit the confidence in the anticipated population size. The Inspectorate considers that unless otherwise agreed with Natural England, a 500m area from boundary of the Proposed Development application site should be checked to establish if any additional waterbodies are present which require surveys for great crested newt.	It is considered that the approach is proportionate and in-line with good practice. The method will be agreed in consultation with NE and justification for the approach will be provided in the ES.

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Biodiversity - Table 7-6 (Scoped Out - European sites and non-statutory Local Nature Reserves) Effects on these sites have been scoped out on the grounds that they are not within the EZoI for the Proposed Development. However, the Inspectorate has concerns about how the EZoI are defined and so does not agree at this stage that these sites can be scoped out. The definition of the EZoI appears to be based on the standard guidance within the DMRB. The Scoping Report states that these distances encompass all the predicted impacts of the Proposed Development but only provide limited justification to support this. The ES must clearly justify the EZoI and therefore the study area used for assessment purposes. This applies to all ecological receptors. KCC, DBC and Natural England (NE) have also raised concerns about the adequacy of the study area in relation to effects on designated sites (see Appendix 2).	Clarification to NE comment sought and received with NE during meeting on 11/01/18. The EZoI is based on DMRB guidance (Vol 11, Section 4, Part 1, HD44/09). It is not anticipated that designated sites outside of the EZoI will need detailed assessment. However, if further traffic modelling and air quality assessment reveal potential impacts to any designated site, then detailed assessment will be provided in the ES.
Biodiversity - Table 7-6 (Scoped Out - Effects on aquatic invertebrates) Table 7-6 of the Scoping Report indicates that it is considered unlikely on the basis of the data collected to date, that notable aquatic invertebrates would be affected by the Proposed Development but that this will be confirmed during the Preliminary Design Stage. It is unclear therefore whether effects on aquatic invertebrates have been scoped out or not. On the basis of the evidence provided in the Scoping Report the Inspectorate does not agree to effects on aquatic invertebrates being scoped out of assessment in the ES.	It is not anticipated that aquatic invertebrates will need detailed assessment. Full data will be presented in the ES.
Biodiversity - Table 7-6 (Scoped Out - Effects on water vole and otter) The Scoping Report proposes to scope out effects on these species on the basis of data collected and because the Ebbsfleet River is hard engineered in the area surrounding the Proposed Development and culverted beneath the A2. As the Scoping Report does not identify the extent of the river that has been subject to hard engineering and does not include the data referred to in the Scoping Report, the Inspectorate does not agree to effects on these species being scoped out.	It is not anticipated that otter and water vole will need detailed assessment. Full data will be presented in the ES.
Biodiversity - General (Supporting info) Although Figure A-1 shows the location of the SSSI and the ancient woodland, it does not show the location of the LWS or other features of ecological value described in the Scoping Report. The ES must include plans or figures which show the locations of designated statutory and non-statutory wildlife sites, ancient woodland and habitats of principal importance within the EZoI.	LWS will be included on the Environmental Constraints Plan Figure 2.1 in the PEIR Volume 3. Ecological features will be shown on maps in the ES.

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Water - Para 8.4 (baseline) This section of the Scoping Report describes the existing surface and groundwater conditions but no figure has been supplied showing the location of any of the features. The ES must include plans or figures which show the location of the water bodies, aquifers, Source Protection Zones and Flood Zones.	The location of the water bodies, aquifers, Source Protection Zones and Flood Zones and located on Figure 8.1 in Volume 3 of the PEIR.
Water - Para 8.7 (proposed assessment method) The Scoping Report refers to the use of various methods recommended by the DMRB. The ES should include a brief description of the methodology rather than just referring to the DMRB and clearly explain how the significance of effects has been determined.	It was felt appropriate and proportionate for a scoping report not to describe the method proposed in detail. A brief description is included within PEIR in Volume 2 Appendix F and will be included in the ES.
Water - Para 8.9 (proposed consultation) The intention to consult the Environment Agency is welcomed. The Applicant should also consult KCC as the Lead Local Flood Authority for the area affected by the Proposed Development.	AS indicated in Section 8.3 of the PEIR Highways England has consulted the EA and a meeting has been held. A meeting with KCC is planned. Consultation will be fully reported in the ES.
Water - Para 8.10.1 (potential mitigation measures) The Scoping Report notes that mitigation measures will be provided if significant adverse effects are identified. These would be in addition to the embedded mitigation measures within the project's design. The assessments of residual effects in the ES should make it clear which mitigation measures have been taken into account when reaching conclusions about the significance of effects. It should also be clear which measures represent mitigation for the effects of the Proposed Development and which represent improvements to the water environment.	This will be made clear in the ES as at this stage it will be clear what mitigation measures are within the projects design. At scoping stage it is still only at a high-level stage. It is recognised that the level of detail with regards to mitigation will be known at ES stage
Water - Table 8-4 (Consideration of surface water impacts) Table 8-4 refers to effects on the quality of surface waters from run-off and it also refers to an assessment of flood risk. It is not clear from the Scoping Report whether alterations to the quantity of surface water run-off will be covered in the Flood Risk Assessment. The ES must include an assessment of the effects of an increase in surface water run-off. If mitigation such as a Sustainable Urban Drainage System is being relied on to avoid significant effects then the details of the mitigation proposals should be included in the ES. KCC, GBC and the Ebbsfleet Development Corporation (EDC) have also pointed out the need for the ES to consider surface water management issues.	An FRA will cover this detail in the ES. At this stage, details of the drainage system and SUDs will be known
Landscape - Para 9.2 (Study area) The Scoping Report states that the study area has been based on a buffer of	ZTV plans have been added to the PEIR for Winter and Summer views. Views further than 1 km are indicated to the south east of the

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1km from the perimeter of the Proposed Development but that consideration will be given to the wider area for impacts to landscape. Visual impacts beyond the 1km perimeter have been scoped out as they are not expected to be significant. However, the Scoping Report does not include any evidence to support the statement that the proposed study area is adequate to capture all likely significant effects. The ES should clearly explain and in the assessment of landscape and visual impacts. Paragraph 9.6.4 states that Zones of Visual Influence will be produced. The Inspectorate advises that this should be used as the basis for defining the study area.	scheme in particular, however, there are existing long range views of the A2 from the south east and changes proposed would not make a significant change to these long views. This would be explained more fully in the ES. Changes to lighting or increase in the number of gantries would be assessed.
Landscape - Table 9-5 (National Character Area - Regional Landscape Character Areas) The Scoping Report states that the relatively small scale of the Proposed Development would not result in significant effects on landscape character for national or regional landscape character areas. The Scoping Report does not provide any supporting evidence to justify this approach. On that basis the Inspectorate does not agree that significant impacts to national and regional character areas can be scoped out of the ES. The ES should assess the potential impacts to both national and regional landscape character receptors for effects on these receptors.	Figure 9.2 has been added to the PEIR showing the National Character areas and will be included in the ES.
Landscape - Table 9-5 (Local Landscape Character Areas B and D - Beacon Wood Country Park, Darenth Country Park) The potential for significant effects on these receptors has been excluded on the grounds that there is no indivisibility between them and the Proposed Development. No supporting evidence (such as a Zone of Theoretical Visibility) has been provided to support this statement so the Inspectorate does not agree that impacts on these receptors can be scoped out. EDC also advise in their consultation response (see Appendix 2) that impacts on Darenth Country Park should not be scoped out from the assessment.	The ZTV plans have been added to the PEIR Figures 9.6 in Volume 3 that clearly show that there are no views of the scheme from Darenth Country Park. There are possible views from the edge of Beacon Wood Country Park and these will be verified on site, as will the possible views from parts of character areas A and D. The full assessment will be included in the ES.
Landscape - Table 9-6 (Various residential receptors) The potential for significant impacts to various residential receptors has been excluded on the basis of screening by existing vegetation or topography. No plans or figures have been provided showing the location of individual receptors which makes it difficult to verify the statements made in the Scoping Report. The Inspectorate does not agree that impacts on these receptors can be scoped out on the basis of the evidence presented in the Scoping Report.	Figure 9.7 showing Key Visual Receptors Locations is included in the PIER Volume 3 and will be included in the ES.

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Landscape - Table 9-8 (Various PRoWs) No plans or figures have been provided to show the location of these PRoWs which makes it difficult to verify the statements in the Scoping Report. The Inspectorate does not agree that impacts to these receptors can be scoped out from assessment in the ES.	Figure 9.1 showing PRoW has been added to the PEIR Volume 3 and will be included in the ES.
Landscape - Para 9.4 (Baseline conditions) Table 9-3 describes the relevant key characteristics of the regional Landscape Character Areas. The ES should include plans or figures that show the location of these areas. It is not clear how the Local Landscape Character Areas have been derived (LLCA). The ES should explain the source of these LLCA and provide a map showing the location of the different areas.	Figure 9.3 has been added to the PEIR Volume 3 showing the location of the Local Landscape Character Areas. These were determined at the Option Selection Stage.
Landscape - Para 9.5.11-14 (Potential visual impacts) The impacts described do not include the sequential effects on views experienced by users of PRoW or roads. While Chapter 13 of the ES (People and communities) refers to views from the road experienced by vehicle travellers it does not address effects on views from PRoW. The ES should assess the potential for significant sequential effects on road and PRoW users.	Sequential effects for PRoW users will be considered as part of the ES and have been included in the PEIR in paragraphs 9.5.7 - 9.5.14 and will be included in the ES.
Landscape - Para 9.6.7 (Visual receptors) The consultation response from DBC (see Appendix 2) advises that much of the land north of the A2 is already covered by extant planning permissions. The Inspectorate considers that the ES should also assess impacts to these 'future receptors' in the visual impact assessment.	A list of planning applications which have theoretical views according to the ZTV plans have been added to the PEIR in Section 9.8 and will be assessed in the ES.
Landscape - Para 9.9.1 (Proposed consultation) The Applicant should make an effort to agree with relevant consultees (where possible) the visual receptors and the viewpoints to be used in the assessment. It is noted that DBC and GBC will be consulted.	As described in Section 9.3 of the PEIR, DBC and GBC will be consulted, KCC were contacted but referred us to DBC and GBC for consultation on visual receptors and viewpoints. Details of the consultation will be included in the ES.
Landscape - Para 9.11.2-3 (Details of highway infrastructure and construction infrastructure) The Scoping Report states that certain details of highway infrastructure such as communications cabinets will not be available at the time of assessment although it is assumed that information on lighting, gantries and extent of site clearance will be. If detailed construction information is not available at the time of assessment, assumptions will be made about the location of haul roads, construction compounds and storage. Where details of highways and construction infrastructure are not available at the time of the assessment, the	Where details of highways and construction infrastructure are not available at the time of the assessment, the ES will explain what parameters the assessment has been based on and how these represent the worst case scenario for the Proposed Development and take account of the advice on flexibility in section 2.3 of this Opinion and the Inspectorate's Advice Note 9: Rochdale Envelope.

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ES must explain what parameters the assessment has been based on and how these represent the worst case scenario for the Proposed Development. The ES should take account of the advice on flexibility in section 2.3 of this Opinion and the Inspectorate's Advice Note 9: Rochdale Envelope.	
Geology and Soils - Table 10.7 (Re-use of soils and waste soils) The Scoping Report states that this matter is discussed in Chapter 12 Materials and Waste. However, the Inspectorate notes that the re-use of soils and waste water is not discussed within Chapter 12 and therefore the Inspectorate does not agree that this matter can be scoped out and an assessment should be included in the ES.	Chapter 12 will cover all aspects of re-use of soils in the ES including its appropriate use (environmental risk assessments).
Geology and Soils - Para 102.1 (Study area) The Scoping Report lacks sufficient justification as to why a 500m study area extending from the red line boundary has been chosen. The Applicant should include a concise justification of their chosen study area within the ES.	Justification is provided in the PEIR Vol 2 paragraph 10.2.1 and will be included in the ES
Geology and Soils - Para 10.4 (Baseline) The Applicant should provide a figure outlining where the Local Geological Site (LGS), deneholes, potential ground stability risks and earthwork defects are located within the study area. This will make it easier to identify where areas of high value and/or sensitive receptors are located.	Figure will be included in ES.
Geology and Soils - Para 10.6.2 (Proposed level and scope of assessment) The Applicant states that ground investigations will be carried out but the data collected is not expected to be included within the ES. Instead a simple level of assessment will be included in the ES, based on desk studies. A more detailed assessment will be undertaken when GI data is available and the results will be made available during the Examination. If a detailed assessment is required then this should be included in the ES along with the data from the GI.	The methodology has been reworded to reflect the possibility that the GI data/GQRA will not be ready before submitting the ES, but what is available will be taken into account in the ES. The GI cannot be guaranteed to be completed by the deadline due to the lengthy process, restrains due to the high-risk nature of the site and external factors (sub-contractors).
Geology and Soils - Para 10.7 (Proposed assessment method) The Scoping Report demonstrates some duplication of effort with assessments proposed for the risk of contamination of surface water bodies and groundwater being described in both this chapter of the Scoping Report and in Chapter 8 Road drainage. The methodologies appear to be slightly different. The ES should contain one assessment of the risks of contamination for surface water bodies and groundwater. If the assessment is relevant to more than one chapter the Inspectorate advises that it should be cross-referenced to avoid duplication.	Agreement with Highways England that the Water and Drainage chapter 8 in the PEIR will assess the potential for spills on the highway, and Geology and soils PEIR chapter 10 will cover risk to controlled waters from land contamination. This will also be included in the ES.
Geology and Soils Para 10.7.9 (Determination of significance) The Scoping Report states that major and moderate effects are, as a rule,	Noted - this will be clearly explained in the ES. See Vol 2 Paragraph 10.3.21 where this is described within the methodology.

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considered to be significant but then states that professional judgement is also applied where appropriate. The ES should clearly explain the reasoning used to determine the significance of an effect. This also applies where professional judgement is being relied on to reach a conclusion.	
Geology and Soils - Para 10.7.11 (Impact assessment) The receptors for the assessment of the potential effects the Proposed Development will have on human health are not clearly defined. The ES should provide a more detailed definition of what constitutes a 'nearby' receptor and how it relates to the extent of the anticipated impact)	Noted, receptors will be clearly defined in the ES.
Geology and Soils - Para 10.7.16 (Agricultural soils assessment methodology) The Applicant has developed a 'bespoke system' to assess the impact on the loss of BMV land but does not set out how the system will work. The Applicant should provide a description of the system within the ES. The Applicant has also included a partial methodology for the assessment of agricultural soils within Chapter 13 People and Communities. In the ES, the Applicant should include all of this information within one chapter and cross-reference from other chapters as appropriate.	Agricultural land and BMV land will be assessed in chapter 13 and is no longer considered in Soils and Geology.
Cultural Heritage - Table 11-4 (Scoped out - Historic landscape) Paragraph 11.4.21 refers to the Historic Land Characterisation (HLC) by the Kent Historic Environment Record but only provides limited information on the features of the HLC. No plans or figures have been included in the Scoping Report to show the extent of these areas. The Scoping Report does not therefore provide enough evidence for the Inspectorate to agree with the statement in Table 11-4 that the scale of the Proposed Development is not at a level where an assessment of the historic landscape is required. The ES should either include an assessment or a fully reasoned justification for the lack of one.	The historic landscape will be assessed as part of the ES and VZI will be set out in the cultural heritage chapter.
Cultural Heritage - General Comment (Presentation of archaeological information) KCC's response requests that archaeological information is presented to show the layout of key features rather than as point data. The Inspectorate agrees that the archaeological information in the ES should be presented in this way.	The PEI figures will show all key features provided by the HER, but this will include findspots and historic buildings, which are indicated using points.
Cultural Heritage -Para 11.2 (Study area) Responses received from KCC, DBC, EDC and GBC (see Appendix 2) point out that the area around the boundaries of the Proposed Development is quite likely	More detail on the study area and its justification have been added to the PEIR.

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to contain valuable archaeological remains. The Inspectorate requires that the study area in the ES is sufficient to allow an understanding of the archaeological context of the site. The ES should assess impacts on all archaeological remains likely to be impacted by the Proposed Development.	
Cultural Heritage -Para 11.4.6 (Scheduled monuments) The Scoping Report states that there are 5 Scheduled Monuments within the study area. However, the Palaeolithic sites near Bakers Hole appear to be beyond the limits of the study area. The ES should clearly identify which Scheduled Monuments are within the study area and likely to experience impacts from the Proposed Development.	Noted. The PEIR has previously picked this up following the submission of the Scoping Report and has been amended to address this. All assets have been recounted (note changes in number of Scheduled Monuments and Listed Buildings within the site/study area). No change to the PEIR is required as the numbers have previously been updated.
Cultural Heritage -Para 11.4 (Baseline conditions) This section of the Scoping Report reviews the information available on known heritage assets. The response from Historic England (see Appendix 2) identifies additional sources of information which may not have been entered onto the Historic Environment Record. This information should be reviewed and where relevant used to inform the assessment in the ES.	Noted, these additional sources/reports will be determined and added to the ES. See new text in PEIR under 'previous archaeological investigations' which makes reference to the other sources identified by Historic England.
Cultural Heritage -Para 11.5 (Potential impacts) The ES must assess the full range of impacts likely to result from the Proposed Development, including indirect impacts such as alteration to groundwater levels. This point is reinforced by the responses from Historic England, KCC, DBC and GBC in Appendix 2.	Cumulative impacts are addressed in the ES. No change to the PEIR has been made following the comment.
Cultural Heritage -Para 11.7.1 (Assessment method) The Scoping Report gives a very broad description of the methods to be used in carrying out the assessment and it is noted that some points (such as the location and extent of trial trenching) are still to be resolved. The reporting in the ES must explain the methods used in the assessment and which guidance was used to inform the choice of method.	This will be addressed in the ES. No change to the PEIR has been made following the comment.
Cultural Heritage -Para 11.9 (Proposed consultation) It is noted that the Applicant intends to consult Historic England and the Kent	This has been actioned.

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Heritage Conservation Team. The Applicant is advised to agree the scope and methods of fieldwork with these bodies.	See additional text in 'non-designated heritage assets' section of the PEIR which confirms that scope will be agreed with KCC.
Cultural Heritage -Para 11.10 (Potential mitigation measures) Historic England have advised that nationally significant archaeological remains should be conserved in situ and physical and setting impacts for all assets should be reduced as far as possible. The ES should explain how consideration has been given to these points, and how the scheme has been designed to conserve heritage assets where possible.	Noted, the ES will show how consideration has been given to avoidance of impacts and conservation of assets firstly through design. It will then describe how any remaining impacts have been reduced as far as possible where such effects are likely to be unavoidable and provide a balance justification. No change to the PEIR has been made following the comment.
Cultural Heritage -Para 11.10 (Potential mitigation measures) The NNNPS states that where there is a high probability of as yet undiscovered heritage assets with archaeological interest, the Secretary of State should consider requirements to ensure that appropriate procedures are in place for the identification and treatment of such assets discovered during construction. The ES should contain a mitigation strategy which explains the actions that would be taken in the event of discovering previously unrecorded heritage assets during construction.	Noted, the relevant mitigation strategy will be included in the ES. No change to the PEIR has been made following the comment.
Cultural Heritage -Para 11.11.1 (Assumptions) The Scoping Report assumes that works necessary for the delivery of the Proposed Development will be restricted to land within the study area and will avoid assets of medium to high value. However, if the DCO does not restrict works in this way then the ES must assess the full range of impacts which could result from the works consented in the DCO.	Consideration of all scheme impacts within the agreed DCO boundary will be addressed in the ES. Statement has been added to PEIR.
Cultural Heritage -Para 11.11.2 (Limitations) The Scoping Report states that the locations for construction compounds, soil storage, ecological mitigation and water management have not been decided and these additional works have the capacity to have impacts on heritage assets. If the locations of these have not been confirmed at the time of assessment then the ES must explain the parameters that the assessment has been based on and how these represent the worst case scenario for the effects of the Proposed Development.	Information on compound location, soil storage etc. is not currently available for the PEIR; however, this will be included in the ES once this design information is available. Statement has been added to PEIR.

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Materials and Waste - Para 12.6.3/ Table 12-5 (Scoped out - Vulnerability to major accidents and disasters) The Applicant states that a review of major accidents and disasters has been undertaken and is considered to not have a significant effect on material resources. However, the Inspectorate notes that the Scoping Report lacks evidence of the review into how accidents and disasters will impact waste and materials. Therefore, the review should be included and discussed within the ES	This will be addressed in the ES.
Materials and Waste - Para 12.4 (Baseline) The baselines reported for material resources and waste infrastructure capacity are based on data gathered in 2014/15 and 2011 and 2015 respectively. By the time construction commences this information is likely to be out of date. The ES should include a future baseline based on the most recent data available to the Applicant. KCC have advised that updated evidence on waste capacity is now available (see Appendix 2).	Noted, ES will be updated with data from the report below: Kent Waste Needs Assessment 2017 - Construction, Demolition & Excavation Waste Management Needs
Materials and Waste - Para 12.5.2 (Potential impacts) The Inspectorate acknowledges that the amount of waste arising is unknown at this stage of the Proposed Development. The assessment in the ES should be based on the most likely waste arisings for the Proposed Development. If this information is not available, a worst case scenario estimation of the quantity of waste generated should be used to inform the assessment within the ES.	Noted, assessment will be based on worst case if no other, more relevant information is available at the point of writing the ES
Materials and Waste - Para 12.6 (Level and scope of assessment) The consultation response from KCC advises that it is not clear from the Scoping Report if the junction improvements would lead to the sterilisation of Minerals Safeguarding Areas for sand and gravel. The ES should make it clear if the Minerals Safeguarding Areas will be affected; if they are then the Applicant should undertake a Minerals Assessment in consultation with KCC.	This has been addressed in Chapter 10 geology and soils in the PEIR in paragraph 10.5.24 and will be included in the ES.
Materials and Waste - Para 12.11.1 (Assumptions and limitations) It is stated that contaminated soils will be considered separately to contaminated waste. However, no details of how contaminated soils will be considered are included within the Scoping Report. An assessment of impacts associated with contaminated soils should be included within the ES.	This has been addressed in Chapter 10 geology and soils in the PEIR in paragraphs 10.5.5 -15 and will be included in the ES.

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P&C - Para 13.1.1, 13.5.24, 13.5.16, 13.6.12 (Agricultural land and agricultural soils) The Scoping Report states that DMRB Volume 11, Section 3, Part 6 (Land Use), will be incorporated within this Chapter, in accordance with IAN 125/15. However it is then stated that agricultural soils and agricultural land will be considered within the Geology and Soils Chapter of the ES. The Scoping Report also outlines that a full Agricultural Land Assessment may be required, if over 20ha of Best and Most Versatile (BMV) land will be lost as part of the scheme. It appears that agricultural land take, type of husbandry and severance are currently proposed to be assessed by both the People and Communities chapter and the Geology and Soils Chapter. The ES should contain one assessment for these matters. Where this assessment is relevant to more than one chapter in the ES, the Inspectorate advises that it should be cross-referenced to avoid duplication.	The assessment of agricultural land (BMV) has been addressed in the People and Communities Chapter 13 in the PEIR in paragraphs 13.5.7 - 8 and cross referred to in the Geology and Soils chapter 10. Soil degradation will still be included in Geology and Soils chapter 10 paragraphs 10.5.16 - 17 as per their DMRB topic guidance. The assessments will be included in the ES. Agricultural land classification plan to be produced for the main ES.
P&C - Para 13.2.1 (Study areas) The ES should include a clear justification for each of these study areas with corresponding figures to aid understanding. The Inspectorate notes that DMRB Volume 11, Section 3, Part 8, Para 2.2, states that community facilities 'and their catchment areas' should be covered by the assessment. It should be clear in the ES how this requirement has been taken into account in the selection of appropriate study areas. The ES should explain how the routes affected by the Proposed Development have been identified for the purposes of the assessment of community severance, accessibility and connectivity.	Figure 13.1 in the PEIR Volume 3 has been prepared and will be amended as required for the main ES to illustrate the location of the key receptors to the proposed scheme. The study area and justification will be set out more clearly and this is based on mixture of professional judgement and experience and will include potential receptors identified in other chapters that are relevant to people and communities.
P&C - Para 13.2.1 (Study areas for amenity effects) The consultation responses from KCC, EDC and DBC advise that current congestion around the Bean junction leads to drivers seeking alternative routes, which suggests that the effects of the Proposed Development in relation to driver stress could extend over a greater area than the study area described in the Scoping Report. The ES should clearly explain how the study area has been defined and how this captures the zone of influence of the Proposed Development.	There is no specific guidance in DMRB regarding study area extend. The driver stress assessment within the People and Communities study area is influenced by the traffic model/ assessment undertaken for the wider scheme. Driver stress assessment will draw on the traffic modelling data available for the ES looking at affected routes within 250m of our scheme as per best practice (this study area for driver stress was used for M20 J10A).

Comment	Highways England Response
P&C - Para 13.4 (Baseline conditions) The Applicant is advised to include plans and figures to depict the location of receptors included within the assessment to aid understanding, such as community facilities and PRoW.	Figure 13.1 in the PEIR Volume 3 has been prepared and will be amended as required for the main ES showing the key receptors being considered in the assessment including: private dwellings, community assets and facilities (as outlined in DMRB Volume 11, Section 3, Part 8, Para 2.2) development land, agricultural land, public rights of way.
P&C - Para 13.4.5-8 (Baseline conditions) When identifying community facilities the Applicant is advised to include reference to DMRB Volume 11, Section 3, Part 8, Para 2.2 , which identifies key community facilities to be included in the assessment (where relevant): doctors' surgeries; hospitals; aged person homes; schools; shops; post offices; churches and parks, play areas, sport centres etc. In some cases it may be necessary to assess other important facilities (for example, libraries, railway stations, bus services, riding schools).	Figure 13.1 in the PEIR Volume 3 has been prepared and will be amended as required for the main ES. The type of facilities identified in the comment will be included in the ES if they are within the study area/ or those which are outside that are likely to be affected during construction/ operation in guidance within the DMRB.
P&C - Para 13.4.13 (Community severance) The level of impact for community severance is not anticipated to be significant for community access to services and facilities. The Inspectorate is not satisfied that sufficient evidence has been provided to support this statement. The ES should assess the effects of temporary and permanent closures and diversions of footpaths and PRoW on community severance. The consultation response from KCC reinforces this point (see Appendix 2).	The ES will look at potential for community severance and report impacts as a result of the proposed scheme. There is potential for community severance during construction, such as between communities and their facilities to the south of the A2 and communities and facilities to the north.
P&C - Para 13.7.21 (Amenity effects) The Scoping Report states that amenity effects will be assessed elsewhere in the ES. It should be clearly stated in the ES where amenity effects have been assessed.	Assessment within the ES will identify receptors likely to experience a combination of two or more significant amenity effects. This assessment will draw form the findings of other chapters within the ES, including LVIA, Noise and vibration, Air quality etc.
P&C - Para 13.7.24/ Table 13-8 (Assessment criteria) The Scoping Report states the assessment criteria for the assessment of community facilities and land used by the community have been developed using professional judgement. However, the criteria use phrases such as 'substantial change to a modest number' without providing any detail on what constitutes a substantial change or a modest number. The ES methodology	Assessment methodology within the ES will provide quantification.

Comment	Highways England Response
should include some quantification of the terms used to aid understanding of the way significance has been determined.	
P&C - Para 13.7.26 (Community severance) The Scoping Report provides a definition of the term 'community severance'. The Applicant is advised that DMRB Volume 11, Section 3, Part 8 states that severance may also be caused by the demolition of a community facility or the loss of land used by members of the public. This effect should also be considered within the assessment of community severance in the ES.	Assessment within the ES will be mindful of potential severance resulting from demolition or loss of land.
P&C - Para 13.7.28, 13.9.2 (Surveys) The Scoping Report states that a number of surveys will be undertaken to establish the current use of community facilities, private assets and access routes. The Inspectorate advises that the nature and methodology of the surveys undertaken to inform the assessment of People and Communities should be agreed with relevant consultees and explained in the ES.	Relevant stakeholders will be consulted on proposed survey methodology. Methodology employed will be explained in the ES.
P&C - Para 13.7.35 (Guidance for assessment of effects on agricultural holdings) The Scoping Report states that assessment methodology approach has been partly informed by former Planning Policy Guidance Note 7. The Inspectorate notes that Planning Policy Guidance Notes have been withdrawn and advises that the Applicant should take care to ensure any guidance referred to is relevant and applicable.	Noted. Reference to PPG 7 has been removed from the PEIR.
P&C - Para 13.9 (Proposed consultation) The Applicant is advised to also consult KCC in relation to effects on the local highways network for which they are the highways authority.	KCC have been consulted and will continually be consulted in regards to effects on the highways network. KCC shall remain a key consultee throughout preparation of the ES and Transport Assessment.
P&C - Para 13.11.1 (Assumptions and limitations) The Applicant should set out any assumptions underpinning the People and Communities assessment in their ES, such as any relating to the traffic model and the inclusion of committed developments, and use of now withdrawn guidance.	Assumptions (if included/ taken) for the people and communities chapter will be shown in the ES.

Comment	Highways England Response
Climate - Para 14.2.4 (Scoped out - Study area) The report states that the study area is dependent on the availability of design and construction information and that if such data is not available, part or all of the affected life cycles will be excluded from the assessment. The Inspectorate does not agree that this approach is acceptable. Where construction and design information is unavailable the assessment should be based on assumptions about construction activities and design which correspond to the worst case scenario for the Proposed Development.	The worst case scenario will be assessed based on assumptions agreed with the project team and topic specialists of related environmental topics that include materials and waste, and air quality/greenhouse emissions.
Climate - Table 14-16 (Scoped out - Climate vulnerability) Table 14-16 of the Scoping Report proposes to scope out average air temperature change, precipitation, wind speed change and humidity from further assessment. The Inspectorate accepts that the major risks from climate change are likely to arise from extreme events and agrees that other effects can be scoped out. However, the ES must make it clear what it means by 'extreme weather events'.	Agreed, a definition of extreme weather event will be added to the ES.
Climate - Table 14-5 (Scheme emissions baseline) The life cycle stages shown in this table do not appear to match the life cycle stages listed in Table 14-1 of the Scoping Report. If the assessment in the ES is based on the life cycle stages identified in Table 14-1 then it must be clear which baseline emissions are associated with each stage. Where proxy emissions are used from other schemes then the ES should explain how similar those schemes are to the proposals for the Bean and Ebbsfleet junctions.	The lifecycle stages in Table 14-5 have been specified out with PAS 2080. However, simple comparison enables relevant alignment to be made, i.e. construction, operation, and in-use, align with A1-5, B6 and B9, as stated. Regarding proxy schemes. these have been used as best available data, as stated in the PEIR paragraph 14.4.1.
Climate - Table 14-9 (Climate vulnerability assessment) The Scoping Report does not provide any detailed justification as to how exposure and sector sensitivity has been determined for each climate variable. The ES should explain the criteria used to determine these categories.	Agreed, the ES will explain the criteria used to determine exposure and sector sensitivity.

Comment	Highways England Response
Climate - Table 14-9 (Vulnerability to major accidents and disasters) This section of the Scoping Report describes potential vulnerabilities and their likely effects on emissions and the resilience of the Proposed Development to climate change. It does not explain if or how these events would be assessed in line with the approach described in section 4.13 of the Scoping Report. The ES should report on the effects on these matters from major accidents and disasters using the approach described in section 4.13 of the Scoping Report.	This will be addressed in the ES.
Cumulative Effects - Para 15.2.3-4 (Distance thresholds for identifying other developments) The thresholds are stated to be based on professional judgement and taking into account the nature and location of the Proposed Development. The ES should provide more detail on the considerations that have led to the choice of these thresholds. The Applicant is advised to agree the developments to be included in the CEA with DBC, EDC, GBC, KCC and the EA.	Further details on threshold defining process can be produced for the ES, though the methodology is already fairly substantial and directs the reader to relevant materials which go into further details such as PINS advice note 17 and DMRB guidance. We have liaised with the LPAs (EDC, GBC &DBC) to help assist with the production of the list of developments. EDC developments will be covered by GBC and DBC. DBC have replied and produced a list. We are waiting on GBC response. They have been emailed again.
Cumulative Effects - Para 15.2.9 (London Resort) The Scoping Report states that the London Resort is not included in the list of the development projects to be included in the CEA because it currently has no formal planning status. The responses from DBC, GBC, KCC and NE raise concerns about the omission of the London Resort from the CEA. The ES must assess all likely significant effects, including cumulative effects. If a degree of uncertainty exists about the delivery of another development which could have cumulative effects with the Proposed Development then the CEA should be based on the approach described in the Inspectorate's Advice Note 17. This advises assigning developments to different tiers based on the progress they have made towards consent and implementation.	The list of NSIP developments within the 10km study area for the CEA chapter is under consideration and will be identified and assessed within the ES. There are four NSIPs within the current boundary. Lower Thames Crossing has been inherently assessed due to inclusion in the traffic modelling. Tilbury 2 and Tilbury Energy Centre will be considered for assessment in ES. London Resort will not be included due to the critical interdependency between the two projects. Should London Resort go ahead the Proposed Scheme would not go ahead.
Cumulative Effects - Para 15.3.3 (Consideration of cumulative effects within each aspect chapter) The Scoping Report states that the potential for cumulative effects will also be considered as part of the assessments in each chapter of the ES. Apart from Chapter 13, the previous sections of the Scoping Report do not provide any	Relates to topic chapters. This has been updated in the PEIR with the inclusion of cumulative effects sections within each topic chapter. Each discipline has been provided with the updated list of developments correct as of 11.01.18.

Comment	Highways England Response
detail on how CEA would be undertaken. The ES must clearly explain the methodology used to assess cumulative effects for each aspect of the environment covered in the ES. The potential for cumulative effects should be addressed for all the categories of receptor identified in Chapters 5 – 14 of the Scoping Report.	
Cumulative Effects - Table 15-2 (Zone of influence/study area) The study areas for the CEA appear to be the same as defined for the assessment of individual topics. As with comments elsewhere in this Opinion, the study area for the assessment should be established having regard to the extent of the likely impacts of the Proposed Development and be sufficient to ensure a robust assessment.	Correct- Following guidance in PINS advice note 17 these were based on the ZOI identified in each chapter and justification is in the relevant chapter. The thresholds proposed are appropriate to most topics in the EIA. The traffic model will take account of the operational effects of major developments in the area and the wider surrounding region using thresholds as established by the transport planners. This will be particularly relevant for Air Quality and Noise operational effects and will ensure the effects assessed are cumulative.
Cumulative Effects - Table 15-2 (Zone of influence for AQ CEA) Table 15-2 defines this as within 200m of the site boundary. Chapter 5 states that it will be 200m from the construction site boundary for construction dust but for construction traffic and during operation it will be based on the ARN. The ES must take a consistent approach to the definition of the zone of influence for impacts from the Proposed Development alone and cumulatively. DBC also raise this point in their consultation response (see Appendix 2).	This has been updated to reflect any changes in the individual topic chapters methodologies. In case of any future changes information provided in the topic chapter has primacy to table 15-2 and is reviewed and updated into the table when the topic chapters are amended.
Cumulative Effects - Para 15.5 (Assumptions and limitations) The Scoping Report identifies the speculative nature of the development projects list as a limitation of the assessment. The Inspectorate advises that the approach described in Advice Note 17 should be followed, with development projects assigned to different tiers as a way of capturing the varying levels of certainty about project delivery.	The PIER provides a tiered approach to the developments this is in the development schedule and follows PINS advice note structure.

4. Not used

5. Appendix D. Air Quality

5.1 Planning and policy context

Air quality criteria

5.1.1 There are two sets of ambient air quality criteria for the protection of public health: legally binding, mandatory limit values set by the European Union (EU); and objectives set out in the Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland (AQS) (Defra, 2007) which local authorities are required to work towards achieving. Both sets of criteria are implemented in Air Quality Regulations (The Air Quality Standards Regulations 2010 (SI 2010/1001) (The National Archives, 2010) for EU limit values, and The Air Quality (England) Regulations (SI 2000/928) (The National Archives, 2000) as amended (SI 2002/3043) (The National Archives, 2002) for AQS objectives). Air quality criteria relevant to the air quality assessment are summarised in Table 5.1 for nitrogen dioxide (NO_2) and particulate matter (PM_{10}). These are the pollutants of most concern near roads (DMRB HA207/07 paragraph 1.1). In both cases, the criteria are the same for both the EU limit values and the AQS objectives.

Table 5.1: Air quality criteria

Pollutant	Criteria
NO_2	1-hour mean concentration should not exceed 200 µg/m^3 more than 18 times a year
	Annual mean concentration should not exceed 40 µg/m^3
PM_{10}	24-hour mean concentration should not exceed 50 µg/m^3 more than 35 times a year
	Annual mean concentration should not exceed 40 µg/m^3

Table Source: Defra (2007) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland

Ecological criteria

5.1.2 The EU has set a critical level for annual mean concentrations of nitrogen oxides (NO_X) to protect sensitive vegetation. This is included in the Air Quality Standards Regulations (SI 2010/1001). Assessment of compliance with this critical level is undertaken at locations more than 20 kilometres from towns with more than 250,000 inhabitants or more than 5 kilometres from other built-up areas, industrial installations or motorways or major roads with traffic counts of more than 50,000 vehicles per day. UK statutory nature conservation agencies' (Natural England) policy is to apply the limit value of 30 µg/m^3, on a precautionary basis, as a benchmark only in all designated conservation sites, including 'Ramsar' sites, Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and Sites of Special Scientific Interest (SSSIs).

5.1.3 Critical loads for nitrogen deposition have been set by the United Nations Economic Commission for Europe (UNECE). A critical load is a quantitative estimate of an exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur, according to present knowledge. Critical loads vary by type of habitat and species. The critical load for deposition (eutrophication) is given as a range and

is quoted in units of kg/ha/year. A single critical load is quoted for acidification, in units of kq/ha/year.

Dust deposition

5.1.4 There are no national standards or guidelines for dust deposition currently set for the UK, nor by the European Union or World Health Organisation (WHO). This is mainly due to the difficulty in setting a standard that would need to relate to dust being a perceptual problem rather than being specifically related to health effects. Typically, assessments use an indicative threshold for the 'likelihood of complaint' for instance, in residential areas this would be a dust deposition flux (as an average measured over a month using a passive deposition gauge) of 200 mg/m^2/day or greater.

National planning policy

National Planning Policy Framework

5.1.5 The National Planning Policy Framework (NPPF) published in 2012 sets out the Government's planning policies for England and how these are expected to be applied. The NPPF requires local planning authorities (LPAs) to take account of air quality in plan making, stating at paragraph 124: '*Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan.'*

National Policy Statement

5.1.6 The National Networks National Policy Statement (NN NPS) (DfT, 2014), prepared by the Department for Transport (DfT), provides policy and guidance relating to the development of nationally significant infrastructure projects. It recognises (paragraph 5.3) that increased emissions of pollutants during construction or operation of projects on national network can contribute to adverse impacts on human health, on protected species and habitats. An Environmental Statement is required for projects that may have significant air quality effects and this should describe (paragraph 5.7):

- Existing air quality levels;
- Forecasts of air quality at the time of opening, assuming that the scheme is not built (the future baseline) and taking account of the impact of the scheme; and
- Any significant effects, their mitigation and any residual effects, distinguishing between the construction and operation stages and taking account of the impact of road traffic generated by the project.

5.1.7 NN NPS requires a judgement to be made as to the risk of a project affecting the UK's ability to comply with the Air Quality Directive; paragraph 5.11 states: "*Air quality considerations are likely to be particularly relevant where schemes are proposed: within or adjacent to AQMAs; roads identified as being above Limit Values or nature conservation sites; and where changes are sufficient to bring*

about the need for a new AQMA or change the size of an existing AQMA; or bring about changes to exceedances of the Limit Values, or where they may have the potential to impact on nature conservation sites."

5.1.8 In addition, paragraph 5.12 states: "The Secretary of State must give air quality considerations substantial weight where, after taking into account mitigation, a project would lead to a significant air quality impact in relation to EIA and/or where they lead to a deterioration in air quality in a zone/agglomeration."

5.1.9 Furthermore, paragraph 5.13 of the NN NPS, states: "The Secretary of State should refuse consent where, after taking into account mitigation, the air quality impacts of the scheme will: result in a zone/agglomeration which is currently reported as being compliant; or affect the ability of a non-compliant area to achieve compliance with the most recent timescales reported to the European Commission at the time of the decision."

Road Investment Strategy (RIS) and Strategic Business Plan

5.1.10 The DfT RIS published in 2015 sets out the DfT's aspirations for the Strategic Road Network (SRN) over the next 25 years. It states that by 2040 DfT aspires to a network that will be sustainable with "*zero breaches of air quality regulations and major reductions in carbon emissions across the network*".

5.1.11 The Highways England Delivery Plan 2015-2020 (Highways England, 2015) identifies Highways England's commitment to investing £75m "*in a range of projects to reduce pollution and ensure the air around the network is clean and healthy*". The Highways England Delivery Plan 2017-2018 (Highways England, 2015) sets out indicators that will be used to measure performance, including of relevance to air quality, the number of air quality pilot studies completed.

National Air Quality Plan

5.1.12 The government produced a UK plan in July 2017 (Defra, 2017b) which sets out the approach for meeting the statutory EU limit values for NO_2 in the shortest possible time.

Local Planning Policy

5.1.13 Dartford Borough Council's Development Policies Plan was adopted in 2017. Policies of relevance to air quality include DP3 Transport Impacts of Development and DP5 Environmental and Amenity Protection.

5.1.14 DP3 states "Development will not be permitted where the localised residual impacts from the development on its own, or in combination with other planned developments in the area, result in severe impacts on one or more of the following: a) road traffic congestion and air quality; …".

5.1.15 DP5 states "Development will only be permitted where it does not result in unacceptable material impacts, individually or cumulatively, on neighbouring uses, the Borough's environment or public health. Particular consideration must be given to areas and subjects of potential sensitivity in the built and natural environment …and other policies, and other potential amenity / safety factors such as: a) air and water quality….".

5.1.16 Gravesham Borough Council's Local Plan Core Strategy (Gravesham Borough Council, 2014a) was adopted in 2014 and contains the current policies that have

replaced the policies from the Local Plan First Review (1994) (Gravesham Borough Council, 2014b). This, along with some saved policies from the Local Plan First Review, make up the Council's current Local Plan for the Borough.

5.1.17 Policies of relevance to air quality include Policy CS19: Development and Design Principles from the Core Strategy, and T1 from the Local Plan First Review.

5.1.18 Policy CS19 states: "New development will be located, designed and constructed to […] avoid adverse environmental impacts from pollution, including noise, air, odour and light pollution, and land contamination."

5.1.19 Policy T1 states: "The Local Planning and Highway Authorities will consider the impact on the transport system and on the environment of traffic generated by new development and will wish to ensure that all proposed developments are adequately served by the highway network identified on the Proposals Map".

Local Air Quality Action Plans

5.1.20 Following assessment of air quality in their area, local authorities are required to prepare Air Quality Action Plans (AQAPs) where the authority has declared an Air Quality Management Area (AQMA), describing the pollution reduction measures it will put in place. Further information on AQMAs near the Scheme is provided in the Baseline Conditions section.

5.1.21 The Dartford Borough Council AQAP (2009) details the council's measures for improvement of air quality within a number of AQMAs near to the air quality study area including the Bean Interchange AQMA (Dartford AQMA No. 4 as described in baseline conditions section). Measures include junction improvements, traffic management improvements, improvements to public transport, and encouraging modal shift.

5.1.22 The Gravesham Borough Council AQAP (2004) details a number of measures for improving air quality at the A2 Trunk Road and Northfleet Industrial Area AQMAs. These measures include traffic management, re-routing freight, public transport improvements, providing park & ride sites, and ensuring travel plans are implemented.

5.2 Study Area

5.2.1 The Scheme is situated within the administrative boundaries of Dartford Borough Council and Gravesham Borough Council.

5.2.2 The air quality assessment study area is set in accordance with the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 1 HA 207/07 'Air Quality' (DfT, 2007).

5.2.3 The air quality study area is defined in accordance with DMRB HA 207/07 (DfT, 2007):

- For assessing the potential effects of construction dust, it is defined as the area within 200 m of the construction site boundary; and
- For assessing construction traffic and normal traffic during the operational phase it is determined in accordance with traffic change criteria, which define the affected road networks (ARN) for local (paragraph 3.12) and regional (paragraph 3.20) air quality assessments. The ARN will be reviewed based on

strategic traffic modelling that will be undertaken to inform this Preliminary Design Stage.

5.2.4 For the purposes of this Preliminary Environmental Information Report (PEIR), the air quality study area is based on the study area used at the Option Selection Stage. This includes the area within 200 m of the ARN which includes the Scheme extent, as well as the A2, A296, B255, and B262. The ARN will be reviewed and updated on the basis of strategic traffic modelling to be undertaken in this Preliminary Design Stage to inform the assessment in the ES.

5.3 Methodology

Overview

5.3.1 The air quality assessment for the Scheme has been undertaken in line with DMRB HA207/07 and has consisted of:

- Discussion of existing baseline conditions;
- Production of constraints maps;
- Qualitative assessment of the likely effect on local air quality during construction;
- Assessment of the likely changes during operation in local air pollutant concentrations at selected human health receptors and nitrogen deposition rates at ecological receptors;
- Assessment of significance of the air quality effects including an assessment of compliance with the EU Air Quality Directive; and
- Identification of the need for mitigation measures where appropriate.

Existing air quality information

5.3.2 A summary of existing air quality has been provided based on information collated for the PEIR.

Constraints map

5.3.3 A constraints map (Figure 5.2 in the PEIR Volume 3) for the Scheme air quality study area has been produced, based on the latest information available. The constraints map includes: affected roads, 200 m boundary from affected roads, sensitive receptors, AQMA boundaries, designated ecological site boundaries, and exceedance areas of air quality criteria without and with the Scheme where known.

Effects on air quality during construction

5.3.4 A qualitative assessment of impacts on air quality from construction has been undertaken by identifying sensitive receptors within 200 m of the Scheme construction works that could be at risk of being affected. Quantitative assessment of vehicle emissions during construction has not yet been undertaken.

Effects on air quality during operation

5.3.5 An air quality assessment has been undertaken principally following the guidance given in the DMRB and associated IANs. A simple assessment was undertaken using the DMRB screening method to calculate NO_2 and PM_{10} concentrations at selected human health receptors, and NO_X concentrations and nitrogen deposition at designated ecological sites in the Scheme opening year. A regional assessment to calculate emissions of NO_X, PM_{10} and CO_2 for the opening and design years has not yet been undertaken.

5.3.6 The key scenarios for assessment are:

- Base year (2014);
- Projected base year (2023);
- Opening year for both the without 'Do Minimum' and with Scheme 'Do Something' (2023); and
- Design year 'Do Minimum' and 'Do Something' (2038).

5.3.7 Traffic data was provided from the strategic traffic model for the air quality assessment at Option Selection Stage to enable the ARN for the local and regional air quality assessments to be determined.

5.3.8 An affected road for the purposes of a local air quality assessment is defined in DMRB HA 207/07 (Para 3.12) as a road that meets any of the following criteria:

- Road alignment will change by 5 m or more; or
- Daily traffic flows will change by 1,000 annual average daily traffic (AADT) or more; or
- Heavy Duty Vehicle (HDV) flows will change by 200 AADT or more; or
- Daily average speed will change by 10 km/hr or more; or
- Peak hour speed will change by 20 km/hr or more.

5.3.9 The changes are applied to roads, rather than modelled links, and so where relevant are determined under two-way traffic conditions.

Local air quality

5.3.10 The local air quality assessment was undertaken using the DMRB screening method. Representative receptors were selected for the local air quality assessment and included those closest to the ARN. Sensitive human health receptors for the purposes of air quality assessment are defined in HA 207/07 (paragraph 3.13) and include residential properties, locations of susceptible populations e.g. schools, hospitals and care homes for the elderly, or any other location where a member of the public may be exposed to an air pollutant for the relevant regulated time period. Sensitive ecological receptors for the purposes of air quality assessment include designated species or habitats within a designated ecological site.

5.3.11 The traffic data required for input into the screening tool included: AADT, the percentage of HDV, and speeds input as a speed category, as determined in accordance with IAN 185/15 (DfT, 2015b) on speed banding.

5.3.12 The output from the model was used to provide estimates of the contribution from road traffic emissions to annual mean concentrations of NO_X and PM_{10} at discrete receptors. These concentrations were combined with estimates of background concentrations, to account for other sources of air pollution, to derive total annual mean concentrations. Background concentrations were taken from Defra's background maps.

5.3.13 Concentrations of NO_2 were derived from NO_X concentrations using Defra's NO_X to NO_2 calculator version 5.1, June 2016. The estimated annual mean NO_2 concentrations were verified by comparison against available ratified monitoring data and the model outputs adjusted where appropriate, with reference to Defra's Local Air Quality Management Technical Guidance (LAQM.TG(16)).

5.3.14 In addition, an assessment was undertaken in accordance with IAN 170/12 v3 (DfT, 2013b) on the assessment of future NO_X and NO_2 projections on long term trends, to account for future year uncertainties in emissions.

5.3.15 Evaluation of compliance with EU limit values was undertaken in accordance with IAN 175/13 (DfT 2013c).

5.3.16 Assessment of potential effects on NO_X concentrations and nitrogen deposition rates was also undertaken at identified sensitive ecological designations, in accordance with Annex F of the DMRB HA 207/07. Evaluation of the significance of the effect of the Scheme on local air quality was undertaken in accordance with IAN 174/13 (DfT 2014a).

Assumptions and limitations

5.3.17 Any air quality model has inherent areas of uncertainty, including:

- The traffic data used in the air quality model;
- The suitability of emissions data;
- Simplifications in model algorithms and empirical relationships that are used to simulate complex physical and chemical processes in the atmosphere;
- The suitability of background concentrations; and
- The suitability of meteorological data.

5.3.18 Uncertainty associated with traffic data has been minimised by using a validated traffic model.

5.3.19 Uncertainties associated with emissions data have been minimised by using the most up to date speed-band emission factors available at the time of the assessment, and by applying IAN 170/12 v3 for long term trends.

5.3.20 Uncertainties associated with model algorithms and empirical relationships have been minimised by using algorithms and relationships that have been independently validated and judged as fit for purpose.

5.3.21 Another uncertainty is with using historical meteorological data to estimate future concentrations. The key limiting assumption is that conditions in the future will be the same as in the past; however, in reality no two years are the same. In line with best practice, the base year meteorology (as used in the model verification and adjustment process) will be used in future year modelling to allow any adjustments to be applied in future cases.

5.4 Baseline Conditions – Tables

Table 5.2: Description of AQMAs

Local Authority	Name	Air Quality Criteria Exceeded		Description
Dartford	AQMA No. 1	NO_2 annual mean PM_{10} 24-hour mean		a corridor approximately 250m wide along the A282 Dartford Tunnel Approach Road from junction 1a to 300m south of junction 1b
	AQMA No. 2	NO_2 annual mean		an area encompassing London Road, Dartford
	AQMA No. 3	NO_2 annual mean		an area encompassing Dartford Town and a number of approach roads
	AQMA No. 4	NO_2 annual mean		An area encompassing the Bean Interchange between the A2 and A296
Gravesham	Gravesham A2 AQMA	NO_2 annual mean PM_{10} 24-hour mean		An area extending either side of the length of the A2 within the borough.
	Northfleet Industrial Area AQMA	NO_2 annual mean PM_{10} 24-hour mean		An area encompassing the Northfleet Industrial Area in Gravesham.
	Echo Junction AQMA	NO_2 annual mean PM_{10} 24-hour mean		On B261 Gravesend
	Gravesham A227 Wrotham Road/ B261 Old Road West AQMA	NO_2 annual mean		An area encompassing the junction of the A227 Wrotham Road and B261 Old Road West extending south to a point to a point just beyond the Woodlands Restaurant
	Gravesham A226 One-way system AQMA	NO_2 annual mean		An area incorporating the entirety of the A226 one-way system in Gravesend
	Gravesham B262/B261 Pelham Arms Junction AQMA	NO_2 annual mean		An area encompassing the junction of the B262 Pelham Road, B262 Pelham Road South and the B261 Old Road West.

Local Authority	Name	Air Quality Criteria Exceeded		Description
	Gravesham Parrock Street AQMA	NO_2 annual mean		An area encompassing Parrock Street and Lord Street.

Table 5.3: Highways England diffusion tube monitoring results (NO_2)

Site ID	HE Site ID	X	Y	2014 unadjusted concentration (µg/m³)	2016 adjusted, annualised concentration (µg/m³)
HE_1	A2BN_001	555592	173376	63.7	**60.9**
HE_2	A2BN_002	555824	173363	54.7	**52.2**
HE_3	A2BN_003	556462	172137	49.4	**47.2**
HE_4	A2BN_004	556819	173369	39.1	37.3
HE_5	A2BN_005	556750	173445	50.7	**48.4**
HE_6	A2BN_006	558670	172652	54.2	**51.8**
HE_7	A2BN_007	558811	172323	30.1	28.8
HE_8	A2BN_008	558425	174632	50.1	**47.9**
HE_9	A2BN_009	558468	174671	59.6	**56.9**
HE_10	A2BN_010	556832	171333	32.9	31.4
HE_11	A2BN_011	560903	173988	30.9	29.5
HE_12	A2BN_012	562219	172312	48.3	**46.1**
HE_13	A2BN_013	562501	172126	42.9	**41.0**
HE_14	A2BN_014	562340	172686	49.0	**46.8**
HE_15	A2BN_015	559260	171843	30.3	28.9
HE_17	A2BN_017	564633	170962	48.7	**46.6**
HE_18	A2BN_018	564633	170962	44.8	**42.8**
HE_19	A2EBB_001	563412	171770	27.3	26.1
HE_20	A2EBB_002	564235	171457	44.5	**42.5**
HE_21	A2EBB_003	564009	170312	34.7	33.2
HE_22	A2EBB_004	564233	171600	42.0	**40.1**
HE_23	A2EBB_005	564413	172432	41.5	39.7
HE_24	A2EBB_006	563702	172023	27.3	26.1
HE_25	A2EBB_007	563595	172265	31.1	29.7
HE_26	A2EBB_008	563998	172571	32.8	31.3
HE_27	A2EBB_009	564454	172767	42.0	**40.1**
HE_28	A2EBB_010	564788	171048	31.4	30.0

Site ID	HE Site ID	X	Y	2014 unadjusted concentration (µg/m³)	2016 adjusted, annualised concentration (µg/m³)
HE_35	A2EBB_017	561290	171720	23.1	22.0
HE_36	A2EBB_018	561336	171966	31.0	29.7
Values in **bold** exceed the AQS objective					

Table 5.4: NO_2 monitoring results (µg/m^3), 2010 - 2016

Site Name	Station Type	X	Y	Criteria	2010	2011	2012	2013	2014	2015	2016
Dartford Bean Interchange	Roadside	558622	172752	Annual Mean	**54**	**53**	**54**	**43**	**51**	**61**	**57**
				No. 1-hr means > 200µg/m^3	3	3	3	7	0	**24**	**26**
Dartford St Clements	Roadside	558525	174709	Annual Mean	**57**	**55**	**57**	**53**	**61**	**50**	**47**
				No. 1-hr means > 200µg/m^3	**19**	14	**28**	**21**	**51**	8	**19**
Gravesham A2	Roadside	562589	172076	Annual Mean	37	34	35	31	31	30	30
				No. 1-hr means > 200µg/m^3	0	0	0	0	0	0	0
Gravesham Industrial	Industrial Background	562155	174360	Annual Mean	28	26	27	31	24	23	24
				No. 1-hr means > 200µg/m^3	3	0	0	0	0	0	0

Annual mean AQS objective is 40 µg/m^3
One-hour mean AQS objective is 200 µg/m^3 not to be exceeded more than 18 times a year
Values in **bold** exceed the AQS objective

Table 5.5: Monitoring results PM_{10} (µg/m^3), 2010 - 2016

Site Name	Station Type	X	Y	Criteria	2010	2011	2012	2013	2014	2015	2016
Dartford Bean Interchange	Roadside	558622	172752	Annual Mean	25	24	21	21	27	26	27
				No. 24-hr means > 50 µg/m^3	4	12	9	5	11	7	10
Dartford St Clements	Roadside	558525	174709	Annual Mean	28	28	22	24	25	20	24
				No. 24-hr means > 50 µg/m^3	20	31	8	13	11	3	5

Site Name	Station Type	X	Y	Criteria	2010	2011	2012	2013	2014	2015	2016
Gravesham A2	Roadside	562589	172076	Annual Mean	18	21	18	20	17	15	19
				No. 24-hr means > 50 µg/m^3	0	5	5	5	6	2	1
Gravesham Industrial	Industrial Background	562155	174360	Annual Mean	30	24	20	20	19	16	18
				No. 24-hr means > 50 µg/m^3	9	18	12	7	11	7	2

Annual mean AQS objective is 40 µg/m^3
24-hour mean AQS objective is 50 µg/m^3 not to be exceeded more than 35 times a year
Values in *italics* have a less than 85% data capture

Table 5.6: Bias adjusted annual mean NO_2 diffusion tube monitoring results (µg/m^3)

Site Name	Station Type	X	Y	2010	2011	2012	2013	2014	2015	2016
Dartford Borough Council										
DA25 Queens Gardens	Background	555801	173194	39	38	**41**	**40**	**42**	36	37
DA63 Churchill Close	Background	555612	173210	38	36	31	37	38	36	34
DA70 Hope Cottages	Roadside	558687	172610	**40**	34	35	**42**	38	39	38
DA72 triplicate Little Dale	Roadside	556433	172124	**41**	**40**	38	**50**	**47**	**44**	**42**
DA75 Ightham Cottages (Telegraph)	Roadside	558593	172815	**40**	**43**	36	**40**	**47**	**45**	**45**
DA81 Green Street	Roadside	556368	172344	No data	35	**40**	**43**	**46**	**45**	37
DA87 NO2 Ightham Cottages (House)	Roadside	558617	172779	No data	No data	**44**	39	39	39	**40**
Gravesham Borough Council										

Site Name	Station Type	X	Y	2010	2011	2012	2013	2014	2015	2016
GR08 Painters Ash School	Roadside	562589	172076	35	35	37	34	34	32	31
GR21 Chaucer Road, Northfleet	Roadside	562665	172207	33	31	30	30	29	26	No data
GR104 Roman Road, Northfleet	Roadside	562465	172153	38	36	38	37	36	35	34
GR105 Chaucer Road, Northfleet	Roadside	562671	172202	27	24	25	26	24	22	23
GR109 Old Road East	Roadside	565229	172955	34	31	32	39	38	36	33
GR116 Saxon Close, Northfleet	Roadside	562480	172225	**42**	34	36	35	33	33	35

Values in **bold** exceed the annual mean AQS objective of 40 µg/m^3

5.5 Potential impacts – Tables

Table 5.7: Selected human health receptor locations included at option selection stage

Receptor		NGR (m)	
		X	Y
R1	Residential property on Princes Road	555866	173352
R2	Residential property on Cadogan Avenue	556813	173443
R3	Residential property on Littledale	556406	172145
R4	Residential property on Green Street Green Road	556394	172322
R5	Residential property, Igtham Cottages on Bean Lane	558620	172774
R6	Residential property on Oakwood Close	555624	173392
R7	Residential property, Hope Cottages on Bean Lane	558664	172638
R7a	Residential property, Hope Cottages on Bean Lane	558675	172619
R8	Residential property on Roman Road	558979	172883
R9	Residential property on Littledale	559316	172765
R10	Residential property, Bean House on Bean Lane	558748	172417
R11	Residential property, Park Corner Road	561024	172409
R12	Residential property on Roman Road	559366	172711
R13	Residential property on Pepper Hill	562207	172332
R14	Residential property on Painters Ash Lane	562490	172139
R15	Residential property on Churchill Close	555667	173214
R16	Residential property on Gore Road	556793	173378
R17	Residential property, Hope Cottages on Bean Lane	558717	172534
R18	Residential property on Beacon Drive	558808	172335
R19	Future Receptor off Roman Road	559346	172855

Table 5-8: Estimated annual mean NO_2 concentrations at selected receptors

Receptor ID	Receptor co-ordinates		2014	LTT adjusted 2023 annual mean NO_2 Concentrations (µg/m³) [1]		Difference between Projected 'Do Something' and Do Minimum' concentration [2]
	X (m)	Y (m)	Mean NO_2 Concentrations (µg/m³)	Do Minimum	Do Something	
R1	555866	173352	28.2	21.2	21.4	+0.2
R2	556813	173443	28.1	20.8	21.0	+0.2
R3	556406	172145	33.9	26.6	26.5	-0.1
R4	556394	172322	31.5	24.1	24.0	-0.1
R5 [2]	558620	172774	39.5	33.6	n/a	-
R6	555624	173392	34.5	26.9	26.9	0.0
R7	558664	172638	39.5	31.9	31.2	-0.7
R7a	558675	172619	35.9	28.7	28.1	-0.6
R8	558979	172883	22.8	17.0	16.2	-0.8
R9	559315	172765	29.3	22.6	21.2	-1.4
R10	558748	172417	24.3	18.6	18.9	+0.3
R11	561024	172409	17.6	13.7	13.7	0.0
R12	559366	172711	32.7	25.7	26.0	+0.3
R13	562207	172332	35.4	27.4	27.4	0.0
R14	562490	172139	26.2	19.8	19.9	+0.1
R15	555667	173214	30.9	23.9	23.9	0.0
R16	556793	173378	25.5	18.8	18.8	0.0
R17	558717	172534	26.4	20.2	22.1	+1.9
R18	558808	172335	27.0	20.5	20.7	+0.2
R19	559346	172855	20.6	15.3	15.0	-0.3

[1] LTTE6=Long Term Trend. Predicted NO_2 concentrations were adjusted using a Gap Factor based on the LTTE6 factor calculated by the Highways England's "INTERIM Highways Agency Alternative Long Term Gap Analysis Calculator v1.1". All values reflect predicted concentrations for the future year 2023.
[2] Receptor 5 will not exist in the Do Something scenario as it is being demolished for the Scheme.

Table 5-9: Estimated annual mean PM_{10} concentrations at selected receptors

Receptor ID	Receptor co-ordinates		Annual mean PM_{10} concentrations ($\mu g/m^3$)			Difference between Projected 'Do Something' and 'Do Minimum' concentration [2]
	X (m)	Y (m)	Base year 2014	Do Minimum 2023	Do Something 2023	
R1	555866	173352	21.4	20.1	20.2	0.1
R2	556813	173443	20.0	18.6	18.7	0.1
R3	556406	172145	22.4	21.0	21.0	0.0
R4	556394	172322	22.2	20.7	20.7	0.0
R5 [2]	558620	172774	24.9	23.8	-	-
R6	555624	173392	22.6	21.3	21.4	0.1
R7	558664	172638	24.9	23.8	23.5	-0.3
R7a	558675	172619	24.0	22.8	22.5	-0.3
R8	558979	172883	20.7	19.5	19.2	-0.3
R9	559315	172765	21.7	20.4	19.8	-0.6
R10	558748	172417	21.1	20.0	20.1	0.1
R11	561024	172409	19.8	18.9	18.9	0.0
R12	559366	172711	22.1	20.6	20.5	-0.1
R13	562207	172332	22.0	20.5	20.5	0.0
R14	562490	172139	20.1	18.6	18.6	0.0
R15	555667	173214	21.4	20.0	20.0	0.0
R16	556793	173378	19.5	18.1	18.1	0.0
R17	558717	172534	21.6	20.4	20.8	0.4
R18	558808	172335	21.6	20.4	20.5	0.1
R19	559346	172855	19.9	18.8	18.6	-0.2

[1] Receptor R5 will not exist in the 'Do Something' scenario as it is being demolished for the Scheme.

Table 5.10: Total modelled NOx concentrations at Darenth Wood SSSI

Receptor ID	Total NOx concentration (µg/m³)			Difference between projected 'Do Something' and 'Do Minimum' concentration [2]	
	Base year 2014	Do Minimum 2023 [1]	Do Something 2023 [1]	Total NOx concentration (µg/m³)	% Change in relation to critical level for vegetation (30 µg/m³)
S1_14m	**110.7**	**104.6**	**103.9**	-0.7	-2.4
S2_20m	**81.0**	**71.9**	**71.4**	-0.5	-1.7
S3_30m	**64.7**	**54.3**	**53.9**	-0.4	-1.2
S4_40m	**57.4**	**46.4**	**46.1**	-0.3	-0.9
S5_50m	**53.0**	**41.7**	**41.4**	-0.2	-0.8
S6_60m	**50.0**	**38.5**	**38.3**	-0.2	-0.7
S7_70m	**47.7**	**36.1**	**36.0**	-0.2	-0.6
S8_80m	**45.9**	**34.2**	**34.1**	-0.2	-0.5
S9_90m	**44.3**	**32.6**	**32.5**	-0.1	-0.5
S10_100m	**43.0**	**31.2**	**31.1**	-0.1	-0.4
S11_110m	**41.9**	**30.1**	**30.0**	-0.1	-0.4
S12_120m	**41.0**	29.1	29.0	-0.1	-0.4
S13_130m	**40.2**	28.3	28.2	-0.1	-0.3
S14_140m	**39.5**	27.6	27.5	-0.1	-0.3
S15_150m	**38.9**	27.0	26.9	-0.1	-0.3
S16_160m	**38.3**	26.4	26.3	-0.1	-0.3
S17_170m	**37.9**	25.9	25.9	-0.1	-0.3
S18_180m	**37.4**	25.5	25.4	-0.1	-0.2
S19_190m	**37.0**	25.1	25.1	-0.1	-0.2
S20_200m	**36.7**	24.8	24.7	-0.1	-0.2
N1_10m	**139.5**	**139.3**	**136.3**	-2.9	-9.8
N2_20m	**81.9**	**73.6**	**72.3**	-1.3	-4.5
N3_30m	**65.2**	**55.1**	**54.2**	-0.9	-2.8
N4_40m	**57.6**	**46.8**	**46.2**	-0.6	-2.1
N5_50m	**53.2**	**42.0**	**41.5**	-0.5	-1.7
N6_60m	**50.2**	**38.8**	**38.4**	-0.4	-1.4
N7_70m	**47.8**	**36.3**	**36.0**	-0.4	-1.2
N8_80m	**46.0**	**34.4**	**34.1**	-0.3	-1.0

Receptor ID	Total NOx concentration (µg/m³)			Difference between projected 'Do Something' and 'Do Minimum' concentration [2]	
	Base year 2014	Do Minimum 2023 [1]	Do Something 2023 [1]	Total NOx concentration (µg/m³)	% Change in relation to critical level for vegetation (30 µg/m³)
N9_90m	**44.4**	**32.8**	**32.5**	-0.3	-0.9
N10_100m	**43.1**	**31.4**	**31.1**	-0.2	-0.8
N11_110m	**42.0**	**30.2**	**30.0**	-0.2	-0.7
N12_120m	**41.0**	29.2	29.0	-0.2	-0.6
N13_130m	**40.2**	28.4	28.2	-0.2	-0.6
N14_140m	**39.5**	27.7	27.5	-0.1	-0.5
N15_150m	**38.9**	27.0	26.9	-0.1	-0.5
N16_160m	**38.4**	26.5	26.3	-0.1	-0.4
N17_170m	**37.9**	26.0	25.9	-0.1	-0.4
N18_180m	**37.5**	25.6	25.4	-0.1	-0.4
N19_190m	**37.1**	25.2	25.1	-0.1	-0.3
N20_200m	**36.7**	24.8	24.7	-0.1	-0.3

[1] LTT=Long Term Trend. Predicted NOx concentrations were adjusted using a Gap Factor based on the LTTE6 adjustment factor calculated by the Highways England's "INTERIM Highways Agency Alternative Long Term Gap Analysis Calculator v1.1". All values reflect predicted concentrations for the future year 2023.
Bold font indicates NOx concentration exceeds AQS Objective of 30µg/m³ for vegetation at associated receptor.

Table 5.11: Modelled N dry deposition rates at Darenth Wood SSSI

Receptor ID	Total N deposition rate (kg N/ha/year)			Difference between 'Do Something' and 'Do Minimum' scenarios	
	Receptor ID	Total N deposition rate (kg N/ha/year)	Difference between Do Something and Do Minimum scenarios	Change in total N deposition rate (kg N/ha/year)	% Change in relation to lowest critical load level for Darenth Wood SSSI
S1_14m	29.99	25.11	25.08	-0.03	-0.23
S2_20m	28.89	24.13	24.12	-0.01	-0.18
S3_30m	28.22	23.55	23.54	-0.01	-0.15
S4_40m	27.90	23.28	23.27	-0.01	-0.12
S5_50m	27.70	23.11	23.10	-0.01	-0.10
S6_60m	27.57	22.99	22.98	-0.01	-0.10
S7_70m	27.46	22.90	22.89	-0.01	-0.08

Receptor ID	Total N deposition rate (kg N/ha/year)			Difference between 'Do Something' and 'Do Minimum' scenarios	
	Receptor ID	Total N deposition rate (kg N/ha/year)	Difference between Do Something and Do Minimum scenarios	Change in total N deposition rate (kg N/ha/year)	% Change in relation to lowest critical load level for Darenth Wood SSSI
S8_80m	27.38	22.83	22.82	-0.01	-0.07
S9_90m	27.30	22.77	22.76	-0.01	-0.07
S10_100m	27.24	22.71	22.71	0.00	-0.07
S11_110m	27.19	22.67	22.66	-0.01	-0.06
S12_120m	27.14	22.63	22.63	0.00	-0.05
S13_130m	27.10	22.60	22.59	-0.01	-0.05
S14_140m	27.07	22.57	22.57	0.00	-0.05
S15_150m	27.04	22.55	22.54	-0.01	-0.05
S16_160m	27.01	22.52	22.52	0.00	-0.04
S17_170m	26.99	22.50	22.50	0.00	-0.04
S18_180m	26.97	22.49	22.48	-0.01	-0.03
S19_190m	26.95	22.47	22.47	0.00	-0.03
S20_200m	26.93	22.46	22.45	-0.01	-0.03
N1_10m	30.96	26.04	25.95	-0.09	-0.82
N2_20m	28.92	24.19	24.14	-0.05	-0.49
N3_30m	28.24	23.58	23.55	-0.03	-0.34
N4_40m	27.91	23.30	23.27	-0.03	-0.26
N5_50m	27.71	23.12	23.10	-0.02	-0.22
N6_60m	27.57	23.00	22.98	-0.02	-0.19
N7_70m	27.47	22.91	22.89	-0.02	-0.16
N8_80m	27.38	22.84	22.82	-0.02	-0.14
N9_90m	27.31	22.77	22.76	-0.01	-0.13
N10_100m	27.24	22.72	22.71	-0.01	-0.12
N11_110m	27.19	22.67	22.66	-0.01	-0.10
N12_120m	27.14	22.64	22.63	-0.01	-0.10
N13_130m	27.10	22.60	22.59	-0.01	-0.08
N14_140m	27.07	22.57	22.57	0.00	-0.07
N15_150m	27.04	22.55	22.54	-0.01	-0.07
N16_160m	27.01	22.53	22.52	-0.01	-0.07

Receptor ID	Total N deposition rate (kg N/ha/year)			Difference between 'Do Something' and 'Do Minimum' scenarios	
	Receptor ID	Total N deposition rate (kg N/ha/year)	Difference between Do Something and Do Minimum scenarios	Change in total N deposition rate (kg N/ha/year)	% Change in relation to lowest critical load level for Darenth Wood SSSI
N17_170m	26.99	22.51	22.50	-0.01	-0.06
N18_180m	26.97	22.49	22.48	-0.01	-0.06
N19_190m	26.95	22.47	22.47	0.00	-0.05
N20_200m	26.93	22.46	22.45	-0.01	-0.05

Table 5.12: Overall evaluation of local air quality significance

Key criteria questions	Yes/No
Is there a risk that environmental standards will be breached?	No. No receptors are expected to exceed the annual mean NO_2 or PM_{10} AQS objectives, either with or without the scheme. There are not expected to be any Defra PCM links in the air quality study area that exceed in 2023 and changes in concentrations would not result in exceedances in 2023 or beyond. There is not expected to be a compliance risk due to the Scheme.
Will there be a large change in environmental conditions?	No. There are no large changes expected in the opening year. Most changes are imperceptible. One receptor is estimated to have a small magnitude increase for NO2 (R17). Four receptors are estimated to have a small magnitude decrease for NO2 (R7, R7a, R8, R9).
Will the effect continue for a long time?	No. Only small changes are expected with the scheme which should be reversible within 2 to 6 years.
Will many people be affected?	No.
Is there a risk that designated sites, areas, or features will be affected?	No. NO_X concentrations and nitrogen deposition are expected to decrease at the only designated site within the air quality study area.
Will it be difficult to avoid or reduce or repair or compensate for the effect?	n/a
On balance is the overall effect significant?	On balance, the overall conclusion is that there would not be a significant adverse effect for either human health or ecological receptors.

5.6 Air quality pollutants

Nitrogen dioxide

5.6.1 Nitrogen dioxide (NO_2) is a secondary pollutant produced by the oxidation of nitric oxide (NO). NO and NO_2 are collectively termed NO_X. Almost a third of the UK NO_X emissions are from road transport. The majority of NO_X emitted from vehicles is in the form of NO, which oxidises rapidly in the presence of ozone (O_3) to form NO_2. In high concentrations, NO_2 can affect the respiratory system and can also enhance the response to allergens in sensitive individuals, whereas NO does not have any observable effect on human health at the range of concentrations found in ambient air. Elevated concentrations of oxides of nitrogen can have an adverse effect on vegetation, including leaf or needle damage and reduced growth. Deposition of pollutants derived from oxides of nitrogen emission contribute to acidification and/or eutrophication of sensitive habitats.

Particulate Matter

5.6.2 The principal sources of 'primary' polluting particles are combustion processes, which include traffic and industry. Diesel engines produce the majority of particulate emissions from the vehicle fleets. Approximately a fifth of primary PM_{10} emissions in the UK are derived from road transport. Finer fractions of particulate matter appear to be associated with a range of symptoms of ill health including effects on the respiratory and cardiovascular systems, on asthma and on mortality.

Carbon dioxide

5.6.3 Carbon dioxide (CO_2) is a greenhouse gas and is used as an indicator of the wider scale, non-local effects of transport schemes. CO_2 does not affect human health at ambient levels and so is not significant as a local pollutant but is important for its national and international role in climate change.

6. Appendix E. Noise and Vibration

6.1 Planning and policy context

Table 6.1: Legislation, regulatory and policy framework for construction and operational noise and vibration

Scale	Legislation/Regulation	Summary of Requirements
National	National Planning Policy Framework (NPPF) 2012	Paragraph 123 states that decisions on development should aim to: • Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development; • Mitigate and reduce to a minimum, other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions; • Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and • Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.
	Planning Practice Guidance Noise (PPGN) 2014	PPGN provides advice on how planning can manage potential noise impacts in new development. Noise should not be considered in isolation and should instead be viewed in relation to social, economic and environmental context.
	National Networks National Policy Statement (NN NPS)	The NN NPS states the following factors as determinants of the likely noise impact: • Construction noise and the inherent operational noise from the proposed development and its characteristics; • the proximity of the proposed development to noise sensitive premises (including residential properties, schools and hospitals) and noise sensitive areas (including certain parks and open spaces); • The proximity of the proposed development to quiet places and other areas that are particularly valued for their tranquillity, acoustic environment or landscape quality such as National Parks, the Broads or Areas of Outstanding Natural Beauty; and

Scale	Legislation/Regulation	Summary of Requirements
		• The proximity of the proposed development to designated sites where noise may have an adverse impact on the special features of interest, protected species or other wildlife.
	Environmental Noise (England) Regulations 2006	The regulations implement the European Environmental Noise Directive (END) in England. Developments must take into account Noise Action Plans.
	Noise Policy Statement for England (NPSE) 2010	Through the effective management and control of environmental noise within the context of Government policy on sustainable development, aims to: • Avoid significant adverse impacts on health and quality of life; • Mitigate and minimise other adverse impacts on health and quality of life; and • Contribute to improvements to health and quality of life, where possible; • Within the context of Government policy on sustainable development; • Avoid significant adverse effects as a result of the scheme; • Mitigate and minimise adverse effects as a result of the scheme; and • Contribute to the enhancement of the acoustic environment. The Explanatory Note to the NPSE assists in the definition of significant adverse and adverse with the following concepts: • No observed effect level (NOEL): This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise; • Lowest observed adverse effect level (LOAEL): This is the level above which adverse effects on health and quality of life can be detected; and • Significant observed adverse effect level (SOAEL): This is the level above which significant adverse effects on health and quality of life occur. The Government policy and guidance do not state values for the NOEL, LOAEL and SOAEL, rather, it considers that they are different for different noise sources, for different receptors and at different times and should be defined on a strategic or project basis taking into account the specific features of that area, source or project. NPSE also states that sustainable development is a core principle underpinning all government policy. The goal is pursued in ways that protect

Scale	Legislation/Regulation	Summary of Requirements
		and enhance the physical and natural environment, and that use resources and energy as efficiently as possible.
	Land Compensation Act 1973	Part I Compensation for depreciation caused by use of public works.
	Infrastructure Act 2015	Section 5(2) of the Infrastructure Act and the Highways England Licence seek to minimise the environmental impacts of projects, protect and enhance the quality of the surrounding environment and conform to the principles of sustainable development.
	Road Investment Strategy (RIS) and Strategic Business Plan 2015	Aspires to the target that by 2040 over 90% fewer people are impacted by noise from the strategic road network. The target for the first Road Period, 2015-2020, is to mitigate at least 1,150 of the Noise Important Areas, which is expected to reduce the number of people severely affected by noise from the strategic road network by at least 250,000. The Highways England Licence states that Highways England should ensure the best practicable environmental outcomes across its activities, while working in the context of sustainable development and delivering value for money.
	Control of Pollution Act 1974 (as amended)	Section 60 – Control of noise on construction sites. Section 61 – Prior consent for work on construction sites. Section 71 – Codes of practice for minimising noise. Section 72 – Best practicable means.
	Environmental Protection Act 1990 (as amended)	Section 79 (1) (ga) noise that is prejudicial to health or a nuisance and is emitted from or caused by a vehicle, machinery or equipment in a street is a statutory nuisance; (NB if so should be inspected by the local authority) (9) interpretation of “best practicable means”.
	The Control of Noise (Code of Practice for Construction and Open Sites) (England) Order 2015	Approves BS 5228:2009+A1:2014 Part 1 Noise and Part 2 Vibration for the purpose of giving guidance on appropriate methods for minimising noise and vibration.
	Noise Insulation Regulations 1975 (as amended)	Regulation 3 imposes a duty on authorities to undertake or make a grant in respect of the cost of undertaking noise insulation work in or to eligible buildings. This is subject to meeting certain criteria given in the Regulation. Regulation 4 provides authorities with discretionary powers to undertake or make a grant in respect of the cost of undertaking noise insulation work in or to eligible buildings, subject to meeting certain criteria given in the Regulation.

Scale	Legislation/Regulation	Summary of Requirements
		Regulation 4 provides authorities with discretionary powers to undertake or make a grant in respect of the cost of undertaking noise insulation work in or to eligible buildings, subject to meeting certain criteria given in the Regulation. Regulation 5 provides relevant authorities with discretionary powers to undertake or make a grant in respect of the cost of undertaking noise insulation work in or to eligible buildings with respect to construction noise. This is subject to meeting certain criteria given in the Regulation.
	The Highways Noise Payments and Movable Homes (England) Regulations 2000	Provide highway authorities with a discretionary power to provide a noise payment where new roads are to be constructed or existing ones altered. The relevant Regulations set out the criteria which should be applied in assessing eligibility for making such payments.
Local	Dartford Borough Council Core Strategy (2011) and Proposals Map (2017)	DP5 Environmental and Amenity Protection.
	Dartford Borough Council Development Policies Plan (2017)	Policy DP5: Environmental and Amenity Protection states that*; development will only be permitted where it does not result in unacceptable material impacts, individually or cumulatively, on neighbouring uses, the Borough's environment or public health. Particular consideration must be given to… noise disturbance or vibration.*
	Gravesham Borough Council Local Plan Core Strategy (2014) and Local Plan First Review (1994) Saved Policies	CS19 Development and Design Principles from the Core Strategy; CS06: Ebbsfleet (Gravesham) Opportunity Area; T1 from the Local Plan First Review.

Table Source: Various

6.2 Study area

6.2.1 The study area for the assessment of noise and vibration effects is defined in the DMRB Volume 11, Section 3, Part 7 HD 213/11 Noise and Vibration as 600 m from the carriageway edge of any proposed new routes or existing routes to be bypassed or improved, and 600 m from any other affected routes within 1 km of the proposed new routes or altered existing routes. An affected route is defined as where it is calculated that there is a possibility of a change of 1dB $L_{A10,18h}$ in the short term or 3dB $L_{A10,18h}$ in the long term (assessed between the opening year and the future year).

6.2.2 The DMRB 11:3:7 provides the following methodology for identifying the size and extents of the study area:

1. Identify the start and end points of the physical works associated with the road project;

2. Identify the existing routes that are being bypassed or improved and any proposed new routes between the start and end points (for each option);
3. Define a boundary 1 km from the carriageway edge of each of the options identified in (2) above;
4. Define a boundary 600 m from the carriageway edge around each of the options identified in (2) above and also 600 m from any other affected routes within the boundary defined in (3) above. The total area within these 600 m boundaries is termed the 'calculation area';
5. Identify any affected routes beyond the boundary defined in (3) above; and
6. Define a boundary 50 m from the carriageway edge of routes identified in (5) above.

6.2.3 Based on the above, the detailed noise calculation area (within 600 m of any affected route that is within 1 km of the Scheme) has been determined.

6.2.4 Determination of the affected routes, and consequently the study area, may be constrained by the geographical extent, and area of validity, of the traffic modelling made available for the Scheme appraisal. The study area for the noise impact assessment will be determined, once the strategic traffic model has been finalised.

6.3 Methodology

6.3.1 Baseline noise surveys will be undertaken at a number of noise sensitive receptors within the study area to establish the current noise climate. This will include monitoring positions at Bean, where the majority of residential buildings in the project area are located, as well as on the site of the new Ebbsfleet development and at other properties towards the outskirts of Gravesend. The locations for baseline noise monitoring will be confirmed once suitable and accessible sites have been identified.

Construction

6.3.2 A construction noise and vibration assessment will be completed in accordance with the prediction methodology described in BS5228:2009 +A1:2014 Code of practice for noise and vibration control on construction and open sites.

6.3.3 The predictions will be based on plants lists and equipment usage patterns for the main construction activities and phases indicated on the construction schedule. Threshold levels from BS5228 Part 1 and Part 2 will be used to determine whether a significant effect, i.e. above the SOAEL, has the potential to occur at receptors, which will be influenced by the existing baseline conditions. Impact significance and the need for mitigation will be determined by taking into account the predicted impact levels, existing conditions, guidance within BS5228, and the duration of the construction activities.

Operation

6.3.4 Road traffic noise modelling has been previously undertaken for a variant of the Scheme and the results of this assessment are discussed in the PEIR Volume 1

Chapter 6 Noise and Vibration. Further noise modelling will be undertaken for the baseline conditions and for the Scheme using updated traffic data, to permit an assessment in line with a "detailed" level of assessment as defined within the DMRB.

6.3.5 The noise model will be created using Noisemap 5, which uses the calculation methodology from Calculation of Road Traffic Noise (CRTN). The model will incorporate 3D ground data, address data, current road layout information, the 3D scheme drawings and traffic data; both with and without the Scheme, and including relevant permitted developments in each assessment year.

6.3.6 The baseline noise model will include all existing noise mitigation, such as noise barriers or bunds, and low noise surfacing. In addition, the 'with scheme' noise models will also include any screening included as part of the scheme design. The road surfacing for each scenario will be determined based on existing surfacing and any plans to resurface in the future and/or with the scheme. Any further mitigation will be determined in accordance with the guidance provided in Section 6.5 of the PEIR Volume 1 Chapter 6 Noise and Vibration.

6.3.7 A detailed assessment is appropriate for this scheme, due to the presence of noise sensitive receptors and the likelihood of significant impact. The assessment consists of the following elements:

- Prediction of daytime ($L_{A10,18h}$) noise levels in the short-term (Scheme opening) and the long-term (future assessment year);
- Prediction of night-time noise levels in the long-term;
- Noise contour plots showing the predicted changes in noise level throughout the study area;
- Assessment of noise levels at traffic links located in the wider area; and
- Assessment of traffic nuisance impacts.

6.3.8 Ordnance Survey base mapping and Addressbase data will be used to establish the relevant noise sensitive receptors within the appropriate calculation area. This will include residential noise sensitive receptors plus non-residential noise sensitive receptors, such as schools, hospitals and places of worship. As ecological receptors have also been identified within Darenth Wood SSSI and Ebbsfleet Marshes LWS that are sensitive to noise, prediction points will be included in the noise modelling to determine how the Scheme will change noise levels within these areas. The impacts in these ecological areas are discussed in more detail in the PEIR Volume 1 Chapter 7 Biodiversity.

6.3.9 The results of this quantitative assessment would then be used to inform the completion of WebTAG worksheets (including calculation of net present value for noise) and Appraisal Summary Tables, and would be reported in accordance with TAG Unit A3 Environmental Impact Appraisal, Chapter 2 Noise Impacts. The Transport Analysis Guidance (TAG) assessment will be reported separately, and quantitative outputs for reporting within the Appraisal Summary Table will be generated where provision of suitable traffic data allows.

Magnitude of impact and significance of effect classification

6.3.10 In terms of road traffic noise, a recognised formal methodology has not yet been developed to establish impact significance. This is recognised in the DMRB 11:3:7 HD 213/11 and an alternate approach is stated:

"In terms of road traffic noise, a methodology has not yet been developed to assign a significance according to both the value of a resource and the magnitude of an impact. However, the magnitude of traffic noise impact from a road project should be classified into levels of impact in order to assist with the interpretation of the road project. Therefore, for the assessment of traffic noise that is covered by this document, a classification is provided for the magnitude of impact."

6.3.11 In absence of a formal methodology for establishing impact significance, the magnitude of the impact will be reported in accordance with the DMRB 11:3:7, detailing the number of noise sensitive receptors predicted to experience given changes in noise levels in both the short term, and long term periods. The magnitude of a noise change is perceived differently dependent on whether it is a sudden change, or a change over a longer period of time. In the short-term (e.g. on Scheme opening) a change in road traffic noise of 1dB $L_{A10,18h}$ is the smallest that is considered to cause a minor impact and is the smallest change that is considered to be perceptible. In the long-term, a 3dB $L_{A10,18h}$ change is considered the minimum required to cause a minor impact and is considered to be the lowest perceptible change in the long term.

6.3.12 The impact magnitudes defined in the DMRB as shown in Table 6.2 The sensitivity of all noise sensitive receptors in the study area is assumed to be high.

Table 6.2: Classification of magnitude of noise impacts

Short-term noise change $L_{A10,18h}$	Long-term noise change $L_{A10,18h}$	Magnitude of impact (adverse or beneficial)
0	0	No Change
0.1 – 0.9	0.1 – 2.9	Negligible
1 – 2.9	3 - 4.9	Minor
3 – 4.9	5 – 9.9	Moderate
5+	10+	Major

Table Source: DMRB HD 213/11

6.3.13 Furthermore, the absolute noise levels predicted at noise sensitive receptors in the opening year and future assessment year of the Scheme will be compared with the SOAEL and the LOAEL. The thresholds assigned to the LOAEL and the SOAEL will be set based upon prevailing guidance for environmental noise assessments and noise thresholds associated impacts to human health, including the WHO Community Noise Guidelines, the DfT TAG (2011a), the Noise Insulation Regulations (NIR) and other appropriate guidance.

6.3.14 The previous assessment undertaken at the Options Selection Stage is reported in Section 6.4 in the PEIR Volume 1 Chapter 6 Noise and Vibration, used the thresholds for adverse effects and significant adverse effects shown in Table 6.3 and Table 6.4.

Table 6.3: Operational noise levels of significance at residential receptors (Daytime)

Effect level	Free-field dB $L_{Aeq,16h}$	Facade dB $L_{A10,18h}$
Adverse effects (LOAEL)	≥ 45	≥ 50
Significant effects (SOAEL)	≥ 63	≥ 68

Table Source: Various

Table 6.4: Operational noise levels of significance at non-residential receptors (Daytime)

Effect level	Free-field dB $L_{Aeq,16h}$	Facade dB $L_{A10,18h}$
Adverse effects (LOAEL)	≥ 46	≥ 51
Significant effects (SOAEL)	≥ 63	≥ 68

Table Source: Various

6.3.15 The assessment of absolute noise levels will establish the following:

- Locations where the LOAEL is exceeded;
- Locations where the existing road traffic noise levels are below the SOAEL and are predicted to exceed the SOAEL as a result of the Scheme; and
- Locations where existing road traffic noise levels are above the SOAEL and are increased by at least 1dB LA10,18h due to the Scheme.

6.3.16 The EIA significance criteria, used to inform the assessment in the PEIR include:

- For properties that do not already exceed the SOAEL, only a moderate or major impact is considered significant. This can be determined using Table 6.2.
- For properties that already exceed the SOAEL in the opening year, a change of 1dB is considered significant in all assessment years. Where this is the case, the short term noise changes provided in Table 6.2 will be used to determine the magnitude of impact.

6.3.17 The significance of a change in noise at any property can be used to determine whether noise mitigation may be required at that property.

Potential for noise mitigation

6.3.18 Noise mitigation for the Scheme can take the form of noise surfacing and environmental noise barriers. It is understood that low noise surfacing will be included on the Scheme and that there are a number of existing environmental noise barriers located near Bean Junction, which can be supplemented, where feasible.

6.3.19 Potential locations requiring environmental noise barriers, based on the findings of Option Selection Stage, will be reviewed early in this Preliminary Design Stage to allow mitigation measures to be incorporated in the design of the Scheme. Noise mitigation will be considered under the following conditions:

- At noise sensitive receptors, with existing noise levels less than the SOAEL, which are predicted significant (Moderate or Major) noise increases as a result of the Scheme;
- At noise sensitive receptors, with existing noise levels more than the SOAEL, which are predicted significant (Minor, Moderate or Major) noise increases as a result of the Scheme;
- To mitigate noise levels in areas with existing high noise levels, such as NIAs, which has not been achieved with the low noise surfacing, as mitigating noise in these areas is a stated objective of the overarching RIS scheme programme; and
- To avoid adverse effects at ecologically sensitive areas.

6.3.20 Detailed noise modelling will be undertaken with potential noise mitigation in place, based on traffic projections from appropriate strategic traffic modelling to permit the degree of accuracy as would be required for such detailed mitigation design. This will include any existing noise mitigation measures that will be retained or replaced by the Scheme. The proposed mitigation measures will be reviewed based on the results of the detailed noise modelling.

6.4 Baseline conditions – Tables

Table 6.5: List of NIAs

NIAs	General area	Specific roads (approximate number of properties in NIA)
NIA 5958	A2	Darenth Wood Road (10)
NIA 5959	A2	Hope Cottages (10) & Ightham Cottages (11), Bean Lane
NIA 6265	A2	The Thrift, Watling Street (2)
NIA 5960	A2	Stonewood Farm, Sandy Lane (1)
NIA 924	B262	Springhead Road (2)
NIA 925	B262	Springhead Road (25)
NIA 1220	Roman Road	Pepper Hill (36), Roman Road (16), Saxon Close (27), Painters Ash Lane (14) & Danes Close (10)
NIA 1219	Roman Road	Landseer Avenue (12), Ashmore Gardens (24), Rowmarsh Close (29), Peach Croft (20), Henley Deane (42), Nash Croft (20), Brightlands (11), Clovers (18), Mallow Close (6), Durndale Lane (14), Dogwood Close (39) & Kemsley Close (23)

Table Source: http://extrium.co.uk/noiseviewer.html

6.5 Potential impacts – Tables

Table 6.6: Short-term traffic noise reporting table (DMRB A1.1)

Change in noise level		Number of dwellings	Number of other sensitive receptors
Increase in noise level, LA10, 18h	0.1 - 0.9	534	0
	1 - 2.9	4	0
	3 - 4.9	0	0
	>=5	0	0
No change	= 0	967	2
Decrease in noise level, LA10, 18h	0.1 - 0.9	735	1
	1 - 2.9	6	0
	3 - 4.9	0	0
	>=5	0	0

Table Source: A2 Bean to Ebbsfleet – Stage 2 EAR – August 2017.

Table 6.7: Long-term traffic noise reporting table (DMRB A1.2)

Change in noise level		Number of dwellings	Number of other sensitive receptors
Increase in noise level, $L_{A10, 18h}$	0.1 - 2.9	321	2
	3 - 4.9	3	0
	5 - 9.9	0	0
	>=10	0	0
No change	= 0	57	0
Decrease in noise level, $L_{A10, 18h}$	0.1 - 2.9	1837	1
	3 - 4.9	28	0
	5 - 9.9	0	0
	>=10	0	0

Table 6.8: Noise impacts on IA's

NIAs	Short term change dB	Long term change dB
NIA 5958	Not assessed at Option Selection Stage	
NIA 5959	-0.1	-2.1
NIA 6265	0.1	-2.2
NIA 5960	0.4	-2.7
NIA 925	0.2	0.8
NIA 1220	0.1	0.4
NIA 1219	-0.2	-2.9
NIA 924	0.0	-3.1

7. Appendix F. Biodiversity

7.1 Planning and policy context

National planning policy

National Policy Statement for National Networks (NN NPS) 2014

7.1.1 The NN NPS sets out the government policies for nationally significant infrastructure rail and road projects for England. Within Chapter 5 of the NPS there is a section on 'Biodiversity and ecological conservation'.

7.1.2 The relevant paragraphs within the Biodiversity and ecological conservation section are summarised below:

- NPS Paragraph 5.27 The most important sites for biodiversity are those identified through international conventions and European Directives.
- NPS Paragraph 5.29 Where a proposed development is likely to have a significant impact on a SSSI, development consent should not normally be granted. Where an adverse effect on a site's notified special interest features is likely, an exception should be made only where the benefits of the development at this site clearly outweigh both the impacts that it is likely to have on the features of the site that make it of special scientific interest, and any broader impacts on the wider network of SSSIs. The Secretary of State should ensure that the applicant's proposals to mitigate the harmful aspects of the development and, where possible, to ensure the conservation and enhancement of the site's biodiversity or geological interest, are acceptable.
- NPS Paragraph 5.31 Sites of regional and local biodiversity have a fundamental role to play in meeting overall national biodiversity targets, in contributing to the quality of life and the well-being of the community, and in supporting research and education. The Secretary of State should give due consideration to such regional or local designations. However, given the need for new infrastructure, these designations should not be used in themselves to refuse development consent.
- NPS Paragraph 5.32 Ancient woodland once lost cannot be recreated. The Secretary of State should not grant development consent for any development that would result in the loss or deterioration of irreplaceable habitats including ancient woodland and the loss of aged veteran trees found outside ancient woodland, unless the national need for and benefits of the development, in that location, clearly outweigh the loss.
- NPS Paragraph 5.33 When considering proposals, the Secretary of State should consider whether the applicant has maximised opportunities for building in beneficial biodiversity features in and around other developments.
- NPS Paragraph 5.35 The Secretary of State should ensure that applicants have taken measures to ensure that statutory protected species, and species and habitats identified as being of principle importance for the conservation of biodiversity in England[1], are protected from adverse effects of development.

[1] Lists of habitats and species of principle importance for the conservation of biological diversity in England published in response to Section 41 of the Natural Environment and Rural Communities Act 2006 are available from the Biodiversity Reporting System website.

The Secretary of State should refuse consent where harm to the habitats or species and their habitats would result, unless the benefits of the development (including need) clearly outweigh that harm.

7.1.3 Applicants should include appropriate mitigation measures as an integral part of their proposed development, including identifying where and how these will be secured. In particular, the applicant should demonstrate that:

- During construction, they will seek to ensure that activities will be confined to the minimum areas required for the works;
- During construction and operation, best practice will be followed to ensure that risk of disturbance or damage to species or habitats is minimised (including as a consequence of transport access arrangements);
- Habitats will, where practicable, be restored after construction works have finished;
- Developments will be designed and landscaped to provide green corridors and minimise habitat fragmentation where reasonable; and
- Opportunities will be taken to enhance existing habitats and, where practicable, to create new habitats of value within the site landscaping proposals, for example through techniques such as the 'greening' of existing network crossing points, the use of green bridges and the habitat improvement of the network verge.

National Planning Policy Framework (NPPF) 2012

7.1.4 The NPPF sets out the Government's planning policies for England and how these are expected to be applied by Local Authorities within their Local Development Frameworks (LDF). Chapter 11 of the NPPF 'Conserving and enhancing the natural environment' sets out the requirements to consider biodiversity in planning decisions.

7.1.5 The relevant paragraphs within Chapter 11 of the NPPF 'Conserving and enhancing the natural environment' are summarised below:

- NPPF Chapter 11 Paragraph 109 The planning system should contribute to and enhance the natural and local environment by:
  - Protecting and enhancing valued landscapes, geological conservation interests and soils;
  - Recognising the wider benefits of ecosystem services; and
  - Minimising impacts on biodiversity and providing net gains in biodiversity where possible, contributing to the Government's commitment to halt the overall decline in biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures.
- NPPF Chapter 11 Paragraph 118 When determining planning applications, local planning authorities should aim to conserve and enhance biodiversity by applying the following principles:
  - If significant harm resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts),

adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused;

- Proposed development on land within or outside a SSSI likely to have an adverse effect on a SSSI (either individually or in combination with other developments) should not normally be permitted. Where an adverse effect on the site's notified special interest features is likely, an exception should only be made where the benefits of the development, at this site, clearly outweigh both the impacts that it is likely to have on the features of the site that make it of special scientific interest and any broader impacts on the national network of SSSI;
- Development proposals where the primary objective is to conserve or enhance biodiversity should be permitted;
- Opportunities to incorporate biodiversity in and around developments should be encouraged; and
- Planning permission should be refused for development resulting in the loss or deterioration of irreplaceable habitats, including ancient woodland and the loss of aged or veteran trees found outside ancient woodland, unless the need for, and benefits of, the development in that location clearly outweigh the loss.
- The following wildlife sites should be given the same protection as European sites:
  - Potential SPAs and possible SACs;
  - Listed or proposed Ramsar sites; and
  - Sites identified, or required, as compensatory measures for adverse effects on European sites, potential SPAs, possible SACs, and listed or proposed Ramsar sites.

- NPPF Chapter 11 Paragraph 119 The presumption in favour of sustainable development (paragraph 14) does not apply where development requiring appropriate assessment under the Birds or Habitats Directives is being considered, planned or determined.

Local planning policy

7.1.6 Table 7.1 below provides a summary of relevant local planning policy.

Table 7.1: Summary of relevant local planning policies

Planning policies	Summary of policy content
Gravesham Borough Council (2014). Local Plan Core Strategy2: - Policy CS12 Green infrastructure	5.7.22 A multifunctional linked network of green spaces, footpaths, cycle routes and wildlife stepping stones and corridors will be created, protected, enhanced and maintained. The network will improve access within the urban area, from the urban area to the rural area and along the River Thames. The key parts of the network are identified on Figure 19: Strategic Green Infrastructure Network. 5.7.23 Sites designated for their biodiversity value will be protected, with the highest level of protection given to internationally designated SPAs, SACs and Ramsar sites, followed by nationally designated

[2] Gravesham Local Plan Core Strategy, Adopted September 2014, available from: http://www.gravesham.gov.uk/services/environment-and-planning/planning/planning-policy/gravesham-local-plan-core-strategy

Planning policies	Summary of policy content
	SSSI, followed by LWS and then by other areas of more local importance for biodiversity. 5.7.24 There will be no net loss of biodiversity in the Borough, and opportunities to enhance, restore, re-create and maintain habitats will be sought, in particular within the Biodiversity Opportunity Areas shown on the Strategic Green Infrastructure Network map and within new development. 5.7.25 Where a negative impact on protected or priority habitats/species cannot be avoided on development sites and where the importance of the development is considered to outweigh the biodiversity impact, compensatory provision will be required either elsewhere on the site or off-site, including measures for ongoing maintenance. 5.7.26 The overall landscape character and valued landscapes will be conserved, restored and enhanced. The greatest weight will be given to the conservation and enhancement of the landscape and natural beauty of the Kent Downs Area of Outstanding Natural Beauty and its setting. Proposals will take account of the Kent Downs Area of Outstanding Natural Beauty Management Plan, the Gravesham Landscape Character Assessment, and the Cluster Studies where relevant.
Dartford Borough Council (2011). Local Plan Core Strategy: - Policy CS 14 Green space	1. The Council will work with its partners to implement a multi-functional, high - quality, varied and well-managed Green Grid3. It will deliver this by: a) Facilitating the creation of approximately 300 hectares of new or improved green spaces as part of new developments by 2026. b) Requiring new development to make a contribution to the Green Grid network as follows: • Sites of 20 ha and over: at least 30% of the site area; • Sites of between 20ha and 2ha: at least 20% of the site area; and • Sites of less than 2ha will be considered on a site by site basis. c) Where on-site open space is not appropriate or feasible, contributions may be sought for off-site improvements of open space in the vicinity of the site. Provision of specific types of green space and water bodies to cater for diverse community needs, including older children and teenagers; natural habitats and biodiversity corridors, and for mitigation of flood risk, will be provided within the overall allocation. d) Working with its partners to implement the projects below, in addition to those in Policy CS 13, through the Council resources and grant funding and as part of the Thames Gateway Parkland project: • Darenth Valley corridor – an enhanced path and landscape from the River Thames through Central Park in Dartford Town Centre to the open countryside; • Central Park – expansion of the park, increased facilities and restoration of its traditional character; • Thames Riverside Path – joining together the existing sections to create a continuous high quality path; • Dartford Marshes – delivery of the 'Managing the Marshes' project which aims to conserve, manage and enhance the grazing marsh; • New Countryside Gateway at South Darenth Lakes;

[3] Green Grid – a strategic network of multi-purpose, attractive public open spaces consisting of green corridors, rivers, lakes and landscapes linked via a series of urban and countryside footpaths, Public Rights of Way, cyclepaths and roads, and designed to connect the main open areas within the urban area.

Planning policies	Summary of policy content
	• Better connectivity between Dartford and Gravesham countryside through Ebbsfleet Valley and A2 corridor; • Creation of a nature reserve east of Stone Lodge; and • Significant biodiversity improvements at development sites include Ebbsfleet Valley, Swanscombe Peninsula and the Northern Gateway. e) Protecting and enhancing existing open spaces, including those shown in Diagram 8 and those identified and designated as locally important, the diverse landscape character, areas of nature conservation value, Sites of Special Scientific Interest, National Nature Reserves and local wildlife sites, community and ancient woodlands, as well as priority habitats and species, both in the urban and rural area. Biodiversity enhancements will be focussed on the Biodiversity Opportunity Areas. Protection and enhancement of biodiversity on brownfield development sites will be based on survey data. 2. Further guidance on the quality, quantity, management, maintenance and delivery of the component parts of the open space will be set out in the Development Management DPD and/or future Supplementary Planning Documents (SPDs).

Biodiversity Action Plans (BAPs)

7.1.7 A Biodiversity Action Plan (BAP) has been produced for Kent by the Kent Biodiversity Partnership (2005), which provides action plans for priority habitats and species. In addition, Highways England have produced a Biodiversity Plan (2015), which proposes a local approach to improving biodiversity surrounding the road network and encourages management activities to be guided by the principles of Natural England's The Mosaic Approach: Managing Habitats for Species (2013), including efforts to target priority habitats and species[4].

Relevant Legislation

7.1.8 Further summaries of UK wildlife legislation relevant to the Scheme are provided below in Tables 7.8 to 7.10.

7.2 Study area

7.2.1 The study area, as defined in the Preliminary Design Stage Scoping Report, was identified by determining an Ecological Zone of Influence (EZoI) encompassing all of the predicted adverse effects of the Scheme on nature conservation resources.

7.2.2 The extent of the EZoI has been revised at each stage of the process to date, as the number of options has reduced, the preferred options have been selected and as the DCO pre-application boundary (red line boundary) of the Scheme (the survey area) has been re-defined.

7.2.3 The EZoI includes the DCO pre-application boundary (red line boundary) (provided on the Scheme Drawings Figure 2.2 Sheets 1-5 in the PEIR Volume 3), but due to the relative importance of some nature conservation resources,

[4] Habitats and species of principal importance for the conservation of biodiversity as identified by the Secretary of State for England, in consultation with Natural England, are referred to in Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 for England.

and the mobility of some species, the study area has been extended to include resources at difference spatial extents (measured from the red line boundary), which were based on current best practice guidance, as follows:

- 2 km[5] for statutory designated sites of nature conservation importance: Special Areas of Conservation (SACs)[6], Special Protection Areas (SPAs)[7], Wetlands of International Importance (Ramsar sites), SSSIs, National Nature Reserves (NNRs) and Local Nature Reserves (LNRs);
- 2 km for non-statutory designated sites of nature conservation importance known locally as Local Wildlife Sites (LWSs) and Roadside Nature Reserves (RNRs);
- 30 km for SACs where bats are one of the qualifying species[8];
- 1 km for notable habitats[9], ancient woodland, and notable[10] or legally protected species[11], which was extended to 5 km for bats and 3 km for reptiles and amphibians[12]; and
- 50 m for veteran trees.

7.3 Methodology

Desk study

7.3.1 A desk study was undertaken to gather information on designated sites, habitats and species within the study area, which included the following:

- The Multi-Agency Geographic Information for the Countryside (MAGIC) website (2017) was used to obtain information on statutory designated sites within 2 km of the Scheme, SACs within 30 km of the Scheme where bats are a qualifying feature, notable habitats and ancient woodland within 1 km of the Scheme;
- Records of non-statutory designated sites of nature conservation importance (LWSs and RNRs) within 2 km of the Scheme, notable and legally protected species, and invasive plant species within 1 km of the Scheme, bats within 5 km of the Scheme, and reptiles and amphibians within 3 km of the Scheme were obtained from Kent and Medway Biological Records Centre (KMBRC);
- Records of badgers (*Meles meles*) within 1 km of the Scheme have been obtained from West Kent Badger Group (WKBG);
- Records of birds within 1 km of the Scheme have been obtained from Kent Ornithological Society (KOS) via KMBRC;

[5] Extended based on professional knowledge to look at potential impacts to internationally designated statutory sites located downstream of any watercourses within or adjacent to the Scheme.
[6] Including candidate and possible SACs (cSACs and pSACs)
[7] Including candidate and possible SACs (cSACs and pSACs)
[8] DMRB guidance on the Assessment of Implications on European Sites recommends this wide search area due to the mobility of bats
[9] This refers to Habitats of Principle Importance, as listed under Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006).
[10] This refers to Species of Principle Importance, as listed under Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006).
[11] Extended to five kilometres for bats.
[12] Based on the extent of the data provided from the Kent Bat Group and Kent Reptile and Amphibian Group.

- Records of veteran trees within 50 m of the Scheme have been obtained from the Woodland Trust's website (2011); and
- Ordnance Survey maps (2017) and the Where's the Path website (2013) were used to identify the presence of waterbodies within 500 m of the Scheme, in order to establish if great crested newts (*Triturus cristatus*) are potentially present on land within and immediately surrounding the survey area.

7.3.2 In addition, ecological data from the following sources, relating to developments adjacent to the survey area, were reviewed:

- Land Securities, the owners of Eastern Quarry located immediately to the north of the Bean to Ebbsfleet stretch of the A2, provided ecological data from 2015 and 2017 relating to the development and implementation of the Biodiversity Action Plan Monitoring and Management Plan for the Eastern Quarry site;
- Bluewater Retail Park was approached in 2014 for ecological data which was provided for survey work that had been undertaken within their grounds;
- London Resort provided details of surveys to be undertaken within the A2 project area in relation to their development; and
- Dartford Borough Council planning portal was searched in 2017 for documents relating to other local developments where ecological surveys for notable and legally protected species surveys have been undertaken.

Field surveys

Extended Phase 1 surveys

7.3.3 An extended Phase 1 habitat survey of accessible land was undertaken by Halcrow Hyder Joint Venture (HHJV) within the survey area during May 2015 and June 2015, and updated by HHJV in June 2017. The survey broadly followed the Phase 1 habitat survey methodology as set out in Joint Nature Conservation Committee guidance (2010) to record information on the habitats within the survey area, and was 'extended' to include a search for evidence of presence, and an assessment of the potential of each habitat to support, notable and protected species, as recommended by the Chartered Institute for Ecology and Environmental Management (CIEEM) (2012). Figure 7.1 in the PEIR Volume 3 outlines the findings from the Phase 1 habitat survey.

Notable and protected species surveys

7.3.4 Initial notable and protected species surveys were undertaken by HHJV in 2014 and 2015, and updated by HHJV in 2017. The majority of these surveys have now been completed, although some surveys will continue through the Preliminary Design Stage.

Veteran trees

7.3.5 An arboricultural survey will be undertaken during the Preliminary Design Stage in order to identify any veteran trees that may fall within or immediately adjacent to the permanent or temporary land take areas.

Notable plants

7.3.6 A National Vegetation Classification (NVC) survey will be undertaken during the Preliminary Design Stage of notable habitats such as ancient woodland and species-rich grassland to identify the presence and location of any populations of notable plant species within or immediately adjacent to the permanent or temporary land take areas.

Bat surveys

7.3.7 Bat surveys were undertaken in 2017 according to good practice guidance (Collins, 2016), within the survey area.

7.3.8 Internal and external building inspections were undertaken in May and June 2017 for properties on Bean Lane (Ightham Cottages), where access was permitted, and a stable and three outbuildings. The inspections enabled the identification of potential bat roosting features, evidence of bat presence and a categorisation of potential for each structure to support roosting bats.

7.3.9 Ground-based tree inspections were undertaken in June 2017 to identify potential bat roosting features, which enabled a categorisation of potential to be made for each tree to support roosting bats.

7.3.10 Two wooden bat boxes on semi-mature trees located in the horse sanctuary paddock at Bean Interchange were inspected for evidence of use by roosting bats in June 2017.

7.3.11 A presence/ likely absence survey for bats (comprised of one dawn re-entry survey) was undertaken for accessible buildings on Bean Lane (Ightham Cottages) in June 2017, which were categorised to have at least low potential to support roosting bats.

7.3.12 Bat activity transect surveys were undertaken at one site in June (summer) and September (autumn) 2017 within habitats that were categorised as having low suitability for foraging and commuting bats. The site includes a horse paddock and a section of Bean Lane adjacent to Ightham Cottages.

7.3.13 Further bat surveys will be carried out in 2018 where it is necessary to obtain complete data sets and to update existing data.

Great crested newt surveys

7.3.14 Great crested newt surveys were undertaken in 2015 and 2017 according to good practice guidance (Oldham et al 2000, Biggs et al 2014 and English Nature 2001) within the survey area. Ponds within the Eastern Quarry Land and Bluewater Retail Park were excluded from surveys as these ponds had previously been subjected to great crested newt surveys by other consultancies and the results of these surveys were provided for information.

7.3.15 A Habitat Suitability Index (HSI) assessment was carried out for 10 ponds within the survey area (up to 500 m from the Scheme) in May 2015. Ponds with an HSI score of ‘average’ or above (> 0.6) were subject to further survey.

7.3.16 Great crested newt presence/ likely absence surveys were carried out using the environmental DNA (eDNA) survey method in June 2015 and May 2017. Water samples were taken from seven ponds in 2015 and two ponds (one of which was a re-sample) in 2017. Laboratory analysis of the water samples was undertaken

by Fera Science in 2015 and Sure Screen Scientifics in 2017 to identify great crested newt DNA in each pond, which in-turn confirms the presence or likely absence of great crested newts.

7.3.17 Great crested newt presence/ likely absence surveys were also carried out using standard survey techniques such as bottle trapping, torching, egg searching and netting for two ponds in conjunction with the eDNA method in May 2017 to update existing data. A total of four survey visits were undertaken for each pond using these techniques.

7.3.18 Further great crested newt surveys will be carried out in spring 2018 where it is necessary to update existing data.

Hazel dormouse surveys

7.3.19 Hazel dormouse surveys were undertaken in 2014 and 2017 according to good practice guidance (Bright at al, 2006), within the survey area.

7.3.20 A total of 161 nest tubes were installed in habitats suitable to support hazel dormice to the north and south of the A2 in July 2014. The nest tubes were inspected monthly in August, October, November and December 2014.

7.3.21 A total of 75 nest tubes were installed in suitable habitats on previously inaccessible land in May 2017. These comprised The Thrift ancient woodland and the road verge between the westbound A2 carriageway and Bean Lane. The nest tubes were inspected monthly in June and July 2017. It is understood that survey work has continued by HHJV. However, the results were not available at the time of writing this report.

7.3.22 Further dormouse surveys may need to be carried out in 2018 if it is necessary to update existing data (to be confirmed in consultation with Natural England).

Reptile surveys

7.3.23 A reptile habitat assessment was undertaken during the extended Phase 1 habitat survey to identify areas of habitat considered to offer moderate or high suitability for reptiles within the survey area.

7.3.24 Consequently, reptile surveys were undertaken in September 2017 according to good practice guidance (Gent and Gibson, 2003) in targeted areas of suitable habitat within the survey area using artificial refugia such as corrugated metal and roofing felt sheets, which are known to attract basking and sheltering reptiles.

7.3.25 The results of the surveys were not available at the time of writing this report. Therefore, a precautionary approach has been taken to this assessment and it has been assumed that reptiles are present in areas of suitable habitat.

Badger surveys

7.3.26 Badger surveys were undertaken during the extended Phase 1 habitat survey according to good practice guidance (Harris et al, 1989) to identify field signs such as setts, latrines, paw prints, snuffle holes (created whilst foraging), trackways, hairs and scratching posts, which identify the presence of badgers within the survey area.

7.3.27 Further badger surveys will be carried out within the survey area in spring 2018 to update existing data.

Assessing value (sensitivity) of nature conservation resources

7.3.28 Nature conservation resources have been valued following the framework provided in IAN 130/10 Ecology and Nature Conservation: Criteria for Impact Assessment. This is presented in Table 7.2 below.

7.3.29 The evaluation was based on the information available from the desk study and ecological surveys, and used professional judgement, as well as accepted criteria (Ratcliffe, 1977) (e.g. diversity, rarity and naturalness) for valuing nature conservation resources in a geographical context.

Table 7.2: Resource valuation[13]

Examples of resource valuation based on geographical context
International or European value
Natura 2000 sites including: Sites of Community Importance (SCIs); SPAs; potential SPAs (pSPAs); SACs; candidate or possible SACs (cSACs or pSACs[14]); and Wetlands of International Importance (Ramsar sites). Biogenetic Reserves, World Heritage Sites (designated for their nature conservation value), and Biosphere Reserves. Areas which meet the published selection criteria for those sites listed above but are not themselves designated as such[15]. Resident, or regularly occurring, populations of species which may be considered at International or European level[16] where: • The loss of these populations would adversely affect the conservation status or distribution of the species at this geographic scale; or • The population forms a critical part[17] of a wider population at this scale; or • The species is at a critical phase[18] of its life cycle at this scale.
UK or National value
Designated sites including: SSSIs; including Marine Protected Areas (MPAs); Marine Conservation Zones (MCZs); and NNRs. Areas which meet the published selection criteria e.g. JNCC (1998) for those sites listed above but which are not themselves designated as such[19]. Areas of key/priority habitats identified in the UK Biodiversity Action Plan (BAP); including those published in accordance with Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006) and those considered to be of principle importance for the conservation of biodiversity[20].

[13] Table content copied from IAN 130/10 http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian130.pdf
[14] pSACs are sites which have been formally advised to the UK government but have not yet been submitted to the European Commission. These sites should be valued at European level on the basis that they meet the relevant selection criteria for a SAC but are not yet designated as such.
[15] Valuation to be made in consultation with Statutory Environmental Body (SEB, in this Scheme Natural England).
[16] Valuation to be made in consultation with SEB. Such species include those listed within Council Directive 79/409/EEC on the conservation of wild birds or animal/plant species listed within Council Directive 92/43/EEC.
[17] Valuation to be made in consultation with SEB. Such population include sub-populations that are essential to maintenance of metapopulation dynamics e.g. critical emigration/immigration links between otherwise discrete populations.
[18] Seasonal activity or behaviour upon which survival or reproduction depends.
[19] Valuation to be made in consultation with SEB.
[20] Valuation to be made in consultation with SEB as such listings do not in themselves indicate intrinsic value, but instead indicate a conservation priority.

Examples of resource valuation based on geographical context
Areas of Ancient Woodland e.g. woodland listed within the Ancient Woodland Inventory[21]. Resident, or regularly occurring, populations of species which may be considered at International, European, UK or National level[22] where: • The loss of these populations would adversely affect the conservation status or distribution of the species at this scale; or • The population forms a critical part[23] of a wider population at this scale, or • The species is at a critical phase[24] of its life-cycle at this scale.
Regional value
Areas of key/priority habitats identified in the Regional BAP (where available); areas of key/priority habitat identified as being of Regional value in the appropriate Natural Area Profile (or equivalent); areas that have been identified by regional plans or strategies as areas for restoration or re-creation of priority habitats (for example South West Nature Map); and areas of key/priority habitat listed within the Highways Agency's BAP. Resident, or regularly occurring, populations of species which may be considered at an International, European, UK or National level[2526] and key/priority species listed within the HABAP where: • The loss of these populations would adversely affect the conservation status or distribution of the species at this scale; or • The population forms a critical part[27] of a wider population; or • The species is at a critical phase[28] of its life cycle.
County or Unitary Authority area value
Designated sites including: Sites of Nature Conservation Importance (SNCIs); County Wildlife Sites (CWSs); and Local Nature Reserves (LNRs) designated in the county or unitary authority area context[29]. Areas which meet the published selection criteria for those sites listed above but which are not themselves designated as such[30]. Areas of key/priority habitats identified in the Local BAP; and areas of habitat identified in the appropriate Natural Area Profile (or equivalent).

[21] Valuation to be made in consultation with SEB, and with use of professional judgement as listing does not in itself indicate intrinsic nature conservation value.
[22] Valuation to be made in consultation with SEB as such listings do not in themselves indicate intrinsic value. Such species include those listed within Council Directive 79/409/EEC on the conservation of wild birds or animal/plant species listed within Council Directive 92/43/EEC. Species which may be considered at the UK or National level means: birds, other animals and plants which receive legal protection on the basis of their conservation interest (those listed in the Wildlife and Countryside Act 1981 (as amended), SCH 1, 5 and 8); species listed for their principle importance for biodiversity (in accordance with the Natural Environment and Rural Communities Act 2006 Section 41 [England]; and priority species listed within the UKBAP or species listed within Red Data Books.
[23] Valuation to be made in consultation with the SEB. Such populations include sub-populations that are essential to the maintenance of metapopulation dynamics e.g. critical emigration/immigration links between otherwise discrete populations.
[24] A seasonal activity or behaviour upon which survival or reproduction depends.
[25] Valuation to be made in consultation with the SEB. Such species include those listed within Council Directive 79/409/EEC on the conservation of wild birds or animal/plant species listed within Council Directive 92/43/EEC.
[26] Valuation to be made in consultation with the SEB as such listings do not in themselves indicate intrinsic value. Such species include those listed within Council Directive 79/409/EEC on the conservation of wild birds or animal/plant species listed within Council Directive 92/43/EEC. Species which may be considered at the UK or National level means: birds, other animals and plants which receive legal protection on the basis of their conservation interest (those listed in the Wildlife and Countryside Act 1981 (as amended), SCH 1, 5 and 8); species listed for their principle importance for biodiversity (in accordance with the Natural Environment and Rural Communities Act 2006 Section 41 [England]; and priority species listed within the UKBAP or species listed within Red Data Books.
[27] Valuation to be made in consultation with the SEB. Such populations include sub-populations that are essential to the maintenance of metapopulation dynamics e.g. critical emigration/immigration links between otherwise discrete populations.
[28] A seasonal activity or behaviour upon which survival or reproduction depends.
[29] Valuation to be made in consultation with county ecologist or equivalent, with reference made to the criteria for designation. In terms of Kent, areas which are important for the conservation of wildlife are termed Local Wildlife Sites (LWSs).
[30] Valuation to be made in consultation with county ecologist or equivalent.

Examples of resource valuation based on geographical context
Resident, or regularly occurring, populations of species which may be considered at an International, European, UK or National level[31][32] where: • The loss of these populations would adversely affect the conservation status or distribution of the species across the County or Unitary Authority Area; or • The population forms a critical part[33] of a wider population; or • The species is at a critical phase[34] of its life cycle.
Local value
Designated sites including Local Nature Reserves (LNRs) designated in the local context[35]. Trees that are protected by Tree Preservation Orders (TPOs). Areas of habitat; or populations/communities of species considered to appreciably enrich the habitat resource within the local context (such as veteran trees), including features of value for migration, dispersal or genetic exchange.

Nature conservation assessment

7.3.30 During the Preliminary Design Stage, a detailed assessment36 will be undertaken for specific nature conservation resources. This assessment will incorporate guidance from Design Manual for Roads and Bridges (DMRB) Volume 11: Environmental Assessment, IAN 130/10 and the Chartered Institute for Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2016).

7.3.31 At the time of writing this report, some ecological survey data from 2017 survey work is outstanding and due to be completed by HHJV. Further survey work is also required in 2018 by Atkins. In addition, not all design details have been finalised in respect of the Scheme. However, it is considered that sufficient information is available in order to allow an informed preliminary assessment of the effects of the Scheme on nature conservation resources.

7.3.32 The assessment will include an initial characterisation of the potential impacts on nature conservation resources, and take into account both on-site impacts and those that may occur to adjacent and more distant nature conservation resources, including:

- Direct loss of habitats (including temporary loss);
- Fragmentation or isolation of habitats;
- Changes to the local hydrology, water quality and/or air quality;
- Direct mortality or injury to wildlife through construction activities; and

[31] Valuation to be made in consultation with the SEB. Such species include those listed within Council Directive 79/409/EEC on the conservation of wild birds or animal/plant species listed within Council Directive 92/43/EEC.
[32] Valuation to be made in consultation with the SEB as such listings do not in themselves indicate intrinsic value. Such species include those listed within Council Directive 79/409/EEC on the conservation of wild birds or animal/plant species listed within Council Directive 92/43/EEC. Species which may be considered at the UK or National level means: birds, other animals and plants which receive legal protection on the basis of their conservation interest (those listed in the Wildlife and Countryside Act 1981 (as amended), SCH 1, 5 and 8); species listed for their principle importance for biodiversity (in accordance with the Natural Environment and Rural Communities Act 2006 Section 41 [England]; and priority species listed within the UKBAP or species listed within Red Data Books.
[33] Valuation to be made in consultation with the SEB. Such populations include sub-populations that are essential to the maintenance of metapopulation dynamics e.g. critical emigration/immigration links between otherwise discrete populations.
[34] A seasonal activity or behaviour upon which survival or reproduction depends.
[35] Valuation to be made in consultation with county ecologist or equivalent, with reference made to the criteria for designation.
[36] According to DMRB Volume 11, Section 2, Part 1 General Principles and Guidance of Environmental Impact Assessment

- Disturbance to species from noise, light or other visual stimuli.

7.3.33 An effect resulting from impacts on nature conservation resources would be determined significant if those impacts change the structure and functions of designated sites, notable habitats, or ecosystems; or the conservation status of habitats and species.

7.3.34 Effects are identified at the geographic scale at which they become significant, which is dependent on the value of the affected resource and the characteristics of the ecological impact. The residual significance of effects takes into account any mitigation provided.

7.3.35 The significance of effects on nature conservation resources are categorised on the five-point scale in-line with IAN 130/10 shown in Table 7.3 below. Application will rely on professional judgement by experienced ecologists.

Table 7.3: Significance of effects

Significance category	Typical descriptors of effect
Very large	An impact on one or more receptor(s)37 of International, European, UK or National Value. NOTE: only adverse effects are normally assigned this level of significance. They should be considered to represent key factors in the decision-making process.
Large	An impact on one or more receptor (s) of Regional Value. NOTE: these effects are considered to be very important considerations and are likely to be material in the decision-making process.
Moderate	An impact on one or more receptor(s) of County or Unitary Authority Area Value. NOTE: These effects may be important, but are not likely to be key decision-making factors.
Slight	An impact on one or more receptor (s) of Local Value. NOTE: These effects are unlikely to be critical in the decision-making process, but are important in enhancing the subsequent design of the project.
Neutral	No significant impacts on key nature conservation receptors. NOTE: Absence of effects, or those that are beneath levels of perception.

Limitations and assumptions

7.3.36 The limitations and assumptions that apply to ecological surveys undertaken to date are provided in the Preliminary Design Stage Scoping Report.

7.3.37 The detailed assessment will be based on the baseline conditions and design information available at the time of writing this report. Survey data is required from surveys work completed by HHJV in 2017. In addition, further survey work is required in 2018 to update existing data and complete the data sets for notable and legally protected species. However, it is considered that sufficient information is available in order to allow an initial characterisation of the potential effects of the Scheme on nature conservation resources.

[37] Features are referred to as 'nature conservation resources' in this report

7.4 Baseline conditions – Tables

Table 7.4: Summary of statutory designated sites within the study area

Site name	Approximate distance and direction from the survey area	Description	Area (ha)	Grid reference
Darenth Wood SSSI	Directly adjacent to the survey area, north and south of the A2, west of Bean Junction	Ancient semi-natural woodland (ASNW). 'The site comprises some of the most valuable areas of ancient semi-natural woodland in north-west Kent and includes several rare woodland types. There are recent records of two nationally rare (Red Data Book) species and 32 nationally scarce species and historic records of a further 40 Red Data Book species and 200 nationally scarce species.' 'The range of soils that occur throughout the site has given rise to several distinct woodland types: Acidic birch Betula spp -- sessile oak Quercus petraea wood'… 'on higher ground', … 'sessile oak hornbeam Carpinus betulus woodland' … 'on shallow chalk soils at the base of slopes' … ('very rare in Britain, largest known example in North Kent'), and 'acidic hazel Corylus avellana-sessile oak woodland' … 'on sloping ground.' 'Many of the recorded invertebrate species are associated with dead wood and include the nationally rare beetles Agrilis pannonicus and Platypus cylindricus'. 'Numerous bugs, beetles and moths, including the cloaked carpet moth Euphyia biangulata and the ground bug Trapezonotus dispar, are associated with the more open conditions found along the edges of the glades'. 'Immediately to the west of Darenth Wood is a small area of chalk grassland, which supports a wide range of plants, including the nationally rare and specially protected field eryngo or Watling Street thistle (*Eryngium campestre*) and the nationally scarce ground pine (*Ajuga chamaepitys*) and man orchid (*Aceras anthropophorum*).'[38]	121.79	TQ 575722

[38] https://designatedsites.naturalengland.org.uk/PDFsForWeb/Citation/1003548.pdf

Table 7.5: Summary of LWS within the study area

Site name	Approximate distance and direction from the survey area	Description	Area (ha)	Grid reference
Ebbsfleet Marshes LWS	Directly adjacent to the survey area, east of Ebbsfleet Junction	'The Ebbsfleet is a calcareous stream flowing in a shallow valley with surrounding marsh, scrub and grassy areas. The stream varies in width, generally shallow with a fringing of common marginal species. Areas of dense reedbed occur at the northern end, with sedges and other marshland plants occasional.' 'The uncommon narrow-leaved everlasting pea *Lathyrus sylvestris* was observed in the scrubby margins.' 'The site is likely to support a good bird and invertebrate fauna. Many common butterflies were present. The uncommon Roesel's bush cricket *Metrioptera roeselii* was also recorded.' 'A large flooded chalk pit at the north-eastern end with vertical cliffs and adjacent vegetation supports kestrel, house martin, swallow, sand martin and swift. Great crested newt, smooth newt, slow worm and grass snake have also been observed.' 'The north-western end is mainly dense scrub with scattered areas of calcareous grassland infrequent between the main scrubby areas.' 'Grassland adjoining the railway embankment was notable for large numbers of brimstone, peacock and comma butterflies.'	46.95	TQ616729
Beacon Wood Country Park LWS	370 m south of the survey area (at Bean Junction)	The site supports pockets of ancient semi-natural woodland (forming the ancient woodland designation below) and a large water body, with rare plants (including sea club-rush (*Bolboschoenus maritimus*), aquatic moss and round-leaved wintergreen (*Pyrola rotundifolia),* fungi and invertebrates, amphibians, woodland and farmland birds, badger and hazel dormouse.	27.52	TQ588718

Table 7.6: Summary of ancient woodland within the study area

Site name	Approximate distance and direction from the survey area	Area (ha)	Grid reference
The Thrift	Partially within the survey area (see below re boundary), south of the A2, east of Bean Junction.	8.27	TQ592725

Site name	Approximate distance and direction from the survey area	Area (ha)	Grid reference
Unnamed (two small areas, possibly remnants of The Thrift)	Adjacent to the survey area north of the A2, east of Bean Junction.	0.40 and 0.20	TQ591727 and TQ593727
Darenth Wood	Adjacent to the survey area north and south of the A2, west of Bean Junction.	11.33	TQ581724
Parkhill Wood	Adjacent to the survey area south of the A2 (mid-way between Bean and Ebbsfleet Junctions).	4.77	TQ599725
Beacon Wood	700 m south from the survey area (at Bean Junction).	2.44	TQ589716

7.5 Potential mitigation measures – Tables

Table 7.7: Potentially significant effects of the Scheme on nature conservation resources (with mitigation)

Nature conservation resource	Value of resource	Potential impacts and mitigation	Significance of effect after mitigation
Darenth Wood SSSI	National	No direct impacts. Indirect adverse impacts from very limited localised vegetation clearance within the highways boundary reducing the ecological buffer to the SSSI. Indirect adverse impacts from air/groundwater pollution during construction and operation of the Scheme. Potential for beneficial effects from reduced noise and air quality impacts will be assessed during the Preliminary Design Stage. Mitigation will include measures to protect the SSSI from pollution and accidental incursion.	Neutral
Ebbsfleet Marshes LWS	County	No direct impacts. Indirect adverse impacts from air/water pollution during construction and operation of the Scheme. Mitigation will include measures to protect the LWS from pollution and accidental incursion.	Neutral
Ancient Woodland	National (Darenth Wood) To be confirmed (The Thrift, Parkhill Wood and two	Potential for direct impacts resulting from very localised permanent habitat loss from the edge of two small unnamed ancient woodlands located adjacent the A2 to the north (existing data indicates ancient woodland loss can be avoided; to be confirmed during the Preliminary Design Stage). Indirect adverse impacts from localised vegetation clearance within the highways	Moderate (to be confirmed). Residual impacts may include loss of irreplaceable habitat, which cannot be recreated (if loss of ancient woodland cannot

Nature conservation resource	Value of resource	Potential impacts and mitigation	Significance of effect after mitigation
	unnamed areas)	boundary reducing the ecological buffer to ancient woodland. Indirect impacts from air/groundwater pollution during construction and operation of the Scheme. Potential for beneficial effects from reduced noise and air quality. Impacts will be assessed during the Preliminary Design Stage. Mitigation will include measures to protect retained ancient woodland from pollution and accidental incursion.	be avoided; to be confirmed during the Preliminary Design Stage). If this is the case, compensation would be required.
Notable Habitats (where not designated and/or in ancient woodland)	Local (HPI and potential HPI) Other vegetation supports habitat connectivity surrounding the Scheme	Direct impacts resulting from permanent and temporary habitat loss. Indirect impacts from air/water pollution during construction and operation of the Scheme. Mitigation will include advanced planting, new habitat creation, and measures to protect adjacent habitats from pollution and accidental incursion.	Slight (anticipated to reduce to Neutral in the long-term).
Notable and Legally Protected Species	Local	Direct impacts resulting from permanent and temporary habitat loss and/or fragmentation, killing, injury and disturbance during construction. Indirect impacts from noise/light pollution during construction and operation of the Scheme. Mitigation will include measures to protect notable and legally protected species during site clearance, including working under a mitigation licence (where required), and sensitive lighting design.	Slight (anticipated to reduce to Neutral in the long-term).

7.6 Summary of further relevant legislation and policy

Table 7.8: Summary of relevant biodiversity legislation – Species

Species	Legislation	Offences	Licensing procedures and guidance
Bats European protected species	Conservation of Habitats and Species Regulations 2010 (as amended) Reg 41	Deliberately[39] capture, injure or kill a bat; deliberate disturbance[40] of bats; or damage or destroy a breeding site or resting place used by a bat. [The protection of bat roosts is considered to apply regardless of whether bats are present.]	A Natural England licence in respect of development is required. Guidance documents: • Natural England Standing Advice for protected species 2013; • European Protected Species: Mitigation Licensing- How to get a licence (Natural England, 2013); • Bat Mitigation Guidelines (English Nature 2004); and • Bat Workers Manual (JNCC 2004).
	Wildlife and Countryside Act 1981 (as amended) S.9	Intentionally or recklessly obstruct access to any structure or place used for shelter or protection or disturb[41] a bat in such a place.	Licence from Natural England is required for surveys (scientific purposes) that would involve disturbance of bats or entering a known or suspected roost site.
Badger	Protection of Badgers Act 1992 (as amended)	Wilfully kill, injure or take a badger; or intentionally or recklessly damage, destroy or obstruct access to a badger sett or disturb a badger in its sett. [It is not illegal to carry out disturbance activities in the vicinity of setts that are not occupied.]	Where required, licences for development activities involving disturbance or sett interference or closure are issued by Natural England. Licences for activities involving watercourse maintenance, drainage works or flood defences are issued under a separate process. Licences are normally not granted from December to June inclusive because cubs may be present within setts. Guidance documents: • Natural England Standing Advice for protected species 2013; and • Badgers & Development (Natural England, 2007).

[39] Deliberate capture or killing is taken to include “accepting the possibility” of such capture or killing.
[40] Deliberate disturbance of animals includes in particular any disturbance which is likely a) to impair their ability (i) to survive, to breed or reproduce, or to rear or nurture their young, or (ii) in the case of animals of hibernating or migratory species, to hibernate or migrate; or b) to affect significantly the local distribution or abundance of the species to which they belong.
[41] Lower levels of disturbance not covered by the Conservation of Habitats and Species Regulations 2010 remain an offence under the Wildlife and Countryside Act 1981 although a defence is available where such actions are the incidental result of a lawful activity that could not reasonably be avoided.

Species	Legislation	Offences	Licensing procedures and guidance
Otter European protected species	Conservation of Habitats and Species Regulations 2010 (as amended) Reg 41	Deliberately[39] capture, injure or kill an otter; deliberate disturbance[40] of otters; or damage or destroy a breeding site or resting place used by an otter.	Licences issued for development by Natural England. Guidance documents: • Natural England Standing Advice for protected species 2013; and • European Protected Species: Mitigation Licensing- How to get a licence (Natural England, 2013).
	Wildlife and Countryside Act 1981 (as amended) S.9	Intentionally or recklessly obstruct access to any structure or place used for shelter or protection or disturb[41] an otter in such a place.	No licence is required for survey in England. However, a licence would be required if the survey methodology involved disturbance.
Hazel dormouse European protected species	Conservation of Habitats and Species Regulations 2010 (as amended) Reg 41	Deliberately capture, injure or kill a hazel dormouse; deliberate disturbance of a hazel dormouse; or damage or destroy a breeding site or resting place used by a hazel dormouse.	A Natural England licence in respect of development is required. Guidance documents: • Natural England Standing Advice for protected species 2013; • European Protected Species: Mitigation Licensing- How to get a licence (Natural England, 2013); and • Dormouse Conservation Handbook (English Nature 2006).
	Wildlife and Countryside Act 1981 (as amended) S.9	Intentionally or recklessly obstruct access to any structure or place used for shelter or protection or disturb[48] a hazel dormouse in such a place.	Licence issued for survey and conservation by Natural England.
Water vole	Wildlife and Countryside Act 1981 (as amended) S.9	Intentionally kill, injure or take water voles; intentionally or recklessly damage, destroy or obstruct access to any structure or place used for shelter or protection or disturb a water vole in such a place.	No licence is required for survey in England, unless you are likely to commit an action that is otherwise illegal. There are currently no licensing purposes that explicitly cover development activities or activities associated with the improvement or maintenance of waterways. However when a proposed lawful activity has no opportunity to retain water voles within a development site and their translocation would result in a conservation benefit then a licence from Natural England may be obtained.

Species	Legislation	Offences	Licensing procedures and guidance
			Guidance documents: • Natural England Standing Advice for protected species 2013; • The Water Vole Conservation Handbook (R. Strachan & T. Moorhouse, Wildlife Conservation Research Unit, 2nd Edition 2006); and • Water voles and development licensing policy - Natural England Technical Information Note TIN042 2008.
Birds	Wildlife and Countryside Act 1981 (as amended) S.1	Intentionally kill, injure or take any wild bird; intentionally take, damage or destroy the nest of any wild bird while that nest is in use or being built; intentionally take or destroy the nest or eggs of any wild bird. Intentionally or recklessly disturb a Schedule 1 species while it is building a nest or is in, on or near a nest containing eggs or young; intentionally or recklessly disturb dependent young of such a species [e.g. most birds of prey, kingfisher, barn owl, black redstart, little ringed plover].	No licences are available to disturb any birds with regard to development. Licences are available in certain circumstances to damage or destroy nests, but these only apply to the list of licensable activities in the Act and do not cover development. General licences are available in respect of 'pest species' but only for certain very specific purposes e.g. public health, public safety, air safety. Guidance documents: • Natural England Standing Advice for protected species 2013.
Great crested newt European protected species	Conservation of Habitats and Species Regulations 2010 (as amended) Reg 41	Deliberately[39] capture, injure or kill a great crested newt; deliberate disturbance[40] of a great crested newt; deliberately take or destroy its eggs; or damage or destroy a breeding site or resting place used by a great crested newt.	Licences issued for development by Natural England. Guidance documents: • Natural England Standing Advice for protected species 2013; • European Protected Species: Mitigation Licensing- How to get a licence (Natural England; 2013); and • Great Crested Newt Mitigation Guidelines (English Nature 2001).
	Wildlife and Countryside Act 1981 (as amended) S.9	Intentionally or recklessly obstruct access to any structure or place used for shelter or protection or disturb[41] a great crested newt in such a place.	Licences issued for science (survey), education and conservation by Natural England.

Species	Legislation	Offences	Licensing procedures and guidance
Adder Common lizard Grass snake Slow worm	Wildlife and Countryside Act 1981 S.9(1) and S.9(5)	Intentionally kill or injure any common reptile species.	No licence is required. However an assessment for the potential of a site to support reptiles should be undertaken prior to any development works which have potential to affect these animals. Guidance documents: Natural England Standing Advice for protected species 2013.
White-clawed crayfish	Wildlife and Countryside Act 1981 S.9(1) only	Intentionally take from the wild.	Licences issued by Natural England for survey (to take crayfish by hand, by hand net or by crayfish trap). Use of crayfish traps for survey requires Environment Agency consent. Using crayfish traps to remove crayfish for maintenance or development activities in a watercourse requires a conservation licence from Natural England and a permit from the Environment Agency. No licences in respect of development are available. Guidance documents: • Natural England Standing Advice for protected species 2013.
Rabbits, foxes and other wild mammals	Wild Mammals (Protection) Act 1996	Intentionally inflict unnecessary suffering to any wild mammal.	Natural England provides guidance in relation to rabbits, foxes (which are also protected under the Wildlife and Countryside Act 1981 from live baits and decoys) and other wild mammals, on their website. Lawful and humane pest control of these species is permitted.
Plants Invasive species e.g. Japanese knotweed, giant hogweed,	Wildlife and Countryside Act 1981 S.14	It is illegal to plant or otherwise cause these species to grow in the wild.	Any contaminated soil or plant material is classified as controlled waste and should be disposed of in a suitably licensed landfill site, accompanied by appropriate Waste Transfer documentation, and must comply with section 34 of the Environmental Protection Act 1990. Guidance documents: • The Knotweed Code of Practice (Environment Agency, 2013 version 3);

Species	Legislation	Offences	Licensing procedures and guidance
Himalayan balsam			• Managing Invasive Non-native Plants (Environment Agency 2010); and • Guidance on Section 14 of the Wildlife and Countryside Act, 1981 (Defra 2010).

Table 7.9: Summary of relevant biodiversity legislation – Site designations

Site designations	Legislation	Protection	Guidance
SAC SPA Wetland of International Importance (Ramsar site)	Conservation of Habitats and Species Regulations 2010 (as amended). EC Directive on the conservation of natural habitats and of wild fauna and flora (92/42/EEC). EC Directive on the conservation of wild birds (79/409/EEC). Convention on Wetlands of International Importance especially as Waterfowl Habitat 1971 (the Ramsar Convention).	Assessment of the implications of plans and projects is affected through Part 6 of the Conservation of Habitats and Species Regulations 2010 (in particular Regs 59 – 67). The legislation for the Site of Special Scientific Interest which will underpin each designation also applies. These sites are given protection through policies in the Local Development Plan.	Formal Appropriate Assessment is required to be undertaken by the competent authority before undertaking, or giving consent, permission or other authorisation for a plan or project which is likely to have a significant effect on such a site. Guidance documents: • The NPPF (DCLG, March 2012), with particular reference to Policy 11. The Government Circular: Biodiversity and Geological Conservation - Statutory Obligations and their Impact within the Planning System (ODPM Circular 6/2005 & Defra Circular 01/2005) (the joint Circular).
SSSI	Wildlife and Countryside Act 1981 (as amended)	It is an offence to carry out or permit to be carried out any potentially damaging operation. SSSIs are given protection through policies in the Local Development Plan.	Owners, occupiers, public bodies and statutory undertakers must give notice and obtain the appropriate consent under S.28 before undertaking operations likely to damage a SSSI. S.28G places a duty on all public bodies to further the conservation and enhancement of SSSIs. Guidance documents: • The NPPF (DCLG and the joint Circular).
LNR	National Parks and Access to the Countryside Act 1949 S.21	LNRs are given protection through policies in the Local Development Plan.	LNRs are generally owned and managed by local authorities. Development proposals that would potentially affect a LNR would need to provide a detailed justification for the work, an

Site designations	Legislation	Protection	Guidance
			assessment of likely impacts, together with proposals for mitigation and restoration of habitats lost or damaged. Guidance documents: • The NPPF (DCLG, March 2012), with particular reference to Policy 11, and the joint Circular.
Local Sites (e.g. LWS and Roadside Nature Reserves (RNR))	There is no statutory designation for local sites.	Local sites are given protection through policies in the Local Development Plan.	Development proposals that would potentially affect a local site would need to provide a detailed justification for the work, an assessment of likely impacts, together with proposals for mitigation and restoration of habitats lost or damaged. Guidance documents: • The NPPF (DCLG, March 2012), with particular reference to Policy 11, and the joint Circular.

Table 7.10: Summary of relevant biodiversity legislation – Species and habitats

Site designations	Legislation	Guidance
Species and Habitats of Principal Importance for the Conservation of Biodiversity	Natural Environment & Rural Communities Act 2006 S.40	S.40 of the NERC Act 2006 sets out the duty for public authorities to conserve biodiversity in England. Habitats and species of principal importance for the conservation of biodiversity are identified by the Secretary of State for England, in consultation with Natural England, are referred to in S.41 of the NERC Act for England. The list, known as the 'England Biodiversity List', of habitats and species can be found on the Natural England web site. The 'England Biodiversity List' is used as a guide for decision makers such as public bodies, including local and regional authorities, in implementing their duty under Section 40 of the NERC Act 2006 to have regard to the conservation of biodiversity in England when carrying out their normal functions. Ecological impact assessments should include an assessment of the likely impacts to these habitats and species.
Biodiversity Action Plan (BAP) Habitats & Species	No specific legislation, unless it is also a species or habitat of principal	The Biodiversity Action Plan (BAP) is the UK's initiative to maintain and enhance biodiversity in response to the Convention on Biological Diversity signed in 1992. The UK BAP was used to draw up the 'England Biodiversity List' and has been succeeded by the UK Post-2010 Biodiversity Framework in 2012, due to a change in government strategy by all

Site designations	Legislation	Guidance
	importance as described above.	UK countries, focussing on managing the environment as a whole rather than dealing with different aspects of biodiversity and environment separately. However, the UK BAP list of priority habitats and species continue to be regarded as conservation priorities in the UK Post-2010 Biodiversity Framework (JNCC & Defra 2012).
Hedgerows	The Hedgerows Regulations 1997	Under the regulations, it is against the law to remove or destroy certain hedgerows without permission from the local planning authority in Wales. In general, permission will be required before removing hedges that are at least 20 metres in length, over 30 years old and contain certain species of plant. The local planning authority will assess the importance of the hedgerow using criteria set out in the regulations.

8. Appendix G. Road Drainage and the Water Environment

8.1 Planning and policy context

8.1.1 As identified at Scoping Stage, the relevant legislation is summarised in Table 8.1. This will be reviewed as the Scheme progresses to determine ongoing relevance.

8.1.2 Relevant policies will be assessed by identifying the degree of compliance or conflict with the scheme. The evaluation of these will be undertaken at the next stage of the assessment.

Table 8.1: Legislation

European legislation
Environmental Quality Standards Directive (2008/105/EC)
Groundwater Directive (2006/118/EC)
Habitats Directive (92/43/EEC)
Floods Directive (2007/60/EC)
Water Framework Directive (WFD) 2000/60/EC)
National legislation
Antipollution Works Regulations (1999)
Environment Act (1995)
Environmental Damage (Prevention and Remediation) Regulations (2009)
Environmental Protection Act (1990)
Flood Risk Regulations (2009) Amended SI2011/2880 transpose directive 2007/60/EC
Flood and Water Management Act 2010 and Commencement Orders
Groundwater (England and Wales) Regulations (2009)
Highways Act 1980 (HA 1980)
National Planning Policy Framework (NPPF) (Department for Communities and Local Government, 2012)
National Planning Practice Guidance (NPPG) 2014 Policy 10: Meeting the challenge of Climate Change, Flooding and Coastal Change Policy 11: Conserving and Enhancing the Natural Environment
River Basin Districts Typology, Standards and Groundwater threshold values (Water Framework Directive) (England and Wales) Directions 2010
Water Act 2003 (WA 2003)
Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015
Water Industry Act (1991) (Amendment) (England and Wales) Regulations (2009)
The Water Resources (Environmental Impact Assessment) (England and Wales) Regulations 2003

Table Source: Various

8.3 Study area

8.3.1 Previous assessments used a 1 km buffer around the Scheme, which is considered to be a suitable study area. However, in order to align with the Thames River Basin Management Plan (RBMP) (Environment Agency, February 2016), the extent of the geographical area (of potential impact) includes as a minimum, the catchments of the watercourses that will be crossed by the Scheme. Equally, for groundwater, the potential zone of impact will be assessed on the underlying Water Framework groundwater body.

8.4 Methodology

Surface water

8.4.1 The Highways Agency DMRB (DfT, 2009) provides guidance on the assessment of likely significance of effects on the water environment associated with highway schemes. This guidance in conjunction the DfT TAG guidance (WebTAG) (DfT, 2015) will be adopted for assigning the importance and potential magnitude of impact.

8.4.2 The assessment will use drainage information and Annual Average Daily Traffic (AADT) data to establish potential impacts of the Scheme on the water environment and the requirement for mitigation measures to adequately reduce the risk.

8.4.3 The potential ecological impacts of routine runoff on surface water will be assessed using the HAWRAT as advised in the DMRB (DfT, 2009). Spillage risk tests will also be undertaken in accordance with the DMRB (DfT, 2009).

Groundwater

8.4.4 At the time of reporting, it is unknown if discharge to ground will be required and the suitability of this method. Once confirmed, the assessment of the potential pollution impacts from runoff to groundwater may be required. This will be in accordance with Method C as outlined in HD45/09 (DfT, 2009).

Flood risk

8.4.5 The Flood Risk Assessment (FRA) will be carried out in accordance with the requirements of the NPPF (DCLG, 2012) and its accompanying Technical Guidance (DCLG, 2014), and the Environment Agency's 'Climate change allowances for planners' NPPF supporting guidance (Environment Agency, 2017).

Water Framework Directive (WFD)

8.4.6 The approach to the WFD compliance assessment will follow Planning Inspectorate guidance on preparation of WFD assessments for a Nationally Significant Infrastructure Project (The Planning Inspectorate, 2017). It will be based on a format that was originally developed in close consultation with the Environment Agency for a large transport infrastructure scheme (HS2, 2016). This format was subsequently promoted by the Environment Agency as an example of best practice, particularly for large schemes that affect many water bodies. It captures the core requirements of a compliance assessment whilst

being transparent and simple to interpret. Assessment can be readily updated, creating a clear audit trail of WFD compliance as a scheme progresses through its lifecycle from options assessment to design and environmental permitting.

8.5 Baseline conditions – Tables

Table 8.2: Baseline information summary – Surface water

Water feature	Description
Major surface water features	River Ebbsfleet is the only designated Main River within the site boundary. The River Ebbsfleet is not designated under the WFD. River Thames, located approximately 1.2 km north of the site boundary (WFD waterbody 'Thames Middle'). The River Thames is a heavily modified waterbody that has a 'Moderate' ecological status and a 'Good' chemical status. Although, not within 1km study area, the River Ebbsfleet is in direct hydraulic connectivity to this so there is potential for indirect impacts.
Other minor surface water features	There are also a number of lakes in the vicinity of the site. Eastern Quarry contains a number of lakes and is located north of the A2 and the Blue Lake, is located approximately 350 m northeast of the site. These waterbodies were formed from historical quarrying activities. Blue Water Retail Park, located approximately 500 m north of the site, also contains a series of ponds. These lakes and ponds are not described in the RBMP nor classified under the WFD. There are also a number of attenuation/infiltration ponds that form part of the surface water drainage systems that serve the existing highways within the study area. The site and study area also contains a number of un-named surface water drains and ditches that are likely to receive local drainage and form tributaries to the main watercourses listed above.
Surface Water abstractions	Information on licensed abstractions from surface waters from the EA shows that there are no abstractions within and up to 0.5 km from the study area. There are a number of abstraction points on the River Darent and the River Thames, but given their distance from site these are unlikely to pose a constraint on development.
Flood Risk	The EA flood map for planning, which illustrates flood risk from main rivers and the sea, indicates that the majority of the Scheme and wider study area is located in Flood Zone 1, having an annual chance of less than 1 in 1000 (0.1%) of flooding from these sources. There is a narrow area of Flood Zone 3 (greater than 1 in 100 year (1%) annual chance of flooding) along the upstream reach of the River Ebbsfleet, which intersects with the Scheme approximately 500 m east of the A2 Ebbsfleet Junction. No parts of the Scheme or wider study area are within the medium (Flood Zone 2) or high (Flood Zone 3) flood risk zones associated with the River Thames. However, flooding within the River Thames may interact with the River Ebbsfleet, via backwater effects for example, and this may contribute to the predicted flood likelihood and extent for the River Ebbsfleet and the Ebbsfleet junction area of the Scheme. The EA flood map also indicates that much of the flood risk areas described above benefit from protection by flood defences, however the standard of these defences has not been confirmed. The EA risk of flooding from surface water map shows that land within the Scheme limits generally has a very low risk of surface water flooding, which denotes areas with an annual chance of flooding of less than 1 in 1000 (0.1%). However, there are some areas of low, medium and high risk; the distribution of these areas is

Water feature	Description
	synonymous to the existence of current surface water features and areas of low-lying topography. Areas of high risk, including the highway corridor, are located around the River Ebbsfleet crossing of the A2, toward the eastern boundary of the Scheme. The EA risk of flooding from reservoirs map shows that there is no risk to the Scheme of flooding from reservoir failure and release. Neither Kent County Council (KCC) nor the EA hold any records of flooding in the study area. However, the HADMMS database records thirteen incidents of highway flooding within the Scheme limits, seven in the proximity of the Bean Junction and six at Ebbsfleet Junction. The majority of these incidents were related to blocked gullies or filter drains becoming over grown. No information about the storm return period or duration is recorded so it is not possible to confirm if the storms that resulted in these floods were greater than the allowable design return period, or if the current drainage is inadequate.

Table 8.3 Baseline information summary – Geology and hydrogeology

Feature	Description
Geology Source – British Geological Survey map viewer	Superficial Deposits – The majority of the Scheme is not underlain by superficial deposits. There are scattered areas of head deposits and river terrace deposits underlying the Scheme. Areas of Made Ground are indicated in the study area based on historical BGS logs.
	Solid Geology – At Bean junction the Scheme would lie on or close to the Seaford Chalk Formation. To the south of the junction the dominant geology then becomes Thanet sand, with small pockets of Lambeth Group sand and clay and the London Clay Formation to the east of the junction. At Ebbsfleet the south east and east area of the junction is dominated by the Seaford chalk formation. Towards the western side of Ebbsfleet the geology is dominated by the Thanet sand formation.
Hydrogeology OS Maps / EA database – "What's in my backyard	Aquifer Designations – Superficial: The river terrace deposits are designated a secondary A aquifer. The head deposits are designated a Secondary aquifer – undifferentiated. Bedrock: The Lambeth Group sand and clay and Thanet Sand are designated as Secondary A aquifers. The Seaford Chalk Formation is shown as a principal aquifer of high to intermediate vulnerability.
	Groundwater Vulnerability Zones - The majority of the Scheme is classed as either being a minor or a major aquifer with intermediate vulnerability. North of the A296 adjacent to the Bean junction is classed as a major aquifer with high vulnerability. The eastern part of the Ebbsfleet junction falls in an area classed as Minor aquifer or a major aquifer with high vulnerability.
	Source Protection Zones (SPZ) There are several SPZ 1's within the study area, including: • One c.1 km to the north of Bean junction, adjacent to the access for the Bluewater Shopping Centre; • One c. 600 m to the north east of Bean junction adjacent to the A296 and the quarry; • One c. 500 m to the south west of Bean junction, adjacent to Darenth Wood; • Two to the south east of Bean junction (c. 800 m and 1 km);

Feature	Description
	• One at the southern edge of the Ebbsfleet junction which extends south which is related to a public drinking water supply borehole; • One at the northern edge of Ebbsfleet junction which extends north; and • One c. 600 m north of Ebbsfleet junction; • The remaining study area lies within a SPZ 2 or 3.
	Flow Direction and Groundwater Depth Groundwater flow is considered to flow generally to the north and towards the Thames. Near the Ebbsfleet junction groundwater is likely to flow towards the River Ebbsfleet. The Hydrogeological map of chalk in Kent (BGS, 1970) indicated groundwater levels would be expected to be between 0 m AOD and 7 m AOD. Regional levels are expected to have a rising trend based on reduced industrialisation. The superficial deposits may have shallow groundwater which may follow localised flow directions.
	Groundwater abstractions: • One c. 400 m north west of the Scheme limit, west of Bluewater shopping centre, • One c.450 m north east of scheme limit adjacent to Quarry; • One c. 650 m south west of the Scheme limit at Lords Wood south of Bean; • One abstraction c. 600 m south of the Scheme limit between Stonewood and Betsham; • One large public water abstraction 500 m south of the Scheme limit and another c. 1 km south between the Scheme and Southfleet. • Two within the Scheme limit east of the Ebbsfleet junction; and • One 150 and three c. 800 m north east of north east of the Scheme limit towards Northfleet. All of the above are in the study area. Only the two abstractions east of the Ebbsfleet junction are within the Scheme limit.
	Groundwater Flood Risk Groundwater flood risk may become high when the water table rises in areas such as the Darenth catchment and former chalk quarries. The EA groundwater emergence map, showing areas vulnerable to groundwater emergence (flooding), shows no potential flooding within the project extent (Kent County Council, February 2013. Flood Response Plan, Issue 1). However, the method of analysis is not stated so the potential for groundwater flooding should be reassessed at the Preliminary Design Stage, particularly if deep excavation is proposed.
	Discharges to Groundwater: Based on information request to EA (10-1): • One within the Scheme limit, immediately south of Ebbsfleet junction; • One c. 100 m south east of the Scheme boundary at B262/A2 junction; • One c. 500 m north of the Scheme boundary at Eastern Quarry; and

Feature	Description
	• A2 drainage soakaways, infiltration ponds and ditches (see later section).
	Groundwater Quality Based on information from the Environment Agency online mapping (2013), the groundwater in the Chalk aquifer below the site is described as overall being of poor quality. The chemical quality is also classed as poor (deteriorating). Overall the aquifer is defined as being at risk and is a protected area.
Geodiversity heritage sites, SSSI and RIGs Source – Magic website	The nearest and largest SSSI is Darenth Wood (Chapter 9) which is unrelated to geological heritage and is an ecological SSSI. A smaller (6 ha) SSSI (Baker's Hole) is located within 0.5 km of the Scheme area, to the north-east. It comprises an Earth Heritage site (geology). Key Pleistocene site exposing a complex sequence of periglacial and temperate climate deposits, these are associated with the Ebbsfleet Valley and they have yielded mammals, molluscs, and two different Palaeolithic industries. The interdigitation of solifluction (slope) deposits and temperate freshwater sediments implies that more than one glacial period is represented (Magic, 2017). Swanscombe Skull SSSI is located around 1 km to the north of the Scheme area. It is a site of cultural interest as well as geological. Barnfield Pit, Swanscombe is the only site in the UK to yield unquestionable Lower Palaeolithic human remains and arguably the most important site in the British Pleistocene. In addition to its paleoanthropological interest the site is of great importance for stratigraphy, palaeontology and Palaeolithic archaeology. The site is of considerable importance, quite apart from the world-famous human skull. The recorded faunas include 26 mammalian taxa (e.g. man, macaque, lion, straight-tusked elephant, two extinct rhinos, horse, several deer, aurochs and small mammals) and many birds. The site also has a fossil soil and a horizon of fossil footprints, (Magic, 2017). The SSSI designations do not mention surface water or groundwater features and OS mapping does not indicate such features in the vicinity of the SSSIs. Other areas of Culture Heritage are discussed in Chapter 9. There are no World Heritage Sites, registered parks and gardens, registered battlefields or conservation areas within the study area. However, there are four scheduled monuments, these include Neolithic sites near Ebbsfleet, two monuments which date to the Roman period and a woodland boundary of Medieval origin. The study area also contains five Grade II listed buildings. They mostly date from the post-medieval period (AD 1540 to 1901) with a single building originating from the medieval period (AD 1066 to 1540) Grade II listed Stone Castle with one being modern (AD 1901-present).

Table 8.4: Value of water resources and their features

Resource	Features	Indicator of quality (taken from WebTAG table 13)	Measure (taken from WebTAG table 13)	Importance
River Ebbsfleet*	Water Supply	Chemical water quality	Chemical classification/status under the WFD. Good by 2015	Medium
	Biodiversity	Biological water quality	Ecological classification/status under the WFD. Moderate by 2015	Medium
River Ebbsfleet floodplain	Conveyance of flood flows	Presence of flood zones	Existing flood risk - River Ebbsfleet has Flood Zone 2 and also Flood Zone 3 areas	High
Thames Middle Transitional waterbody	Water Supply	Chemical water quality	Chemical classification/status under the WFD. Good by 2015	Medium
	Biodiversity	Biological water quality	Ecological classification/status under the WFD. Moderate by 2015	Low
		Conservation of river corridor	Presence of designations. Designated as a Special Protection Area	Very high
Drainage ditches	Conveyance of flow and material	Number, size and flow of watercourses and potential for material transport	Abnormal changes to volumetric flow or material transport	Medium
Groundwater	Water supply	Groundwater vulnerability	Classification of aquifer vulnerability. Principal aquifer underlain the study area	Very high
	Water supply	Groundwater vulnerability	Location and grade of SPZ. Scheme area has SPZ 1,2 and 3	Very high

8.7 Residual impacts – Tables

Table 8.5: Significance ratings for Ebbsfleet Option 1

Aspect of concern	Magnitude and characterisation of impact	Post mitigation residual significance
SPZ 1	Construction Any below ground works may increase the potential for any contamination to migrate to the groundwater below the works. Also below ground works have the potential to create suspended solids. Ebbsfleet Junction, has no proposed below ground works so there is minimal risk of impacts occurring here and all construction works will follow procedures outlined in the CEMP. Operation No operational impacts identified (assuming mitigation from appropriate fuel interceptors and generic mitigation measures).	Neutral Neutral
SPZ 2	Construction There are no proposed soakaways or infiltration ditches planned at the Ebbsfleet Junction, so low risk of contamination impacts occurring to groundwater. In addition, all work will follow procedures outlined in the CEMP which would further reduce the risk of contamination Operation No operational impacts identified (assuming mitigation from appropriate fuel interceptors).	Neutral Neutral
Contamination of water supply from historical fuel station (Springhead services)	Construction Any below ground works may disturb contamination which may allow some migration to the aquifer below. The risk from legacy contaminated land and groundwater will be assessed and, if necessary, remediated as part of the works. Operation No operational impacts identified (assuming generic mitigation measures described above).	Moderately beneficial Neutral
Contamination from electrical substation and historical quarrying	Construction The risk from legacy contaminated land and groundwater will be assessed and if necessary remediated as part of the works. Operation No operational impacts identified (assuming generic mitigation measures described above).	Moderately beneficial Neutral
Contamination of water supply from	Construction	Moderately beneficial

Aspect of concern	Magnitude and characterisation of impact	Post mitigation residual significance
recorded pollution incidents	The risk from legacy contaminated land and groundwater will be assessed and if necessary remediated as part of the works Operation No operational impacts identified (assuming mitigation from appropriate fuel interceptors and generic mitigation measures described above).	Neutral
Drainage Capacity	Construction Drainage during construction will be a dynamic, active process and will follow procedures outlined in the CEMP Operation There is a shallow water table at Ebbsfleet Junction (2-5 m bgl) and as a result this could allow some groundwater ingress into the drainage system resulting in flooding of the road and surrounding area. Mitigation comprising suitable assessment and if necessary upgrading of the drainage in order that would minimise ingress of groundwater into the surface water drainage system is assumed. It should be noted the current drainage design does not have an allowance for climate change	Neutral Neutral
Infrastructure	Construction No additional below ground works are presently planned at Ebbsfleet junction. There is a theoretical risk such works could create a barrier effect to groundwater flow as well as creating a potential local rise in groundwater flooding/rise causing the road to be flooded. If the design is altered and sub surface structures are proposed then they will be designed to minimise any barrier effects, where necessary and the CEMP would include contingency measurers. Operation Without mitigation, prolonged periods of increased rainfall could result in groundwater flooding, particularly due to the likely shallow water table (as low as 2 m bgl). Mitigation would be provided, as necessary and would include further assessment of groundwater levels and assessment of the need for shallow groundwater drainage. Groundwater drainage is not currently present at the junction and the proposed junction layout will remain at grade. The risk or otherwise of increased groundwater levels e.g. from climate change effects will be considered and appropriate mitigation made in later design stages.	Neutral Neutral
Bakers Hole SSSI and Swanscombe Skull SSSI	Construction No construction impacts are anticipated as the SSSI sites are not close enough to the Scheme area to be impacted. Operation	Neutral Neutral

Aspect of concern	Magnitude and characterisation of impact	Post mitigation residual significance
	Operational impacts are unlikely as flooding of the SSSIs from surface water or groundwater due to the Scheme is unlikely.	
Scheduled monuments and listed buildings)	Construction No construction impacts are anticipated as protection of historic assets will be included in the design and CEMP Operation Operational impacts are unlikely as flooding from surface water or groundwater due to the Scheme is unlikely.	Neutral Neutral
Construction /Maintenance Workers	Construction Any unidentified residual contamination from brownfield land uses such as the fuel stations, electrical substations and historical factories in the Scheme area could impact workers. However appropriate measures will be incorporated into the CEMP and Health and Safety plans such as the use of appropriate PPE. Any residual contamination encountered will be assessed and remediated as necessary. Operation Maintenance workers may still be exposed to unidentified residual contamination from the land uses outlined above when performing upgrades to maintain the road. However, mitigation measures such as the wearing of PPE and monitoring as specified in a health and safety plan would neutralise the risk	Neutral / moderately beneficial Neutral / moderately beneficial
Road Users	Construction No construction impacts anticipated. Operation No operational impacts anticipated.	Neutral Neutral
Surface Water Features	Construction When construction works take place in proximity to surface water features there is potential for direct pollution, silting and erosion. However, adherence to the measures and working methods set out in the CEMP would prevent pollution of the surface water environment or allow containment and rapid clean-up of any accidental spills or incidents. Any contaminated material would be remediated as required by a risk assessment minimising risk from existing contamination. Operation During the operational phase, there is potential for mobilisation of contamination into controlled waters from vehicles using the Scheme. Road drainage could be contaminated by spills and leaks of oil and fuel, and by other materials deposited onto the drained surfaces, and contaminated runoff could be	Neutral Neutral

Aspect of concern	Magnitude and characterisation of impact	Post mitigation residual significance
	released into the surface water environment, or indirectly to groundwater, via this route. There is also a risk that polluting materials may be spilt onto the road surface as a result of a road accident. These pollutants have the potential to enter surface water. However, as a result of the Scheme, mitigation measures will lead to appropriate drainage control/interpretation prior to discharge which is anticipated to lead to a reduction of pollution entering the water courses.	
Infrastructure (Surface Water Flooding)	Construction The risk of surface water flooding occurring during construction is most likely to arise from heavy rainfall when runoff may pond, potentially resulting in flooding of working areas and excavations. However, with appropriate construction site drainage in place surface water would be managed on site to reduce the likelihood of surface water ponding and flooding. Mitigation measures would also be incorporated into the CEMP to account for unexpected situations. Operation New impermeable areas will be created, which without appropriate measures, would induce higher rates and volumes of rainfall runoff, with the potential for increased surface water flood risk. Drainage of cuttings may increase receiving stream flows and any requirement for new watercourse crossings or alterations to existing crossings has the potential to impact on the flow conveyance and capacity of surface water receptors and flood risk from these sources. However, the Scheme drainage design incorporates SuDS measures 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 and any new or altered existing watercourse crossings would be designed and constructed in line with current best practice guidelines to prevent impacts on flow conveyance. As a result of these design measures there would be no increase in flood risk from any source as a result of the operation of the Scheme.	Neutral Neutral

Table 8.6: Significance ratings for Bean Option 5

Aspect of concern	Magnitude and characterisation of impact	Post mitigation residual significance
SPZ 1	Construction Any below ground works may allow some contamination to migrate to the aquifer below the works. An infiltration ditch, which already exists along the slip road from the A296 onto the A2 eastbound, lies over a SPZ 1 and presents a potential risk of impact to water quality during construction. The risk to controlled	Neutral/ Minor Beneficial

Aspect of concern	Magnitude and characterisation of impact	Post mitigation residual significance
	water from existing infrastructure will be reviewed during the design phase and upgrades incorporated as necessary. During construction mitigation would be included as part of the CEMP. Operation No additional operational impacts identified (including for the infiltration ditch compared to the existing situation) assuming mitigation from appropriate fuel interceptors and generic mitigation measures. Additional mitigation to be agreed in consultation with regulators.	Neutral
SPZ 2	Construction Any below ground works may allow contamination to migrate to the aquifer below the works. Construction of the proposed new soakaways around the Bean junction above the SPZ 2 increase the risk of impact to water quality further although the deep water table (30 - 50 m bgl) is noted. The risk to controlled water from existing infrastructure will be reviewed during the design phase and upgrades incorporated as necessary. During construction mitigation would be included as part of the CEMP. Operation No operational impacts identified (assuming mitigation from appropriate fuel interceptors and generic mitigation measures).	Neutral/ Minor Beneficial Neutral
Contamination of water supply from historical quarrying	Construction Any below ground works may disturb contamination which may allow some migration to the aquifer below. The risk from legacy contaminated land and groundwater will be assessed and if necessary remediated as part of the works. Further mitigation measures would be described in the CEMP. Operation No operational impacts identified.	Neutral/Moderately beneficial Neutral
Contamination of water supply from historical fuel station (Watling road services)	Construction Any below ground works may disturb contamination which may allow some migration to the aquifer below. The risk from legacy contaminated land and groundwater will be assessed and if necessary remediated as part of the works. Further mitigation measures would be described in the CEMP. Operation No operational impacts identified (assuming generic mitigation measures described above).	Neutral / Moderately beneficial Neutral
Drainage Capacity	Construction Not applicable Operation No operational impacts anticipated due to the deep water table around the Bean junction (30 - 50 m bgl).	Neutral Neutral

Aspect of concern	Magnitude and characterisation of impact	Post mitigation residual significance
Infrastructure	Construction No construction impacts causing barrier effects to groundwater flow are anticipated due to the deep water table around the Bean junction. Operation No operational impacts anticipated due to the deep water table around the Bean junction.	Neutral Neutral
Construction /Maintenance Workers	Construction Any unidentified residual contamination from potential brownfield land uses could impact workers. However, appropriate measures will be incorporated into the CEMP and Health and Safety plans such as the use of appropriate PPE. Any residual contamination encountered will be assessed and remediated as necessary, which is likely to reduce the risk. Operation Maintenance workers may still be exposed to unidentified residual contamination from the land uses outlined above when performing upgrades to maintain the road. However, mitigation measures such as the wearing of PPE and monitoring as specified in a health and safety plan would neutralise the risk.	Neutral / Minor Beneficial Neutral
Road Users	Construction No construction impacts identified. Operation No operational impacts identified (assuming generic mitigation measures described above).	Neutral Neutral
Surface Water Features	Construction There are limited surface water features localised to the Bean Junction which would be at risk from the works. There is a limited potential for minor and localised residual pollution risks associated with accidental spills and silt releases, however implementation of the CEMP would facilitate rapid containment and clean up. Operation Road drainage design would facilitate appropriate collection and treatment of highway drainage prior to discharge to the surface water environment and would include means of spillage containment. Also, as a result of the Scheme, congestion and the number of accidents, with associated pollution risks, are anticipated to be reduced.	Neutral Neutral
Infrastructure (Surface Water Flooding)	Construction Appropriate construction site drainage would be put in place to manage surface water runoff on site to reduce the likelihood of surface water ponding and flooding.	Neutral

Aspect of concern	Magnitude and characterisation of impact	Post mitigation residual significance
	Operation New impermeable areas will be created, which without appropriate measures, would induce higher rates and volumes of rainfall runoff, with the potential for increased surface water flood risk. Drainage of cuttings may increase receiving stream flows and any requirement for new watercourse crossings or alterations to existing crossings has the potential to impact on the flow conveyance and capacity of surface water receptors and flood risk from these sources. However, the Scheme drainage design incorporates SuDS measures to deliver attenuation of surface water runoff rates, such that greenfield rates are not exceeded. The drainage system would also be designed to accommodate an appropriate allowance for climate change, providing the Scheme with increased flood resilience over its lifetime. Drainage from cuttings would also be made in accordance with relevant consent parameters and any new or altered existing watercourse crossings would be designed and constructed in line with current best practice guidelines to prevent impacts on flow conveyance and flood risk.	Neutral

8.8 Cumulative effects – Table

Table 8.7: Cumulative effects of nearby developments to the Scheme

Name	Location	Reference	Potential cumulative impact
Ebbsfleet	Approximately 300m from red line boundary	96/00047/OUT	Development is comprising employment, residential, hotel and leisure uses supporting retail & community facilities & provision of car parking, open space, roads & infrastructure. The pollution risk/hazard from this type of development low. However, there is potential contamination of the water supply as this development is close to the Scheme and is planned above the same SPZ. This development is also located in the catchment of the River Ebbsfleet and as a result there is potential for cumulative impacts on water quality attributes and the hydrology/flooding regime of the River Ebbsfleet catchment. However, each development will be subject to compliance with relevant planning policies, for example the NPPF with regard to development and flood risk, and regulatory regimes preventing pollution and safeguarding water quality. To satisfy these policy and regulatory requirements, the development would be designed to ensure flood risk resilience and appropriate management of surface water drainage, including climate change allowance. Cumulatively therefore, the developments would be expected to have a neutral effect.
Croxton Garry Site (E	Approx. 1.4km from red line boundary	EDC/17/0110	There is potential contamination of the water supply as this development is planned above the same SPZ as the Scheme. However, each development will be subject to compliance with regimes preventing pollution and safeguarding water quality. To satisfy these policy and regulatory

Name	Location	Reference	Potential cumulative impact
of Ingress Park)			requirements, the development would be designed to ensure the appropriate management of surface water drainage. Further, this development is not thought to be in direct hydraulic connectivity to the surface water environment receptors identified to the scheme. Cumulatively therefore, the developments would be expected to have a neutral effect.
Craylands Lane	Approx. 1.4km from red line boundary	14/01689/OUT	There is potential contamination of the water supply as this development is planned above the same SPZ as the Scheme. However, each development will be subject to compliance with regimes preventing pollution and safeguarding water quality. To satisfy these policy and regulatory requirements, the development would be designed to ensure the appropriate management of surface water drainage. Further, this development is not thought to be in direct hydraulic connectivity to the surface water environment receptors identified to the scheme. Cumulatively therefore, the developments would be expected to have a neutral effect.
Hedge Place Road	Approx. 450m from red line boundary	12/01150/FUL	There is potential contamination of the water supply as this development is planned above the same SPZ as the Scheme. However, each development will be subject to compliance with regimes preventing pollution and safeguarding water quality. To satisfy these policy and regulatory requirements, the development would be designed to ensure the appropriate management of surface water drainage. Further, this development is not thought to be in direct hydraulic connectivity to the surface water environment receptors identified to the scheme. Cumulatively therefore, the developments would be expected to have a neutral effect.
Knockhall Road	Approx. 1.3km from red line boundary	13/01522/OUT	There is potential contamination of the water supply as this development is planned above the same SPZ as the Scheme. However, each development will be subject to compliance with regimes preventing pollution and safeguarding water quality. To satisfy these policy and regulatory requirements, the development would be designed to ensure the appropriate management of surface water drainage. Further, this development is not thought to be in direct hydraulic connectivity to the surface water environment receptors identified to the scheme. Cumulatively therefore, the developments would be expected to have a neutral effect.
Eastern Quarry	Approximately 900m from red line boundary	12/01451/EQVAR	Potential contamination of the water supply could occur as a result of this large development close to the Scheme. This development is planned above the same SPZ. This development is located wholly or partially in the catchment of the River Ebbsfleet and as a result there is potential for cumulative impacts on water quality attributes and the hydrology/flooding regime of the River Ebbsfleet catchment. However, each development will be subject to compliance with relevant planning policies, for example the NPPF with regard to development and flood risk, and regulatory regimes preventing pollution and safeguarding water quality. To satisfy these policy and regulatory requirements, the Eastern Quarry development would be designed to ensure flood risk resilience and appropriate management of surface water drainage, including climate change allowance. Cumulatively therefore, the developments would be expected to have a neutral effect.

Name	Location	Reference	Potential cumulative impact
St James Lane Pit	Approx. 1.1km from red line boundary	05/00221/OUT	There is potential contamination of the water supply as this development is planned above the same SPZ as the Scheme. However, each development will be subject to compliance with regimes preventing pollution and safeguarding water quality. To satisfy these policy and regulatory requirements, the development would be designed to ensure the appropriate management of surface water drainage. Further, this development is not thought to be in direct hydraulic connectivity to the surface water environment receptors identified to the scheme. Cumulatively therefore, the developments would be expected to have a neutral effect.
St Clements Valley	Approximately 1.2km from red line boundary	14/01344/FUL	There is potential contamination of the water supply as this development is planned above the same SPZ as the Scheme. However, each development will be subject to compliance with regimes preventing pollution and safeguarding water quality. To satisfy these policy and regulatory requirements, the development would be designed to ensure the appropriate management of surface water drainage. Further, this development is not thought to be in direct hydraulic connectivity to the surface water environment receptors identified to the scheme. Cumulatively therefore, the developments would be expected to have a neutral effect.
Ebbsfleet Green	Immediately adjacent to red line boundary	05/00308/OUT	There is potential contamination of the water supply as this development is planned above the same SPZ as the Scheme. However, each development will be subject to compliance with regimes preventing pollution and safeguarding water quality. To satisfy these policy and regulatory requirements, the development would be designed to ensure the appropriate management of surface water drainage. Further, this development is not thought to be in direct hydraulic connectivity to the surface water environment receptors identified to the scheme. Cumulatively therefore, the developments would be expected to have a neutral effect.
	Approximately 160m from red line boundary	16/01271/EDCCON	There is potential contamination of the water supply as this development is planned above the same SPZ as the Scheme. However, each development will be subject to compliance with regimes preventing pollution and safeguarding water quality. To satisfy these policy and regulatory requirements, the development would be designed to ensure the appropriate management of surface water drainage. Further, this development is not thought to be in direct hydraulic connectivity to the surface water environment receptors identified to the scheme. Cumulatively therefore, the developments would be expected to have a neutral effect.
Former Empire Sports Ground, Knockhall	Approx. 900m from red line boundary	15/01497/REM	There is potential contamination of the water supply as this development is planned above the same SPZ as the Scheme. However, each development will be subject to compliance with regimes preventing pollution and safeguarding water quality. To satisfy these policy and regulatory requirements, the development would be designed to ensure the appropriate management of surface water drainage. Further, this development is not thought to be in direct hydraulic connectivity to the surface water environment receptors identified to the scheme. Cumulatively therefore, the developments would be expected to have a neutral effect.

Name	Location	Reference	Potential cumulative impact
Village Heights	Approx. 1km from red line boundary	16/00016/OUT	
Land to rear unit G1 Manor Way Bus Park	Approx. 1.9m from red line boundary	14/00679/CPO	There is potential contamination of the water supply as this development is planned above the same SPZ as the Scheme. However, each development will be subject to compliance with regimes preventing pollution and safeguarding water quality. To satisfy these policy and regulatory requirements, the development would be designed to ensure the appropriate management of surface water drainage. Further, this development is not thought to be in direct hydraulic connectivity to the surface water environment receptors identified to the scheme. Cumulatively therefore, the developments would be expected to have a neutral effect.
West Village and Service yards, Bluewater	Approx. 600m from red line boundary	17/01202/REM	There is potential contamination of the water supply as this development is planned above the same SPZ as the Scheme. However, each development will be subject to compliance with regimes preventing pollution and safeguarding water quality. To satisfy these policy and regulatory requirements, the development would be designed to ensure the appropriate management of surface water drainage. Further, this development is not thought to be in direct hydraulic connectivity to the surface water environment receptors identified to the scheme. Cumulatively therefore, the developments would be expected to have a neutral effect.
Ebbsfleet Northfleet Embankment East Crete Hall Road Northfleet Gravesend Kent	Approximately 2.7km from red line boundary	EDC/17/0038	There is potential contamination of the water supply as this development is planned above the same SPZ as the Scheme. However, each development will be subject to compliance with regimes preventing pollution and safeguarding water quality. To satisfy these policy and regulatory requirements, the development would be designed to ensure the appropriate management of surface water drainage. Further, this development is not thought to be in direct hydraulic connectivity to the surface water environment receptors identified to the scheme. Cumulatively therefore, the developments would be expected to have a neutral effect.

9. Appendix H. Landscape

9.1 Planning and policy context

National planning policy

National Planning Policy Framework (NPFF) (2012)

9.1.1 The following NPFF policies are relevant to the Landscape and Visual Assessment:

- Policy 11 – Conserving and enhancing the natural environment. Relevant polices include:
  - Protecting and enhancing valued landscapes, geological conservation interests and soils;
  - Recognising the wider benefits of ecosystem services; and
  - Minimising impacts on biodiversity and providing net gains in biodiversity where possible, contributing to the Government's commitment to halt the overall decline in biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures.
- Policy 12 – Conserving and enhancing the historic environment. Relevant polices include:
  - Opportunities to draw on the contribution made by the historic environment to the character of a place.

National Policy Statement for National Networks (NN NPS) (2012)

9.1.2 The NN NPS, sets out the need for, and Government's policies to deliver Nationally Significant Infrastructure Projects (NSIPs) on the national road and rail networks in England. It provides planning guidance for promoters of nationally significant infrastructure projects on the road and rail networks, and the basis for the examination by the Examining Authority and decisions by the Secretary of State.

9.1.3 Guidance relevant to the landscape and Scheme include the following:

- Avoid and mitigate environmental and social impacts in line with the principles set out in the NPPF and planning guidance;
- Consider reasonable opportunities to deliver environmental and social benefits;
- Good design should be an integral consideration from the outset of the project;
- Visual appearance is a key factor in considering the design of new infrastructure and should be sensitive to place;
- Take aesthetics into account as far as possible (bearing in mind fitness for purpose and sustainability), including siting, design measures relating to existing landscape and historical character and function, landscape permeability, landform and vegetation;

- The visibility and conspicuousness of the project during construction and of the presence and operation of the project and potential impacts on views and visual amenity. This should include any noise and light pollution effects, including on local amenity, tranquillity and nature conservation;
- Where an EIA is required a landscape and visual assessment should be included in the EIA. The Secretary of State will want to judge whether visual effects on a sensitive receptor outweighs the benefits of development;
- Mitigate adverse landscape and visual effects through appropriate siting, design and landscaping; and
- PRoW and National Trails are important recreation facilities for walkers, cyclists and horse riders. Take appropriate mitigation measures to address adverse effects on national trails, other rights of way and open access land.

Local planning policy

9.1.4 Table 9.1 below outlines the relevant local planning policy documents applicable to the study area.

Table 9.1: Local planning policy documents

Local Planning Policy Documents	Relevant Policies
Dartford Local Plan Core Strategy, Adopted 2011	
Dartford Borough Council Development Policies Plan (2017)	DP5 Environmental and Amenity Protection DP25 Nature Conservation and Enhancement DP4 Transport Access and Design DP22 Green Belt in Dartford Borough
Dartford Local Plan 1995: Saved Policies Following Adoption of the Core Strategy	Policy DL1 – Encouragement of restoration schemes Policy C5 – Enhancement of the environmental quality and recreational value of the countryside. Policy B3 – Landscaping within new development
Gravesham Local Plan Core Strategy, Adopted 2014	Policy CS19 – Development Design Principles
The Kent Downs Area of Outstanding Natural Beauty Management Plan 2014-2019	

Table Source: Various

Relevant designations

The Kent Downs Area of Outstanding Natural Beauty (AONB)

9.1.5 The Kent Downs lies approximately 7 km outside the study area and it was determined in previous project Stages that there would be no inter-visibility between the AONB and the Scheme.

Country parks

9.1.6 Two Country Parks lie within the study area, Beacon Wood to the South and Darenth Country Park in the West, a third Swanscombe Heritage Park, lies just outside the study area.

Access land

9.1.7 There is no access land within the study area.

Ancient Woodland

9.1.8 There are a number of areas of ancient woodland within the study area. The impact on the woodlands will be assessed in the PEIR Volume 1 Chapter 7 Biodversity, whilst this chapter will consider the impact on visual amenity and landscape character relating to ancient woodland.

Traditional orchards

9.1.9 The area has a history of horticulture and fruit growing and there are two orchards designated as traditional orchards south of Bean and on the edge of Beacon Wood.

Public Rights of Way (ProW)

9.1.10 The location of the PRoW are shown on Figure 9.1 in the PEIR Volume 3.

9.1.11 There is an extensive network of PRoW within the study area and the following would have a possible view or views of the Scheme, namely; DR18, DR19, Dr20, DR21, DR22, DR23, Dr24, DR25, DR26, DR27, DR128, DR129, DR131, DR132, DR325, DS20, NU14, Nu16, Nu19, Nu47, Nu20, Dr20, DR21, DR22, DR23, Dr24, DR25, DR128, DR131, DR132, DR325, DS20 and Nu16.

9.1.12 The impacts on road users will be considered in the PEIR Volume 1 Chapter 13 People and Communities, whilst the impact on visual amenity will be considered in this chapter including the potential for significant sequential effects on PRoW users.

Scheduled monuments, conservation areas and Listed Buildings

9.1.13 The potential impacts on heritage feature will be covered by the PEIR Volume 1 Chapter 11 Cultural Heritage, whilst any potential impacts on these designations in relation to landscape character and visual amenity will be covered by this chapter.

9.1.14 Listed buildings and structures potentially affected by the scheme in terms of visual setting or construction works are Lower Bean Farmhouse and the barn to the south of Lower Bean Farmhouse and Swanscombe Cutting Footbridge.

Nature Conservation Areas

9.1.15 The potential impacts on the Darenth Woods SSSI will be covered by the PEIR Volume 1 Chapter 7 Biodiversity, whilst any potential impacts on this designation in relation to landscape character and visual amenity will be covered by this chapter. There is a Site of Importance to Nature Conservation (SINC) at Beacon Woods and three LWS within the study area, Ebbsfleet Marshes, Alkerden Pit, Swanscombe and the disused hospital site at Mabledon.

9.2 Study area

9.2.1 A desk top and field study was carried out to determine the extent of the study area for both landscape and visual effects and to support this a zone of theoretical visibility was determined using GIS data.

9.2.2 Zones of Theoretical Visibility have been determined to inform the Summer and Winter assessment for the scheme. The summer scenario includes buildings extruded to 8 m and woodland to 5 m and the winter scenario has buildings extruded to 5 m only. Both scenarios have a value of 1.6 to simulate eye height and an additional 4.5m was added to the road levels to account for high sided vehicles. Refer to Figure 9.4 Zone of Theoretical Visibility (ZTV) - Summer and Figure 9.5 for Zone of Theoretical Visibility (ZTV) – Winter in the PEIR Volume 3 Appendix H.

9.2.3 The proposed works comprise junction improvements to the existing A2.

9.2.4 There are already long-ranging views of the existing A2 from receptors and viewpoints to the south and south east of the Ebbsfleet Junction, where the landscape typically comprises open fields. The A2 is visible rising to the Bean Junction and is already a dominant feature in the landscape. It is considered that the changes proposed would not result in a significant change in the existing baseline.

9.2.5 Therefore, viewpoints and receptors beyond 1 km from the scheme in the south-east and eastern part of the study area, even though shown as having a view on the ZTV were scoped out, this opinion was backed up by verification on site and includes the settlements of Northfleet, South fleet and Betsham.

9.2.6 Topography and vegetation around the Bean Junction restrict views wider than 1 km.

9.2.7 It is expected that any potentially significant landscape and visual effects would be restricted to the land within 1 km of the Scheme. Significant effects are most likely to be within the vicinity of the improvements at Bean Junction and the Bean Triangle.

9.3 Methodology

Assessment methodology

9.3.1 The assessment follows the guidelines produced by relevant professional bodies concerned with transport related schemes and landscape and visual impact assessment, specifically the Highways Agency's Interim Advice Note IAN 135/ 10 (Landscape and Visual Effects Assessment) and the Landscape Institute's Guidelines for Landscape and Visual Impact Assessment Third Edition (GLVIA 3).

9.3.2 At this stage, the landscape and visual impact assessment used to inform this Preliminary Environmental Information has been based on the preliminary geometric layout of the Highways design for the Scheme.

Landscape / townscape sensitivity

9.3.3 The sensitivity of the landscape and townscape resource are determined using the examples shown in Table 9.2 below.

Table 9.2: Landscape and townscape sensitivity

Landscape/ townscape sensitivity	Typical descriptors and examples
High	Resource which by nature of its character would be unable to accommodate change of the type proposed. Typically these would be: • Of high quality with distinctive elements and features making a positive contribution to character and sense of place; • Likely to be designated, but the aspects which underpin such value may also be present outside designated areas, especially at the local scale; • Areas of special recognised value through use, perception or historic and cultural associations; and • Likely to contain features and elements that are rare and could not be replaced.
Moderate	Resource which by nature of its character would be able to partly accommodate change of the type proposed. Typically these would be: • Comprised of commonplace elements and features creating generally unremarkable character but with some sense of place; • Locally designated, or their value may be expressed through non-statutory local publications; • Containing some features of value through use, perception or historic and cultural associations; and • Likely to contain some features and elements that could not be replaced.
Low	Resource which by nature of its character would be able to accommodate change of the type proposed. Typically these would be: • Comprised of some features and elements that are discordant, derelict or in decline, resulting in indistinct character with little or no sense of place; • Not designated; • Containing few, if any, features of value through use, perception or historic and cultural associations; and • Likely to contain few, if any, features and elements that could not be replaced.

Table Source DMRB IAN135/10 Annex 1 Table 2, Ref 6-1

Visual sensitivity and typical descriptors

9.3.4 Visual impacts are likely to occur where there are residential properties within the study area which may have a view to the Scheme. This also applies to users of publicly accessible areas where views are impacted, such as open access land, as well as other PRoW within the study area. Criteria to define visual sensitivity are defined in below Table 9.3.

Table 9.3: Visual sensitivity and typical descriptors

Visual sensitivity	Typical criteria
High	Residential Properties Users of PRoW or other recreational trails (e.g. Regional Trails, footpaths, bridleways etc.) Users of recreational facilities where the purpose of that recreation is enjoyment of the countryside (e.g. Country Parks, National Trust or other access land etc.)

Visual sensitivity	Typical criteria
Moderate	Outdoor workers Users of scenic roads, railways or waterways or users of designated tourist routes Schools and other institutional buildings, and their outdoor areas
Low	Indoor workers Users of main roads (e.g. trunk roads) or passengers in public transport on main arterial routes Users of recreational facilities where the purpose of that recreation is not related to the view (e.g. sports facilities)

Table Source: DMRB IAN135/10 Annex 1 Table 2, Ref 6-1

Assessing impacts and effects (magnitude of impacts and significance of effects)

9.3.5 It has been considered that a reasonable level of mitigation will be in place as part of the Scheme. The assessment will take into account appropriate mitigation and enhancement measures during construction and operation to minimise the negative effects of the Scheme on the landscape and townscape resource and on the visual amenity of the study area.

9.3.6 For the purposes of the appraisal, the scale of impact on the landscape and townscape resources are determined using the seven-point scale shown in Table 9.4 below.

Table 9.4: Magnitude and nature of impact and typical descriptors

Magnitude of impact on landscape/ townscape	Typical criteria descriptors
Major Beneficial	Large scale improvement of character by the restoration of features and elements, and/or the removal of uncharacteristic and conspicuous features and elements, or by the addition of new distinctive features.
Moderate Beneficial	Partial or noticeable improvement of character by the restoration of existing features and elements, and/or the removal of uncharacteristic and noticeable features and elements, or by the addition of new characteristic features.
Minor Beneficial	Slight improvement of character by the restoration of existing features and elements, and/or the removal of uncharacteristic features and elements, or by the addition of new characteristic elements.
No Change	No noticeable loss, damage or alteration to character or features or elements.
Negligible Adverse	Barely noticeable loss or damage to existing character or features and elements, and/or the addition of new but uncharacteristic features and elements.
Minor Adverse	Slight loss or damage to existing character or features and elements, and/or the addition of new but uncharacteristic features and elements.
Moderate Adverse	Partial loss or noticeable damage to existing character or distinctive features and elements, and/or the addition of new but uncharacteristic noticeable features and elements.

Magnitude of impact on landscape/ townscape	Typical criteria descriptors
Major Adverse	Total loss or large scale damage to existing character or distinctive features and elements, and/or the addition of new but uncharacteristic conspicuous features and elements.

Table Source: DMRB IAN135/10 Annex 1 Table 2, Ref 6-1

9.3.7 For the purposes of the appraisal, the scale of impact on the visual receptors are determined using the scale and indicative criteria shown in Table 9.5 below. Please note the nature of the magnitude of impact would be either adverse or beneficial depending on the extent to which the Scheme is out of character with the existing view.

Table 9.5: Magnitude and nature of impact and typical descriptors

Magnitude of impact on visual receptors	Typical criteria descriptors
Major	The project, or a part of it, would become the dominant feature or focal point of the view.
Moderate	The project, or a part of it, would form a noticeable feature or element of the view which is readily apparent to the receptor.
Minor	The project, or a part of it, would be perceptible but not alter the overall balance of features and elements that comprise the existing view.
Negligible	Only a very small part of the project would be discernible, or it is at such a distance that it would form a barely noticeable feature or element of the view.
No Change	No part of the project, or work or activity associated with it, is discernible.

Table Source: DMRB IAN135/10 Annex 2, Table 2, Ref 6-1

Determination of significance

9.3.8 Determination of significance is a factor of the previously described sensitivity of the resource or receptor and the magnitude of the impact as described above. The range of significance of effects on the landscape and townscape resources and visual receptors is presented in Table 9.6 below.

9.3.9 Where there is a choice in significance score, professional judgement is used to determine the significance level.

Table 9.6: Significance of effects categories

		Magnitude of impact				
		No Change	Negligible	Minor	Moderate	Major
Sensitivity	High	Neutral	Slight	Slight/Moderate	Moderate/ Large	Large/ Very Large

		Magnitude of impact				
		No Change	Negligible	Minor	Moderate	Major
	Moderate	Neutral	Neutral/Slight	Slight	Moderate	Moderate/ Large
	Low	Neutral	Neutral/Slight	Neutral/Slight	Slight	Slight/ Moderate

Table Source: DMRB IAN 135/10 Annex 1 Table 3 and Annex 2 Table 3, Ref 6-1

Typical descriptors of significance of effect categories for landscape / townscape and visual setting

9.3.10 Please note the significance of effects would be either adverse or beneficial as described in DMRB IAN 135/10 Annex 1 Table 4 and Annex 2 Table 4.

9.4 Cumulative effects

Table 9.7: Proposed developments

Planning application reference	Development summary	Distance from Scheme	Potential cumulative effects
DA/12/01451/EQVAR DA12/00758/EQVAR Approval of condition variations October 2012 Dartford app number: 03/01134/OUT	Eastern Quarry Watling Street Swanscombe Kent A mixed use development of up to 6250 dwellings & in addition up to 231,000 square metres of built floorspace. The development will include open space (including parks, play spaces, playing fields, allotments, lakes and water features, community woodland & formal and informal open space); landscaping; works to create ecological & nature reserves & refuge areas.	Land to the North of the A2, within the Ebbsfleet Eastern Quarry site – see attached detailed map for mixed use breakdown	Vegetation screening along Roman Road and along the A2 would be largely unaffected by the development with roadside planting retained to shield the development from the A2 and other roads. Poor lighting design for the junction improvements and Eastern Quarry could have a combined negative impact on light spill and lighting pollution.
15/00887/CPO Approved November 2015	Eastern Quarry Wastewater Treatment Works Wastewater treatment works and ancillary infrastructure to serve the development at Eastern Quarry	Land to the North of the A2, within the Ebbsfleet Eastern Quarry site – see attached detailed map for mixed use breakdown	Vegetation screening along Roman Road and along the A2 would be largely unaffected by the development with roadside planting retained to shield the development from the A2 and other roads. Poor lighting design for the junction improvements and Eastern Quarry could have a combined

Planning application reference	Development summary	Distance from Scheme	Potential cumulative effects
			negative impact on light spill and lighting pollution.
20150155 Application Permitted February 2016	Land at Ebbsfleet Bounded by A2.	Adjacent to Ebbsfleet Junction	Vegetation screening along the A2 and the eastern side of Eastern Quarry would be largely unaffected by the development with roadside planting retained to shield the development from the A2 Junction and other roads. Poor lighting design for the junction improvements, Land at Ebbsfleet and Eastern Quarry could have a combined negative impact on light spill and lighting pollution.

10. Appendix I. Geology and Soils

10.1 Planning and policy context

10.1.1 This section identifies and describes legislation, policy and guidance of relevance to the assessment of the potential soil and geology impacts associated with the Scheme.

Ground conditions

Environmental Protection Act

10.1.2 Part 2A of the Environmental Protection Act (EPA) 1990 introduced a statutory regime for the identification and remediation of 'Contaminated Land'. It introduced, for the first time in the UK, a statutory definition of 'Contaminated Land' based on significant harm or the likelihood of significant harm or the pollution or likely pollution of controlled waters (all groundwater, inland waters and estuaries, excluding water perched above the zone of saturation).

10.1.3 Local authorities are the primary regulators under the Part 2A regime, with a duty to identify whether the land in their area is 'Contaminated Land', although provision is made for consultation and co-ordination with the Environment Agency in situations when pollution of controlled waters is an issue.

National Planning Policy Framework (NPPF) (2012)

10.1.4 The NPPF states that local planning policies and decisions should ensure that:

- The site is suitable for its new use, taking account of ground conditions and land instability, including from natural hazards or former activities such as mining, pollution arising from previous uses and any proposed land remediation;
- After remediation, as a minimum, land should not be capable of being determined as Contaminated Land as defined under Part 2A of the Environmental Protection Act (as amended); and
- Adequate site investigation information, prepared by a competent person, is presented.

Guidance for the Safe Development of Housing on Land Affected by Contamination R&D66

10.1.5 Environment Agency and National House Building Council (NHBC) Guidance for the Safe Development of Housing on Land Affected by Contamination R&D66 (2008) provides guidance on the development and application of the consequence and probability matrix and guidance on conducting a risk assessment. R&D66 sets out land quality estimation of the Level of Risk by Comparison of Consequence and Probability.

National Policy Statement for National Networks (NN NPS) (2014)

10.1.6 The NN NPS seeks to ensure that Nationally Significant Infrastructure Projects (NSIPs) are designed so as to minimise social, environmental impacts and to improve quality of life. Further, in delivering new schemes, opportunities to

deliver environmental benefits should also be considered as part of scheme proposals.

10.1.7 The NPS sets out policies and provides detailed guidance in relation to the assessment of the likely main environmental issues that need to be considered for such schemes. It also details potential key mitigation measures that can be implemented to minimise any adverse effects.

10.1.8 Guidance and policy regarding the assessment of land stability is set out in paragraphs 5.116 to 5.119. Key requirements are that the scheme proposals must be suitable for the location and that unacceptable risks associated with land instability are prevented.

10.1.9 Water quality and resource guidance and policy is set out in paragraphs 5.219 to 5.231. The objective is that new and existing development should be prevented from contributing to, or being put at unacceptable risk from, or being adversely affected by, water pollution. Key requirements are that the existing status of water quality, water resources and physical characteristics in the water environment must be ascertained and that the impacts of the proposed project, including those associated with any cumulative effects, are assessed as part of the environmental statement (ES). Careful design to facilitate adherence to good pollution control practice can reduce the risk of impacts on the water environment.

Contaminated Land Statutory Guidance

10.1.10 The principal objectives of the legislation, are described in the DEFRA Contaminated Land Statutory Guidance (2012) as follows:

- Identify and remove unacceptable risks to human health and the environment;
- Seek to ensure that contaminated land is made suitable for its current use; and
- Ensure that the burdens faced by individuals, companies and society as a whole are proportionate, manageable and compatible with the principles of sustainable development.

10.1.11 These objectives underlie the 'suitable for use' approach to the assessment and remediation of 'land contamination'. This approach recognises that the risks presented by any given level of land contamination will vary greatly according to the use of the land and a wide range of other factors, such as the sensitivity of the underlying geology and the receptors which may be affected. The 'suitable for use' approach consists of three elements:

- Ensuring that land is suitable for its current use;
- Ensuring that land is made suitable for any new use; and
- Limiting requirements for remediation to the work necessary to prevent unacceptable risks to human health or the environment in relation to the current use or future use of the land.

Contaminated Land Report 11 and Guiding Principles for Land Contamination

10.1.12 Primary guidance for assessing and managing land contamination is presented in Contaminated Land Report 11 (CLR11) (2004) and the Guiding Principles for

Land Contamination (Environment Agency, 2010). These documents provide a technical framework for the identification and remediation of contamination through the application of a risk management process.

Kent County Council, Minerals and Waste Local Plan 2013-2030 (2016)

10.1.13 The plan outlines an overarching strategy and planning polices for mineral extraction, importation and recycling, and the spatial implications of economic, social and environmental change in relation to strategic minerals.

Gravesham Borough Council Local Plan

10.1.14 The Scheme borders Gravesham borough to the east of the River Ebbsfleet, where the A2 acts as a boundary line between Dartford Borough and Gravesham District, with Dartford to the south and Gravesham to the north.

10.1.15 With regards to soils and geology, the Local Plan Core Strategy states 'new development will be located, designed and constructed to avoid adverse environmental impacts from pollution, including noise, air, odour and light pollution, and land contamination; and not pose an unacceptable risk or harm to the water environment, including the quality and/or quantity of ground waters, surface waters, wetlands and coastal water systems'.

Gravesham Borough Council Contaminated Land Strategy (2007)

10.1.16 Gravesham Borough Council's Contaminated Land Strategy aims to identify and suitably deal with all land where a significant pollutant linkage exists within the borough. It sets out the methods by which contamination is to be identified and the procedures by which contamination will be dealt with across the borough.

Dartford Borough Council Development Plan (2017)

10.1.17 The western extent, Bean Junction and Ebbsfleet fall within Dartford Borough Council boundary.

10.1.18 Dartford Borough Council's development plan is the basis for decision making relating to planning applications made within the borough. It comprises the Core Strategy (2011) and the Development Policies Local Plan (2011).

10.1.19 The Core Strategy sets out the council's long term spatial strategy for the Borough until 2026.

10.1.20 The Development Policies Local Plan sets out the main planning policies used to assess planning applications. Policy DP5: Environment and Amenity Protection sets out that:

- Development will only be permitted where it does not result in unacceptable material impacts, individually or cumulatively, on neighbouring uses, the Borough's environment or public health. Particular consideration must be given to areas and subjects of potential sensitivity in the built and natural environment (including as highlighted on the Policies Map) and other policies, and other potential amenity/ safety factors such as: a) air and water quality, including groundwater source protection zones; k) land instability; l) ground contamination; and
- Planning applications on or in the immediate vicinity of landfill sites must be accompanied by a full technical analysis of the site and its surroundings, in

accordance with Environmental Health and Environment Agency requirements for permitted sites. Analysis must establish that landfill gas will not represent a hazard in development of the site or that development will not cause adverse impacts on groundwater. Development will only be permitted where it has been clearly demonstrated that the proposed development can be safely, satisfactorily and fully achieved, including: a) avoidance of risks to neighbouring uses/ the wider area; and b) design quality, infrastructure objectives and other policy requirements such as affordable housing are not compromised as a result of high remediation costs.

Dartford Borough Council Contaminated Land Strategy (2001)

10.1.21 Dartford Borough Council's Contaminated Land Strategy aims to identify and suitably deal with all land where a significant pollutant linkage exists within the borough. It sets out the methods by which contamination is to be identified and the procedures by which contamination will be dealt with across the borough.

Water Quality

National Planning Policy Framework (NPPF) (2012)

10.1.22 The NPPF sets out policies for water quality and resources in paragraphs 5.219 and 5.231. The key aspects addressed are as follows:

- Preventing new and existing development from contributing or being adversely affected by water pollution;
- The existing quality of waters, water resources, physical characteristics of the water environment, and any cumulative effects must be considered in ESs; and
- The risk of impacts on the water environment can be reduced by using good pollution control practice.

The Water Resources Act 1991 (as amended)

10.1.23 The Water Resources Act sets controls of pollution of water sources in Section III. It contains information about water quality objectives, powers to prevent and control pollution, and pollution offenses.

Environment Agency's approach to groundwater protection (2017)

10.1.24 The Environment Agency's approach to groundwater protection contains position statements on SPZs, areas identified as drinking water protected areas and aquifer designations. It states that:

- The development of infrastructure should be directed to less sensitive groundwater locations;
- The Environment Agency will use a risk based tiered approach to regulate activities that may impact groundwater resources; and
- The Environment Agency expects developers and operators to take into account all current and future groundwater uses and their dependent ecosystems.

Water Framework Directive (WFD) (2000)

10.1.25 The purpose of the WFD (European Parliament, 2000) is to establish a framework for the protection of inland surface waters, transitional waters, coastal waters and groundwater. It includes directions that:

- Environmental objectives should be set to ensure that good groundwater status is achieved and that its deterioration is avoided. This includes that any upward sustaining trend in the concentration of a pollutant must be identified and reversed;
- A good status of groundwater requires early action and stable long-term planning of protective measures, owing to the natural time lag in its formation and renewal; and
- Monitoring programmes should cover monitoring of the chemical and quantitative status of groundwater.

Thames Basin River Basin Management Plan (RBMP) (2009)

10.1.26 The RBMP (Defra, 2009) is designed to protect and improve the quality of the water environment. It provides direction on the following topics:

- Plans for the protection and improvement of the water environment;
- Future plans that may affect the infrastructure sector and its obligations;
- Development proposal considerations regarding the requirements of the RBMP; and
- Environmental permit applications.

10.2 Study area

10.2.1 The assessment of geology and soils has considered a study area extending 500 m from the extent of the red line Scheme boundary, herein referred to as the 'study area'. The study area of 500 m was chosen as it was deemed appropriate for a linear feature such as a highway and to ensure that all potential sources and receptors which may be impacted by the Scheme are identified.

10.2.2 The ES shall include a detailed definition of what constitutes a receptor and how it relates to identified impacts or risks, by providing a description of potential pathway exposures.

10.2.3 For the purposes of this assessment, the identified potential sources, pathways, and receptors have been split into those located within the Scheme and those located within the study area but outside of the Scheme.

10.3 Methodology

10.3.1 The assessment of the potential impacts of the Scheme on geology and soils will be undertaken over two stages, in consultation with the Environment Agency and local authorities:

- Stage 1 - Land contamination risk assessment; and
- Stage 2 - Impact assessment.

10.3.2 Based on information available to date, assessment of baseline conditions within the study area has been largely qualitative, with only limited ground investigation data to assess ground conditions on site.

10.3.3 A phase of ground investigation is to be undertaken to inform the design and to confirm the appropriate mitigation measures. The ground investigation is currently being procured.

10.3.4 At this stage it is envisaged that the ground investigation will:

- Target areas of identified potential contamination;
- Provide an assessment of geological boundaries, thickness of strata and geotechnical testing to provide geotechnical parameters for design;
- Characterise the groundwater regime within the study area;
- Sample identified surface water receptors to derive site-specific environmental quality standards;
- Determine the extent and nature of any fill material (Made Ground) which may be present; and
- Determine the aggressivity of the ground towards buried concrete.

10.3.5 The ES will review the geology and soil issues at baseline, using desk based information and available ground investigation data. Potential impacts on existing ground conditions and receptors as a result of construction and operation of the Scheme will be identified cognisant of the government's Good Practice Guide to EIA (Defra, 2006[42]).

Stage 1 - Land contamination risk assessment

10.3.6 The approach adopted for the land contamination risk assessment is based on the guidance document CLR116 and the Good Practice Guide to EIA17. These documents are considered as key guidance in the United Kingdom, and provide a technical framework for the application of a risk management process through the following steps:

- Develop a Preliminary Conceptual Site Model (CSM). A desk study review of readily available information will be undertaken to develop the preliminary CSM, which describes the linkages between potential contamination hazards/sources, pathways and receptors relevant to the site. Where all three are present or considered likely to be present, these are described as potential contaminant linkages (PCLs) which can then be subject to the risk assessment process;
- Gather site specific information. The available information will be used to assess the potential for existing contamination at the site. Once these data have been reviewed, recommendations for further ground investigation will be made if required; and
- Risk Assessment. Generic quantitative risk assessments (GQRAs) for human health and groundwater receptors will be undertaken to inform a judgement as to whether the concentrations of contaminants in soil, soil leachate and

[42] It should be noted that this document has been archived; however, it still constitutes good advice and should be referred to in the absence of alternative guidance documents.

groundwater represent a potential risk to identified receptors. GQRA will be carried out through the comparison of the ground investigation results to appropriate generic assessment criteria (GAC). GAC are concentrations of a contaminant in soil or groundwater, below which the level of risk is considered acceptable. Using the information from the ground investigation and the GQRA, the preliminary CSM will be updated to include an assessment of the level of risk associated with each PCL identified during the baseline, construction and operational phases. Where risks are identified, consideration will be given to whether these would be appropriately mitigated through design and/or the development of a remediation strategy and its subsequent validation, as necessary. The residual risks will be determined and assessed based on estimation of likelihood and consequence. In the absence of ground investigation data, risk assessments will be undertaken using desk-based information.

10.3.7 The risk assessment applies the principles given in the NHBC and Environment Agency report R&D663, which provides guidance on the development and application of the consequence and probability matrix Table 10.1 for contaminated land risk assessment.

Table 10.1: Land quality estimation of the level of risk by comparison of consequence and probability

		Consequence			
		Severe	**Medium**	**Mild**	**Low**
Probability	High Likelihood	Very High Risk	High Risk	Moderate Risk	Moderate/Low Risk
	Likely	High Risk	Moderate Risk	Moderate/Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate/Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate/Low Risk	Low Risk	Very Low Risk	Very Low Risk

Table source: Based on R&D66 (NHBC and Environment Agency, 2008)

10.3.8 The potential risk to a receptor is a function of the probability and consequence of a PCL being realised. Probability (likelihood of an event occurring) takes into account both the presence of the hazard and the receptor and the integrity of the exposure pathway. Consequence takes into account both the potential severity of the hazard and the sensitivity of the receptor. Definitions for the classification of probability and consequence are provided in Tables 10.2 and 10.3 below.

Table 10.2: Classifications of probability

Classification	Definition of probability of harm/pollution occurring
High likelihood	The contaminant linkage exists and it is very likely to be realised in the short term, and/or will almost inevitably be realised in the long term, and/or there is current evidence of it being realised.
Likely	The source, pathway and receptor exist for the contaminant linkage and it is probable that this linkage will be realised. Circumstances are such that realisation of the linkage is not inevitable, but possible in the short term and likely over the long term.

Classification	Definition of probability of harm/pollution occurring
Low likelihood	The source, pathway and receptor exist and it is possible that it could be realised. Circumstances are such that realisation of the linkage is by no means certain in the long term and less likely in the short term.
	The source, pathway and receptor exist for the contaminant linkage but it is improbable that it will be realised even in the long term.

Table 10.3: Classifications of consequence

Classification	Definition of consequence
Human health receptors - site end users	
Severe	Acute damage to human health based on the potential effects on the critical human health receptor.
Medium	Chronic damage to human health based on the potential effects on the critical human health receptor.
Minor	Minimal short- term effects on human health based on the potential effects on the critical human health receptor.
Negligible	No appreciable impact on human health based on the potential effects on the critical human health receptor.
Controlled waters receptors	
Severe	Pollution of a principal aquifer within a source protection zone (inner and outer) or potable supply characterised by a breach of drinking water standards. Pollution of a surface water course characterised by a breach of an EQS at a statutory monitoring location or resulting in a change in GQA grade of river reach. Discharge of a List I or List II substance to groundwater.
Medium	Pollution of a principal aquifer outside a source protection zone (inner and outer) or a secondary A aquifer characterised by a breach of drinking water standards. Pollution of an industrial groundwater abstraction or irrigation supply that impairs its function. Substantial pollution but insufficient to result in a change in the GQA grade of river reach.
Minor	Low levels of pollution of a principal aquifer outside a source protection zone or an industrial abstraction, or pollution of a secondary A or B aquifer. Low levels of pollution insufficient to result in a change in the GQA grade of river reach, pollution of a surface water course without a quality classification.
Negligible	No appreciable pollution, or pollution of a low sensitivity receptor such as a secondary (undifferentiated) aquifer or a surface water course without a quality classification.
Ecosystem receptors	
Severe	For sites with designations as follows - Site of Special Scientific Interest, National Nature Reserve, Special Protection Area (and potential sites), Special Area of Conservation (and candidate sites) or Ramsar. Irreversible adverse change in the functioning of the ecological system or any species of special interest that forms part of that system.
Medium	For sites with designations as follows - Site of Special Scientific Interest, National Nature Reserve, Special Protection Area (and potential sites), Special Area of Conservation (and candidate sites) or Ramsar.

Classification	Definition of consequence
	Substantial adverse change in the functioning of the ecological system or any species of special interest that forms part of that system.
Minor	Harm to ecosystems of a low sensitivity such as sites of local importance. No appreciable harm to ecosystems with statutory designations.
Negligible	Limited harm to ecosystems of low sensitivity such as sites of local importance.
Property receptors – buildings, foundations and services	
Severe	Collapse of a building or structure including the services infrastructure from explosion.
Medium	Significant damage to a building or structure including the services infrastructure impairing their function.
Minor	Damage to buildings/structures and foundations but not resulting in them being unsafe for occupation. Damage to services but not sufficient to impair their function.
Negligible	No appreciable damage to buildings/structures, foundations and services.

10.3.9 Based on R&D663, the descriptions of the classified risks are as follows:

- Very high risk: There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the site without remediation action OR there is evidence that severe harm to a designated receptor is already occurring. Realisation of that risk is likely to present a substantial liability to the site owner/or occupier. Investigation is required as a matter of urgency and remediation works are likely to follow in the short-term.
- High risk: Harm is likely to arise to a designated receptor from an identified hazard at the site without remediation action. Realisation of the risk is likely to present a substantial liability to the site owner/or occupier. Investigation is required as a matter of urgency to clarify the risk. Remediation works may be necessary in the short-term and are likely over the longer term.
- Moderate risk: It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely, that the harm would be relatively mild. Further investigative work is normally required to clarify the risk and to determine the potential liability to site owner/occupier. Some remediation works may be required in the longer term.
- Low risk: It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely at worst, that this harm if realised would normally be mild. It is unlikely that the site owner/or occupier would face substantial liabilities from such a risk. Further investigative work (which is likely to be limited) to clarify the risk may be required. Any subsequent remediation works are likely to be relatively limited.
- Very low risk: There is a low possibility that harm could arise to a designated receptor, but it is likely at worst, that this harm if realised would normally be mild or minor.

- No potential risk: There is no potential risk if no pollution linkage has been established.

Stage 2 - Impact assessment

Land contamination

10.3.10 The land contamination impact assessment requires comparison of the baseline with the potential impacts that the development will have during the construction phase and operational phase. This approach enables changes in the impact to receptors during the construction and operational phases to be identified, an assessment of the effect of the Scheme to be made and appropriate mitigation measures specified. The changes in contamination status are described as either beneficial or adverse and consideration is made of whether they are major, moderate, minor or negligible, on the basis of the value of the receptor, the area over which the effect may occur, duration (short, medium or long term) and whether the effect is permanent or temporary.

10.3.11 The methodology for the assessment of significant effects using sensitivity and magnitude is presented in Table 10.2 and Table 10.3 above. This assessment is built into the Stage 1 land contamination risk assessment process and the R&D66 assessment method integrates the sensitivity of the receptor into the assessment of the magnitude (defined as consequence in R&D66) of harm and then compares this against the likelihood of the harm occurring. However, as land contamination cannot be defined as a resource, the magnitude of impact on the resource is not assessed, rather the magnitude of impact on each receptor is evaluated. Table 10.1 above shows how the interactions of consequence and likelihood associated with the PCLs results in the significance of a potential risk or impact.

10.3.12 For the purposes of informing the land contamination impact assessment, land contamination risk assessments need to be undertaken for each development phase.

10.3.13 The development phases to be considered include: construction without mitigation; construction with mitigation, based on the identified mitigation measures that would need to be implemented through the design and construction stages of the Scheme; and operation of the Scheme (including maintenance), assuming all mitigation has been undertaken prior to and during construction.

Geology and geomorphology

10.3.14 An impact assessment of the potential effects of the Scheme on ground conditions and geology as a valuable resource has been undertaken using a qualitative approach considering the effects on topography, soil compaction, soil erosion and ground stability, degradation of soil quality and loss, destruction or sterilisation of a valuable geological resource.

Assessing effects and defining significance

10.3.15 The value of a receptor is considered when determining consequence of an effect in the impact assessment. The value and/or sensitivity of each of the receptors is determined using the classifications given in Table 10.4 below.

10.3.16 As mentioned above, the below criteria are not utilised in the assessment of land contamination impacts as the value of a receptor is considered when determining consequence of an effect in the risk assessment.

Table 10.4: Criteria for classifying the value and/or sensitivity of environmental resources/receptors

Value/ sensitivity	Criteria	Examples
High	Attribute possesses key characteristics which contribute significantly to the distinctiveness, rarity and character of the site/receptor. Attribute has a very low capacity to accommodate the proposed change.	Principal Aquifer providing potable water to a large population, within an inner or outer groundwater source protection zone (Source Protection Zone (SPZ) 1 or SPZ 2). WFD high status water body (surface water) providing potable water to a small population. Sensitive human health receptors, e.g. young children. Buildings, including services and foundations but of high historic value or other sensitivity e.g. statutory designations, schools, residential dwellings. Ecological statutory designations with high sensitivity e.g. SSSI, LNR, SPA, RAMSAR etc. Statutory geological sites e.g. Geological SSSIs. Regionally important mineral resource. Soils of a high quality for arable agricultural horticultural purposes. Major topographic, ground stability, soil compaction or erosion hazards present at the site. High potential for materials re-use.
Medium	Attribute possesses key characteristics which contribute significantly to the distinctiveness, rarity and character of the site/receptor. Attribute has a low capacity to accommodate the proposed change.	Principal Aquifer beyond a SPZ, or secondary aquifer. Secondary aquifer providing abstraction water for agricultural or industrial use. WFD good status water body (surface water). Buildings, including services and foundations. Less sensitive human receptors, e.g. construction workers using PPE. Moderately economically viable mineral resource. Soils suitable for pasture and less sensitive use. Moderate topographic, ground stability, soil compaction and erosion hazards present at the site. Moderate potential for materials re-use.
Low	Attribute only possesses characteristics which are locally significant. Attribute has some tolerance to accommodate the proposed change.	Unproductive strata or Secondary Aquifer without abstraction. WFD moderate - poor status (surface water). Infrastructure (roads, bridges, railways). Non-statutory designated sites of regional importance that are not highly sensitive to damage from coastal change. No economically viable minerals. Soils not suitable for agricultural use. No sensitive human receptors. No topographic, ground stability, soil compaction or erosion hazards present at the site. No opportunity for materials re-use.

10.3.17 Following determination of the value of receptors, the magnitude of potential construction phase and operational phase impacts is determined based on the criteria defined in Table 10.3. The magnitude of land contamination impacts is guided by comparison of baseline, construction phase and operational phase risks, as determined in the Stage 1 assessment.

10.3.18 As mentioned above, the criteria in Table 10.5 below are not utilised in the assessment of land contamination impacts as the assessment of magnitude is considered when determining consequence of an effect in the risk assessment.

Table 10.5: Classification of magnitude of effect

Classification of magnitude	Criteria
High	Total loss of major alterations to one of more of the key elements, features or characteristics of the baseline. The post-development situation will be fundamentally different.
Medium	Partial loss or alteration to one of more of the key elements or characteristics of the baseline. The post-development situation will be partially changed.
Low	Minor loss or alteration to one or more of the key elements, features or characteristics of the baseline. Post-development, the change will be discernible but the underlying situation will remain similar to the baseline.
Negligible	Very minor loss or alteration to one of more of the key elements, features or characteristics of the baseline, such that post-development, the change will be barely discernible, approximating to the “no change” situation.

Table source: DMRB Volume 11, Section 2, Part 5

10.3.19 The overall potential significance of effects is then defined using the matrix presented below in Table 10.6, which describes the relationship between the value of the resource (sensitivity) as defined in Table 10.4 and magnitude of the potential impact as defined in Table 10.5.

Table 10.6: Criterion for determining the impact significance of effects

		Magnitude of impact			
		High	Medium	Low	Negligible
Value / sensitivity of receptor	High	Major	Moderate / major	Moderate	Minor / moderate
	Medium	Moderate / major	Moderate	Minor / moderate	Minor
	Low	Moderate	Minor / moderate	Minor	Negligible

10.3.20 The classification of significance of effects is based on the criteria defined in Table 10.7.

Table 10.7: Classification of significance of effects

Classification of significance	Effect
Major adverse effect	Complete loss of destruction of an important geological site. Significant sterilisation of mineral resources. Complete permanent change in topography which impacts the local community. Significant soil erosion, soil compaction, ground instability or soil quality degradation that is permanent in nature. An increase in contamination risk from the existing baseline conditions of 4 or 5 risk levels in the risk matrix, e.g. land that has a very low contamination risk in the baseline becomes a high or very high risk. Land that does not meet the statutory definition of Contaminated Land in the existing baseline becomes capable of being determined under Part 2A. The generation of significant volumes of hazardous waste requiring off-site disposal to appropriate landfill.
Moderate adverse effect	Moderate damage of an important geological site. Moderate sterilisation of a mineral resource. Partial long term (> 10 years) change in topography which impacts the local community. Moderate soil erosion, soil compaction, ground instability or soil quality degradation that is either permanent or long term in nature. An increase in contamination risk from the existing baseline conditions of 2 or 3 risk levels in the risk matrix, e.g. land that has a low contamination risk in the baseline becomes a moderate or high risk. Land that does not meet the statutory definition of Contaminated Land in the existing baseline becomes capable of being determined under Part 2A. The generation of a moderate volume of waste requiring offsite disposal.
Minor adverse effect	Minor damage of an important geological site. Minor sterilisation of a mineral resource. Limited medium term (5 to 10 years) change in topography which impacts the local community. Limited medium term soil erosion, soil compaction, ground instability or soil quality degradation. An increase in contamination risk from the existing baseline conditions of 1 risk level in the risk matrix, e.g. land that has a low contamination risk in the baseline becomes a moderate/low risk. The generation of a minor amount of waste.
Negligible	No change to geological receptors. No measurable impact on topography, soil erosion, soil compaction, ground instability or soil quality or impacts that are only temporary in nature (< 5 years). Negligible change in contamination risks. No generation of waste as part of the development, materials are used sustainably.
Minor beneficial	Minor improvement of an important geological site. Minor improvement in access to a mineral resource. Limited medium term (5 to 10 years) change in topography which has a positive impact on the local community. Limited medium term reduction in existing soil erosion, soil compaction or ground instability issues or degradation of soil quality.

Classification of significance	Effect
	A reduction in contamination risk from the existing baseline conditions of 1 risk level in the risk matrix, e.g. land that has a moderate/low contamination risk in the baseline becomes a low risk. A minor amount of materials reuse as part of the development limiting the offsite disposal of waste.
Moderate beneficial	Moderate improvement of an important geological site. Moderate improvement in access to a mineral resource. Partial long term (> 10 years) change in topography which has a positive impact on the local community. Moderate permanent or long term reduction in existing soil erosion, soil compaction or ground instability issues or degradation of soil quality. A reduction in contamination risk from the existing baseline conditions of 2 or 3 risk levels in the risk matrix, e.g. land that has a high contamination risk in the baseline becomes a moderate/low or low risk. Land that meets the statutory definition of Contaminated Land in the existing baseline is no longer capable of being determined under Part 2A. A moderate amount of materials re-use as part of the development limiting the offsite disposal of waste.
Major beneficial	Major improvement of an important geological site. Major improvement in access to a mineral resource. Complete permanent change in topography which has a positive impact on the local community. Significant permanent reduction in existing soil erosion, soil compaction or ground instability issues or degradation of soil quality. A reduction in contamination risk from the existing baseline conditions of 4 or 5 risk levels in the risk matrix, e.g. land that has a very high contamination risk in the baseline becomes a low or very low risk. Land that meets the statutory definition of Contaminated Land in the existing baseline is no longer capable of being determined under Part 2A. Sustainable use of material including recycling/reusing on site material. No offsite disposal of wastes to landfill.

10.3.21 Following the classification of an effect a clear statement is made as to whether the effect is 'significant' or 'not significant'. As a general rule, major and moderate effects are considered to be significant and minor and negligible effects are considered to be not significant. The ES shall clearly present the reasoning used to determine the significance of an effect. However, professional judgement is also applied where appropriate and the ES shall describe and justify professional judgement when it has been relied on to reach a conclusion.

10.4 Baseline conditions – Tables

Table 10.8: Aquifer designations

Unit	Environment Agency designation
Head	Secondary (undifferentiated) – Superficial
Alluvium	Secondary 'A' – Superficial
River Terrace Deposits (undifferentiated)	Secondary 'A' – Superficial
London Clay Formation	No designation/ Unproductive Strata

Lambeth Group	Secondary 'A' - Bedrock
Thanet Formation	Secondary 'A' – Bedrock
Chalk Group	Principal - Bedrock

Notes

Principal Aquifer (superficial and bedrock): "these are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer".

Secondary A Aquifer (superficial and bedrock): "permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers".

Secondary (undifferentiated) Aquifer: "has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type".

Unproductive Strata: "rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow".

Table Source: Environment Agency (2017)

Table 10.9: Landfill sites within 500 m of the Scheme

Name	Direction from junction	Operator	Historical / operational	Received waste
Darenth Wood	Southwest of Bean Junction	Unknown	Historical	Inert and commercial
Darenth Wood Road	West of Bean Junction	Rural District Council of Dartford	Historical	Inert, commercial, industrial and household
Stone 9a 1976	North of Bean Junction	Greater London Council	Historical	Inert, commercial and Household
Northfleet Landfill extension	North of Ebbsfleet Junction	Lafarge	Operational	Commercial, industrial and household
Southfleet Pit	North of Ebbsfleet Junction	Lafarge	Historical	Inert

Notes

Inert: Waste which remains largely unaltered once buried such as glass, concrete, bricks, tiles, soil and stones.

Table Source: Envirocheck Report (Landmark, 2017)

10.5 Potential impacts – Tables

Table 10.10:Summary of preliminary land contamination risk assessment

Source	Receptor	Pathway	Classification of risk		Mitigation measures	Mitigation measures	
			Baseline	Construction without mitigation		Construction with mitigation	Operation
Potential contaminants in soil / groundwater and gases / vapours associated with the following **on-site** sources: Made Ground of unknown provenance at the A2, B255, A296 and A2260 carriageways (including embankments), local access roads within the Scheme extent and dismantled railway at Ebbsfleet Junction. Fill materials (Infilled pit or quarry) Active and previous potentially contaminative activities within the	Human health (on-site) Construction workers and site workers	Inhalation, ingestion and dermal contact with contaminants in soil and soil-derived dust/fibres	**Moderate Risk**	**High Risk**	Ground investigation and risk assessment as necessary to define risk. Remediation / removal of existing contamination if risk assessments deem necessary. Implementation of measures in the Construction Environmental Management Plan (CEMP) such as good management of stockpiles in accordance with EA PPG, implementation of pollution incident control e.g. plant drip trays and spill kits. Implementation of dust management systems.	**Moderate / Low Risk**	**Low Risk Risk**
		Inhalation, ingestion and dermal contact with contaminants within perched water and shallow groundwater	**Moderate / Low Risk**	**High Risk**		**Moderate / Low Risk**	**Low Risk**
		Migration and accumulation of ground gases followed by inhalation or ignition causing asphyxiation and/or explosion	**Moderate Risk**	**Moderate Risk**		**Moderate Risk**	**Moderate / Low Risk**
		Inhalation of vapours from soil and / or groundwater	**Moderate / Low Risk**	**Moderate / Low Risk**		**Moderate / Low Risk**	**Low Risk**

Source	Receptor	Pathway	Classification of risk		Mitigation measures	Mitigation measures	
			Baseline	Construction without mitigation		Construction with mitigation	Operation
Scheme extent (including a former fuel station, car breakers and historical quarrying activities), notably potentially uncontrolled land use within the Bean Triangle. Pollution incidents (notably pesticides, oils, chemicals such as fire retardants). (Potential contaminants of concern include a range of inorganic and organic contaminants including heavy metals, hydrocarbons, fuels / oil, Polycyclic Aromatic Hydrocarbons (PAH), Total Petroleum Hydrocarbons (TPH), solvents, asbestos, Polychlorinated Biphenyls (PCBs), herbicides and pesticides, soil gas/landfill gas).	Human Health (on-site) On-site residents (Ightham Cottages, Bean House, along Hall Road) Members of the public using public rights of way (non motorised users)	Inhalation, ingestion and dermal contact with contaminants in soil and soil-derived dust/fibres	**Moderate Risk**	Receptor not present on-site during construction phase	RAMS to be completed prior to construction and risk management with appropriate personal protective equipment (PPE). Additional monitoring and risk assessment if required to determine mitigation measures that may need to be incorporated into design of structures and services.	Receptor not present on-site during construction phase	**Low Risk**
		Ingestion and dermal contact with contaminants within perched water and shallow groundwater	**Moderate / Low Risk**				**Low Risk**
		Migration and accumulation of ground gases followed by inhalation or ignition causing asphyxiation and/or explosion	**Moderate Risk**				**Moderate / Low Risk**
		Inhalation of vapours from soil and / or groundwater	**Moderate / Low Risk**				**Low Risk**
	Human Health (off-site) Local residents. School children and staff (Painters Ash Primary School, Northfleet School	Inhalation, ingestion and dermal contact with contaminants in windblown soil-derived dust/fibres	**Moderate / Low Risk**	**Moderate Risk**		**Moderate / Low Risk**	**Low Risk**

Source	Receptor	Pathway	Classification of risk		Mitigation measures	Mitigation measures	
			Baseline	Construction without mitigation		Construction with mitigation	Operation
	for Girls, Jumping Beans Village Pre-School). Workers and visitors at nearby commercial / industrial premises and recreational facilities Members of the public using public rights of way (non motorised users)	Ingestion and dermal contact with contaminants within perched water and shallow groundwater	**Moderate / Low Risk**	**Moderate / Low Risk**		**Moderate / Low Risk**	**Low Risk**
		Migration and accumulation of ground gases followed by inhalation or ignition causing asphyxiation and/or explosion	**Moderate Risk**	**Moderate Risk**		**Moderate / Low Risk**	**Moderate / Low Risk**
		Inhalation of vapours from soil and / or groundwater	**Moderate / Low Risk**	**Moderate / Low Risk**		**Moderate / Low Risk**	**Low Risk**
	Controlled Waters (on-site) Groundwater (localised superficial Secondary 'A' and Secondary (Undifferentiated) Aquifers; bedrock Principal and Secondary 'A' Aquifers). Groundwater abstractions and SPZs, notably an SPZ1 and a number of	Leaching/ vertical migration of contaminants in soils to underlying groundwater	**High Risk**	**Very High Risk**	Ground investigation and risk assessment as necessary to define risk. Remediation / removal of existing contamination if risk assessments deem necessary. Controlled Waters piling risk assessments.	**Moderate Risk**	**Moderate / Low Risk**
		Vertical migration of contaminants to deeper groundwater	**Moderate Risk**	**Very High Risk**		**Moderate / Low Risk**	**Moderate / Low Risk**
		Lateral migration of contamination in groundwater	**High Risk**	**Very High Risk**		**Moderate Risk**	**Moderate / Low Risk**

Source	Receptor	Pathway	Classification of risk		Mitigation measures	Mitigation measures	
			Baseline	Construction without mitigation		Construction with mitigation	Operation
	Thames Water abstraction boreholes. Surface water (River Ebbsfleet, unnamed ditches and attenuation ponds).	Migration of contaminants entrained in surface water run-off	**Moderate Risk**	**Very High Risk**	Dewatering risk assessment if dewatering processes are to be implemented. Implementation of measures in the CEMP such as good management of stockpiles in accordance with EA PPG, implementation of pollution incident control e.g. plant drip trays and spill kits. Control of run off and implementation of dust management systems.	**Moderate Risk**	**Moderate / Low Risk**
		Migration of contamination via surface waters	**Moderate Risk**	**Very High Risk**		**Moderate Risk**	**Moderate / Low Risk**
	Controlled Waters (off-site) Groundwater (localised superficial Secondary 'A' and Secondary (Undifferentiated) Aquifers; bedrock Principal and Secondary 'A' Aquifers). Groundwater abstractions and SPZs. Surface water (River Ebbsfleet, lakes and ponds associated with historical quarrying activities, unnamed ditches and attenuation ponds).	Leaching/ vertical migration of contaminants in soils to underlying groundwater	**High Risk**	**Very High Risk**		**Moderate Risk**	**Moderate / Low Risk**
		Lateral migration of contamination in groundwater	**High Risk**	**Very High Risk**		**Moderate Risk**	**Moderate / Low Risk**
		Migration of contaminants entrained in surface water run-off	**Moderate Risk**	**Very High Risk**		**Moderate Risk**	**Moderate / Low Risk**
		Migration of contamination via surface waters	**Moderate Risk**	**Very High Risk**		**Moderate Risk**	**Moderate / Low Risk**
	Ecology Darenth Wood SSSI, Beacon Wood Country	Lateral migration of contamination in shallow groundwater	**Moderate Risk**	**High Risk**	Ground investigation and risk assessment as necessary to define risk.	**Moderate / Low Risk**	**Low Risk**

Source	Receptor	Pathway	Classification of risk		Mitigation measures	Mitigation measures	
			Baseline	Construction without mitigation		Construction with mitigation	Operation
	Park and Ancient Woodland.	Migration of contaminants entrained in surface water run-off	**Moderate / Low Risk**	**High Risk**	Remediation / removal of existing contamination if risk assessments deem necessary. Dewatering risk assessment if dewatering processes are to be implemented. Implementation of measures in the CEMP such as good management of stockpiles in accordance with EA PPG, implementation of pollution incident control e.g. plant drip trays and spill kits. Control of run off and implementation of dust management systems.	**Moderate / Low Risk**	**Low Risk**
	Property (on-site) Piles and other foundations Underground services, historical features such as Roman Road (Watling Street).	Chemical attack from aggressive chemical constituents in soil or groundwater	**Low Risk**	**Moderate Risk**	Ground investigation and risk assessment as necessary to define risks. Remediation / removal of existing contamination if risk	**Very Low Risk**	**Very Low Risk**
		Migration of ground gases or vapours along preferential	**Moderate Risk**	**High Risk**		**Moderate Risk**	**Moderate / Low Risk**

Source	Receptor	Pathway	Classification of risk		Mitigation measures	Mitigation measures	
			Baseline	Construction without mitigation		Construction with mitigation	Operation
		pathways including permeable ground, services trenches and service entry points and accumulation in enclosed spaces such as services ducts or access points			assessments deem necessary. Appropriate assessment and design of services resistant to chemical attack if risk assessments deem necessary. Additional monitoring and risk assessment if required to determine mitigation measures that may need to be incorporated into design of structures and services.		
	Property (off-site) Residential, commercial and industrial properties Underground services, historical features such as Roman Road (Watling Street).	Chemical attack from aggressive chemical constituents in soil or groundwater	**Low Risk**	**Moderate Risk**		**Low Risk**	**Very Low Risk**
		Migration of ground gases or vapours along preferential pathways including permeable ground, services trenches and service entry points and accumulation in enclosed spaces such as services ducts or access points	**Moderate Risk**	**High Risk**		**Moderate Risk**	**Moderate / Low Risk**
Potential contaminants in soil / groundwater and gases / vapours	Human Health (on-site) Construction workers and site workers	Inhalation, ingestion and dermal contact with contaminants in	**Moderate / Low Risk**	**Moderate Risk**	Ground investigation and risk assessment	**Moderate / Low Risk**	**Moderate / Low Risk**

Source	Receptor	Pathway	Classification of risk		Mitigation measures	Mitigation measures	
			Baseline	Construction without mitigation		Construction with mitigation	Operation
associated with the following **off-site** sources: Made Ground of unknown provenance associated with the construction of local roads, railways and the infilling of ponds, pits and quarries. Operational and historical Landfills (Darenth Wood, Darenth Wood Road, Stone 9a, Northfleet Landfill extension and Southfleet Pit). Pollution incidents (notably oils, chemicals and sewage effluent). Active and previous potentially contaminative activities within the study area (including a car breakers, a haulage company, three timber		windblown soil-derived dust/fibres			as necessary to define risks. RAMS to be completed prior to construction and risk management with appropriate personal protective equipment (PPE). Additional monitoring and risk assessment if required to determine mitigation measures that may need to be incorporated into design of structures and services.		
		Ingestion and dermal contact with contaminants within perched water and shallow groundwater	**Moderate / Low Risk**	**Moderate / Low Risk**		**Moderate / Low Risk**	**Low Risk**
		Migration and accumulation of ground gases followed by inhalation or ignition causing asphyxiation and/or explosion	**Moderate Risk**	**Moderate Risk**		**Moderate / Low Risk**	**Moderate / Low Risk**
		Inhalation of vapours in the soil and / or groundwater	**Moderate / Low Risk**	**Moderate / Low Risk**		**Moderate / Low Risk**	**Low Risk**
	Human Health (on-site) On-site residents (Ightham Cottages, Bean House, along Hall Road) Members of the public using public rights of way (non motorised users)	Inhalation, ingestion and dermal contact with contaminants in windblown soil-derived dust/fibres	**Moderate / Low Risk**	Receptor not present on-site during construction phase		Receptor not present on-site during construction phase	**Moderate / Low Risk**
		Ingestion and dermal contact with contaminants within perched	**Moderate / Low Risk**				**Low Risk**

Source	Receptor	Pathway	Classification of risk		Mitigation measures	Mitigation measures	
			Baseline	Construction without mitigation		Construction with mitigation	Operation
suppliers, a concrete manufacturer, two garden centres, a clay pigeon shooting centre, National Grid electricity sub-stations (operational and historical), a waterworks, a pumping station, fuel stations (operational and former), six waste management facilities, historical quarrying activities, a historical 'works' and two historical nurseries). Of note is potentially uncontrolled land use within the Bean Triangle. Agricultural activities in the surrounding area. *(Potential contaminants of concern include a range of inorganic and organic contaminants including heavy metals, hydrocarbons, fuels / oil, Polycyclic Aromatic Hydrocarbons (PAH), Total Petroleum Hydrocarbons (TPH),*		water and shallow groundwater					
		Migration and accumulation of ground gases followed by inhalation or ignition causing asphyxiation and/or explosion	**Moderate Risk**				**Moderate / Low Risk**
		Inhalation of vapours in the soil and / or groundwater	**Moderate / Low Risk**				**Low Risk**
	Controlled Waters (on-site) Groundwater (localised superficial Secondary 'A' and Secondary (Undifferentiated) Aquifers; bedrock Principal and Secondary 'A' Aquifers). Groundwater abstractions and SPZs, notably an SPZ1 and a number of Thames Water abstraction boreholes. Surface water (River Ebbsfleet, lakes and ponds associated with historical quarrying	Lateral migration of contamination in groundwater	**High Risk**	**High Risk**	Ground investigation and risk assessment as necessary to define risks. Dewatering risk assessment if dewatering processes are to be implemented. Additional monitoring and risk assessment if required to determine control measures that may need to be implemented if risk assessments deem necessary.	**Moderate Risk**	**Moderate / Low Risk**
		Migration of contaminants entrained in surface water run-off	**Moderate Risk**	**Moderate Risk**		**Moderate Risk**	**Moderate / Low Risk**
		Migration of contamination via surface waters	**Moderate Risk**	**Moderate Risk**		**Moderate Risk**	**Low Risk**

Source	Receptor	Pathway	Classification of risk		Mitigation measures	Mitigation measures	
			Baseline	Construction without mitigation		Construction with mitigation	Operation
solvents, asbestos, Polychlorinated Biphenyls (PCBs), herbicides and pesticides, soil gas / landfill gas).	activities, unnamed ditches and attenuation ponds).						
	Property (on-site) Piles and other foundations Underground services, historical features such as Roman Road (Watling Street).	Chemical attack from aggressive chemical constituents in soil or groundwater	**Low Risk**	**Low Risk**	Ground investigation and risk assessment as necessary to define risks. Dewatering risk assessment if dewatering processes are to be implemented. Additional monitoring and risk assessment if required to determine mitigation measures that may need to be incorporated into design of structures and services	**Low Risk**	**Very Low Risk**
		Migration of ground gases or vapours along preferential pathways including permeable ground, services trenches and service entry points and accumulation in enclosed spaces such as services ducts or access points	**Moderate Risk**	**Moderate Risk**		**Moderate Risk**	**Moderate / Low Risk**

Table 10.11: Geology and geomorphology impact assessment

Topic	Feature	Value	Construction with mitigation		Operation	
			Magnitude of impact	Classification of significance of effect	Magnitude of impact	Classification of significance of effect
Topography	-	Low	Low	Minor adverse	Negligible	Negligible
	Soil Erosion and Quality.	Low	Low	Minor Adverse Effect	Negligible	Negligible

Topic	Feature	Value	Construction with mitigation		Operation	
			Magnitude of impact	Classification of significance of effect	Magnitude of impact	Classification of significance of effect
Changes in physical properties, and ground stability	Compressible Ground, Landslide, Running Sands, Dissolution.	Low	Low	Minor Adverse	Negligible	Negligible
	Collapsible Ground, Shrinking or Swelling Clays, Aggressive Ground.	Low	Negligible	Negligible	Negligible	Negligible
Geology as a Valuable Resource	Mineral Resources	Medium	Low	Minor / Moderate Adverse	Negligible	Minor Adverse

10.6 Cumulative effects – Table

Table 10.12:Proposed developments

Planning application reference	Development summary	Distance from Scheme
Ebbsfleet 96/00047/OUT	Development of up to 789,550sq.m gross floorspace comprising employment, residential, hotel and leisure uses supporting retail & community facilities & provision of car parking, open space, roads & infrastructure.	Approximately 300m from red line boundary
Ebbsfleet Green 05/00308/OUT	Mixed use redevelopment of site comprising a mixed use of up to 950 dwellings & non-residential floorspace for: shopping, food & drink, hotel use; community, health, education & cultural uses; assembly & leisure facilities & associated works to provide the development	Immediately adjacent to red line boundary
Eastern Quarry DA/12/01451/EQVAR DA12/00758/EQVAR Approval of condition variations October 2012 Dartford app number: 03/01134/OUT	Eastern Quarry Watling Street Swanscombe Kent A mixed use development of up to 6250 dwellings & in addition up to 231,000 square metres of built floorspace. The development will include open space (including parks, play spaces, playing fields, allotments, lakes and water features, community woodland & formal and informal open space); landscaping; works to create ecological & nature reserves & refuge areas.	Land to the North of the A2, within the Ebbsfleet Eastern Quarry site – see attached detailed map for mixed use breakdown
Village Heights 16/00016/OUT	Erection of up to 33 residential units, comprising 3 x 3 bed houses and 4 x 2 bed houses, 15 x 2 and 11 x 1 bed apartments, together with medical centre and associated parking, landscaping and amenity space	Approx. 1km from red line boundary
Land At Former Northfleet Cement Works The Shore Northfleet Gravesend Kent DA11 9AN	Outline application for a mixed development and comprising: up to 532 Homes, related car parking and landscaping (C3) up to 46,000 sq. m Employment Floorspace, related car parking, servicing and landscaping (B1/B2/B8); Mixed Use Neighbourhood Centre comprising mix of: up to 850 sq. m retail/cafe/takeaway floor space (A1/A2/A3/A5); residential uses (C3); community centre (D1) and related car parking and landscaping; Riverside Food and Drink Uses comprising up to 500 sq m of pub or food and drink uses (A3/A4); Public Open Space including riverside promenade, public park with equipped play areas and playing field with shared public/school use, multi-use games area and wildlife corridors; Fastrack Link to provide a segregated link across the site along with Fastrack stops Street and Footpath Network to provide access to development and maintain and enhance existing public rights of way, including a bridge link between Hive Lane and Factory Road; Access Improvement to Grove	Approx. 900m from red line boundary

	Road/The Creek and The Shore/Crete Hall Road and associated highway improvements; Supporting Services and Infrastructure including new utilities, enhanced flood defences and providing for access to cliffs and tunnels; Ground re-grading to create efficient development and open space platforms and to raise land to address flood risk ; and Other Minor Works and development ancillary to the main proposals including the demolition of existing buildings and the retention of tunnels and facing walls adjacent to Lawn Road.	

10.7 Additional baseline tables

Table 10.13: Site history

Date	Map observations
1869	Bean Junction Watling Street runs in a northwest-southeast direction, in the same location as the present-day A296. It becomes a track to the east of the present-day Bean Junction. An unnamed road intersects Watling Street and runs in a north-south direction, assumed to be the present-day Bean Lane/B255. Bean village is made up of a cluster of houses, located to the south of the current Scheme extent. The surrounding area is rural, with woodland, fields and farm tracks mapped across the study area. A limekiln is mapped approximately 100 m to the northwest of the Bean Lane-Watling Street intersection. A2 No road is present between Bean and Ebbsfleet Junctions, with a narrow 'Roman Road' track marked in a similar location to the A2. The surrounding area is rural, with Swanscombe Park shown predominantly to the north and west and agricultural fields shown primarily to the south and east of the Scheme. Caston's Place Farm and Stonewood are mapped approximately 230 m south. Ebbsfleet Junction Park Corner Road runs southwest to northeast, connecting to Watling Street at the present-day Ebbsfleet Junction. A road running north-south is present in the same location and orientation as B259 (Southfleet Lane). To the east of the Ebbsfleet Junction, Leather Bottle Lane and Pepperhill Lane are mapped in a similar location to the present-day Springhead Road and Hall Road respectively and Painters Ash Lane is mapped in its current location. The River Ebbsfleet is mapped approximately 400 m east of the present-day Ebbsfleet Junction, discharging into Sawyer's Lake. Park Corner Cottages are mapped south of the Scheme, adjacent to the present-day Ebbsfleet Junction. New Barn, an agricultural property, is mapped approximately 700 m to the north. The surrounding area is generally undeveloped or used for agricultural purposes.
1898	Bean Junction Old chalk pits have been mapped. Relative to the Bean Lane-Watling Street Junction they are located approximately 100 m northwest, 200 m north-northeast, and 200 m east-southeast (2). An old sand pit is also mapped just south of Bean Farm, approximately 400 m southwest of the Scheme. Upper Bean Farm is mapped in the location of present-day Bean House. Present day Bean Lane/B255 is named Cobham Terrace. A2 Cherry Orchard is in the southwest corner of Swanscombe Park and a small historical village, Caerberlarber, is mapped in the southeast corner of the park, approximately 120 m north of the Scheme.

Date	Map observations
	Ebbsfleet Junction Three pits have been mapped in the vicinity of Ebbsfleet Junction; an old clay pit 700 m to the north, an old chalk pit 260 m to the southwest and an additional old chalk pit 250 m to the north of Ebbsfleet Junction. Both chalk pits are located directly adjacent to the Scheme extents. Two additional old chalk pits are located near the eastern extent of the Scheme; one approximately 300 m to the south and the second 400 m to the southeast. A rail line oriented southwest to northeast crosses the easternmost portion of the Scheme. Park Corner Cottages is no longer mapped. Springhead is mapped approximately 500 m to the east of Ebbsfleet Junction, indicating the source of the River Ebbsfleet.
1909 - 1910	Bean Junction Ightham Cottages are shown adjacent east of Bean Lane in their present location. Brick works are also mapped, adjacent southeast and approximately 200 m east-northeast of Bean Lane-Watling Street intersection. Ancient Earthworks are also indicated in the study area to the west of the western extent of the Scheme and approximately 450 m northeast of Bean Junction. A2 Appears to be no significant development change. Ebbsfleet Junction A pumping station, owned by the Metropolitan Water Board, Kent District, is shown 190 m to the south of the Scheme, near the A2 westbound onslip.
1931 - 1932	Bean Junction Hope Cottages are shown adjacent west of Bean Lane in their present location. A2 Watling Street is mapped as a wider road, with embankments, connecting the western and eastern portions of the Scheme. A reservoir owned by the Metropolitan Water Board is mapped 250 m south of Watling Road. Alkerton Clay Plant, mapped with an engine shed, is present on the east side of Swanscombe Park, 400 m north of Watling Road. A tramway approximately 600 m in length connects the Clay plant to the old clay pit on Southfleet Road. Ebbsfleet Junction A pumping station is mapped west adjacent to the Scheme, along Southfleet Road. A nursery is present northeast adjacent to the Scheme, in the location of the present-day Springhead Nurseries. An Old Chalk Pit is mapped 50 m east of the northern boundary of the Scheme. A Roman cemetery site is mapped north, adjacent to the eastern extent of the Scheme and a Roman settlement, Vagniacae, is present to the south of the A2 and present-day Springhead Nursery.
1938	Bean Junction The Brick works approximately 200 m east-northeast of Bean Lane-Watling Street intersection is no longer mapped. A large chalk pit with a tunnel located at its northern end is present 500 m northwest of Bean Lane-Watling Street intersection. A2 A large clay pit has is mapped in the western portion of Swanscombe Park, adjacent north of the present-day A296-A2 merge with smaller, old clay pits mapped to the east of the larger clay pit and to the south of the present-day A2. Ebbsfleet Junction A Residential area has been developed approximately 300 m northeast of the eastern section of the Scheme extent.

Date	Map observations
1938 - 1951	Bean Junction (1950) A sandpit is mapped adjacent to Ightham Cottages. The chalk pit located 500 m northwest of Bean Lane-Watling Street intersection has increased in size and the tunnel at its northern end is no longer mapped. A2 Appears to be no significant development change. Ebbsfleet Junction The old chalk pit located 50 m east of the northern boundary of the scheme has a tramway oriented north-south, and an active Chalk pit is mapped to the east of the tramway.
1961 - 1962	Bean Junction (1961) The chalk pit located 500 m northwest of Bean Lane-Watling Street intersection has continued to increase in size and a new tunnel has appeared at the northeast corner of the pits. A quarry is also mapped approximately 500 m to the northwest of Bean Lane-Watling Street intersection. The brick works adjacent southeast of Bean Lane-Watling Street junction is marked as disused works. A2 The old clay pit north of the Metropolitan Water Board reservoir has increased in size. A Roman road is now mapped south of its previous location. Alkerton Clay Plant, its associated tramway, and the large clay pit to the west of it are no longer mapped. Ebbsfleet Junction The tramway to the north of Ebbsfleet Junction is no longer mapped. The pumping station located west adjacent of the Scheme, along Southfleet Road, is no longer mapped. Residential development has increased to the northeast of the eastern extent of the Scheme.
1966 - 1967	Bean Junction (1967) A number of buildings are mapped at the present- day Bean Triangle, including Brickfield Nurseries and Watling Street Nurseries. The quarry to the northeast of Bean Lane-Watling Street intersection has expanded and is marked as a Chalk Pit. Mounts Road has appeared to the northeast of the Scheme and connects to Bean Road (formerly Cobham Terrace). The brick works adjacent southeast from Bean Junction are no longer mapped. A2 The clay pits located within the Swanscombe Park are no longer mapped. Ebbsfleet Junction 'Works' are present where the pumping station previously was, to the south of the junction. The old chalk pit located 50 m east of the northern Scheme extent is no longer present. A large building, assumed to be an electrical substation is mapped adjacent north of the A2, approximately 100 m to the west of Ebbsfleet Junction.
1973 - 1974	Bean Junction The A2 is now present and is mapped in its current position, with Bean Lane crossing the A2 as a flyover. A pond is shown to the northeast of Bean Junction in the present-day Bean Triangle. Additional houses are present in Bean village along Bean Lane, and Bean Lane-Watling Street junction is now mapped as a roundabout. The Chalk Pits to the northeast and northeast of Bean Lane-Watling Street intersection have expanded up to the Bean Lane-Watling Street intersection and there several tunnels marked along its boundaries. Residential Development has increased along Bean lane, south of the A2. A2

Date	Map observations
	The reservoir historically mapped 250 m south of Watling Road is described as 'covered'. Works with eight tanks has appeared north of present-day A296. The pits within Swanscombe Park have been listed as disused. Ebbsfleet Junction The large building mapped approximately 100 m west of Ebbsfleet Junction is now named Northfleet West Grid Substation and a smaller building has appeared to the northeast of it. The 'Works' 190 m to the south has been renamed 'Water Works'. The chalk pit to the north of the junction and the railway running in a southwest-northeast orientation are now marked as disused. Residential buildings are mapped adjacent east of the eastern extent of the scheme and the road layout matches the present-day layout. A Roman Temple is now mapped adjacent south of the eastern Scheme extent.
1980 - 1984	Bean Junction The chalk pit to the northeast of Bean Lane-Watling Street junction is no longer mapped. However, several tunnels associated with the disused chalk pits are still shown. A conveyer crossing Bean Road and extending southeast towards Watling Road has appeared. A2 The works with eight tanks, north of present-day A296 is now surrounded by a very large chalk pit to the north. Cherry Orchard is no longer mapped. Ebbsfleet Junction Appears to be no significant development change.
1988	Bean Junction Appears to be no significant development change. A2 Appears to be no significant development change. Ebbsfleet Junction No map available for this year.
1991 - 1992	Bean Junction Appears to be no significant development change. A2 The Chalk Pit has expanded east and south, located adjacent to the A2. The central portion of the chalk pit located north of A296 is labelled as disused workings. Ebbsfleet Junction The pumping station located west adjacent of the Scheme, along Southfleet Road, is mapped again. Northfleet East Grid Substation is present at the location of the previous roman cemetery, north adjacent to the eastern Scheme boundary. A public refuse tip with an associated car park has appeared south adjacent to the eastern Scheme boundary. Residential development has significantly increased east and south east of Ebbsfleet Junction.
1999	Bean Junction A roundabout in the north of the study area is mapped, assumed to be a section of Bluewater Parkway. A roundabout exists at Ightham Cottages Junction and the B255 flyover joins Ightham Cottages Roundabout with the B255 to the north of Bean Lane-Watling Street junction. A brickfield is present adjacent southeast to Bean Junction. A2 The works located north of the A296 now has two additional tanks on the property. A conveyer surrounding the property and terminating to the east of the works is shown and and larger areas within the chalk pit north of the property are

Date	Map observations
	deemed disused. Residential development has increased south of Watling Road, along Sandy Lane and School Lane. Ebbsfleet Junction A pumping station is present 100 m north east of the Northfleet West Grid Substation adjacent to the northern Scheme extent. A superstore has been constructed 50 m north of the Northfleet East Grid Substation. A garden centre is mapped adjacent southwest of the eastern Scheme boundary, adjacent to the public refuse tip.
2006	Bean Junction Bluewater Shopping Centre and associated road infrastructure is fully mapped northwest of the Scheme and Hope Cottages Roundabout is shown. A2 All of the chalk pits previously located north of the Scheme are no longer mapped. Drainage associated with the works north of the A296 are mapped to the north and east of the property. Ebbsfleet Junction Two roundabouts to the north of the A2, and a loop to the south are mapped, matching with the current alignment of Ebbsfleet Junction. Channel Tunnel Rail Link runs under the eastern extent of the Scheme in a northwest-southeast direction and the railway crossing in a southwest-northeast direction is labelled as a dismantled railway. The public refuse tip is now marked as a depot.
2017	Bean Junction Appears to be no significant development change. A2 The tanks and conveyers associated with the works north of the A296 are no longer shown and the chalk quarry areas are all marked as disused. Ebbsfleet Junction Appears to be no significant development change.

Table 10.14: Site area trade directories

Location	Name	Active / inactive	Potential contaminants	Distance (m) and direction from junction	Inside / outside site boundary
Watling Street	A2 Car Breakers	Inactive	Fuels, oils, solvents	500 east of Bean Junction	Outside
Watling Street	U Kings Global Ltd Road Haulage Services	Active	Fuel, oils, solvents	300 northeast from Bean Junction	Outside
Watling Street	Forestrall Ltd* Timber Merchants	Active	Solvents	500 northeast from Bean Junction	Outside
Watling Street	Sleepers Kent* Timber sleepers	Active	Solvents	500 northeast from Bean Junction	Outside
Watling Street	Decking London* Timber decking	Active	Solvents	500 northeast from Bean Junction	Outside

Location	Name	Active / inactive	Potential contaminants	Distance (m) and direction from junction	Inside / outside site boundary
Watling Street	Lafarge Concrete products	Inactive	Solvents	700 northeast of Bean Junction	Outside
Bluewater Shopping Centre	Various retail activities	Active	Various substances	600 northwest of Bean Junction	Outside
Wood Lane	JJs shooting ground*	Active	PAHs, lead	800 southwest of Bean Junction	Outside
Watling Street	Springhead Nurseries* Garden centre	Active	Pesticides / herbicides, fuels, oils	300 east of Ebbsfleet Junction	Outside
Watling Street	Millbrook Garden Centre*	Active	Pesticides / herbicides, fuels, oils	600 southeast of Ebbsfleet Junction	Outside
Pepperhill Lane	Ebbsfleet East National Grid sub station	Active	Fuels, oils, solvents	800 northeast of Ebbsfleet Junction	Outside
Springhead Rd	Sainsburys Pepper Hill Supermarket / vehicle cleaning services	Active	Fuel, oils, solvents	900 east of Ebbsfleet Junction	Outside

Notes
*Identified on Google Maps

Table 10.15: Pollution incidents

Location	Severity	Pollutant	Distance (m) and direction from junction	Date	Inside / outside Scheme extent
Bean Junction	Major	Pesticides	100 south of Bean Junction	January 1999	Inside
Bean Junction	Minor	Septic Tank Effluent	300 north of Bean Junction	November 1998	Inside
A296 Works	Significant	Oils	800 northeast of Bean Junction	March 2002	Outside
Bluewater Park	Minor	Soluble Anti-freeze Compounds	900 northwest of Bean Junction	December 1999	Outside
Sandy Lane	Significant	Construction/ demolition material	900 southeast of Bean Junction	March 2004	Outside
A2 Darenth Wood	Minor	Foam	1100 west of Bean Junction	November 1996	Outside
Darenth Wood	Significant	Oils	1100 southwest of Bean Junction	November 2002	Outside

Location	Severity	Pollutant	Distance (m) and direction from junction	Date	Inside / outside Scheme extent
Darenth Wood Road	Minor	Oils	1400 west of Bean Junction	June 1998	Outside
Northfleet Lorry Park A2	Minor	Oils	<100 east of Ebbsfleet Junction	June 1994	Inside
Springhead Service Station	Minor	Fire water / Foam	100 east of Ebbsfleet Junction	October 1996	Inside
Springhead Nurseries	Minor	Oils	300 east of Ebbsfleet Junction	May 1995	Inside
Foxhounds Lane	Major	Oils & fuel	600 southwest of Ebbsfleet Junction	October 2004	Outside
Stream adjacent to Springhead Nursery	Major	Oils	1000 southeast of Ebbsfleet Junction	February 1993	Outside
Pepperhill	Minor	Crude sewage	800 southeast of Ebbsfleet Junction	December 1999	Outside
Wingfield Bank Farm	Minor	Red gas oil	600 northeast of Ebbsfleet Junction	May 1999	Outside

Table Source: Site-specific Envirocheck report (Landmark, 2017)

Table 10.16: Land contamination risk assessment

Source	Receptor	Pathway	Classification of risk		Assessed Impact	Mitigation measures	Construction with mitigation		Operation	
			Baseline	Construction without mitigation			Classification of risk	Assessed impact	Classification of risk	Assessed impact
Potential contaminants in soil / groundwater and gases / vapours associated with the following on-site sources: Made Ground of unknown provenance at the A2, B255, A296 and A2260 carriageways (including embankments), local access roads within the Scheme extent and dismantled railway at Ebbsfleet Junction. Fill materials (Infilled pit or quarry) Active and previous potentially contaminative activities within the Scheme extent (including a former fuel station, car breakers and historical quarrying activities), notably potentially uncontrolled land use within the Bean Triangle. Pollution incidents (notably pesticides, oils, chemicals such as fire retardants). (Potential contaminants of concern include a range of inorganic and organic contaminants including heavy metals, hydrocarbons, fuels / oil, Polycyclic Aromatic Hydrocarbons (PAH), Total Petroleum Hydrocarbons (TPH), solvents, asbestos, Polychlorinated Biphenyls (PCBs), herbicides and pesticides, soil gas/landfill gas).	Human health (on-site) Construction workers and site workers	Inhalation, ingestion and dermal contact with contaminants in soil and soil-derived dust/fibres	Moderate Risk	High Risk	Minor adverse	Ground investigation and risk assessment as necessary to define risk. Remediation / removal of existing contamination if risk assessments deem necessary. Implementation of measures in the CEMP such as good management of stockpiles in accordance with EA PPG, implementation of pollution incident control e.g. plant drip trays and spill kits. Implementation of dust management systems. RAMS to be completed prior to construction and risk management with appropriate personal protective equipment (PPE). Additional monitoring and risk assessment if required to determine mitigation measures that may need to be incorporated into design of structures and services.	Moderate / Low Risk	Minor beneficial	Low Risk	Moderate beneficial
		Inhalation, ingestion and dermal contact with contaminants within perched water and shallow groundwater	Moderate / Low Risk	High Risk	Moderate adverse		Moderate / Low Risk	Negligible	Low Risk	Minor beneficial
		Migration and accumulation of ground gases followed by inhalation or ignition causing asphyxiation and/or explosion	Moderate Risk	Moderate Risk	Negligible		Moderate Risk	Negligible	Moderate / Low Risk	Minor beneficial
		Inhalation of vapours from soil and / or groundwater	Moderate / Low Risk	Moderate / Low Risk	Negligible		Moderate / Low Risk	Negligible	Low Risk	Minor beneficial
	Human Health (on-site) On-site residents (Ightham Cottages, Bean House, along Hall Road) Members of the public using public rights of way (non motorised users)	Inhalation, ingestion and dermal contact with contaminants in soil and soil-derived dust/fibres	Moderate Risk	Receptor not present on-site during construction phase			Receptor not present on-site during operation phase		Low Risk	Moderate beneficial
		Ingestion and dermal contact with contaminants within perched water and shallow groundwater	Moderate / Low Risk						Low Risk	Minor beneficial
		Migration and accumulation of ground gases followed by inhalation or ignition causing asphyxiation and/or explosion	Moderate Risk						Moderate / Low Risk	Minor beneficial
		Inhalation of vapours from soil and / or groundwater	Moderate / Low Risk						Low Risk	Minor beneficial
	Human Health (off-site) Local residents. School children and staff (Painters Ash Primary School, Northfleet School for Girls, Jumping Beans Village Pre-School). Workers and visitors at nearby commercial / industrial premises and recreational facilities	Inhalation, ingestion and dermal contact with contaminants in windblown soil-derived dust/fibres	Moderate / Low Risk	Moderate Risk	Minor adverse		Moderate / Low Risk	Negligible	Low Risk	Minor beneficial
		Ingestion and dermal contact with contaminants within perched water and shallow groundwater	Moderate / Low Risk	Moderate / Low Risk	Negligible		Moderate / Low Risk	Negligible	Low Risk	Minor beneficial
		Migration and accumulation of ground gases followed by inhalation or ignition causing asphyxiation and/or explosion	Moderate Risk	Moderate Risk	Negligible		Moderate / Low Risk	Minor beneficial	Moderate / Low Risk	Minor beneficial

Source	Receptor	Pathway	Classification of risk		Assessed Impact	Mitigation measures	Construction with mitigation		Operation	
			Baseline	Construction without mitigation			Classification of risk	Assessed impact	Classification of risk	Assessed impact
	Members of the public using public rights of way (non motorised users)	Inhalation of vapours from soil and / or groundwater	Moderate / Low Risk	Moderate / Low Risk	Negligible		Moderate / Low Risk	Negligible	Low Risk	Minor beneficial
	Controlled Waters (on-site) Groundwater (localised superficial Secondary 'A' and Secondary (Undifferentiated) Aquifers; bedrock Principal and Secondary 'A' Aquifers). Groundwater abstractions and SPZs, notably an SPZ1 and a number of Thames Water abstraction boreholes. Surface water (River Ebbsfleet, unnamed ditches and attenuation ponds).	Leaching/ vertical migration of contaminants in soils to underlying groundwater	Moderate / Low Risk	Negligible	Low Risk	Ground investigation and risk assessment as necessary to define risk. Remediation / removal of existing contamination if risk assessments deem necessary. Controlled Waters piling risk assessments. Dewatering risk assessment if dewatering processes are to be implemented. Implementation of measures in the CEMP such as good management of stockpiles in accordance with EA PPG, implementation of pollution incident control e.g. plant drip trays and spill kits. Control of run off and implementation of dust management systems.	Moderate Risk	Minor beneficial	Moderate / Low Risk	Moderate beneficial
		Vertical migration of contaminants to deeper groundwater	Moderate / Low Risk	Negligible	Low Risk		Moderate / Low Risk	Minor beneficial	Moderate / Low Risk	Minor beneficial
		Lateral migration of contamination in groundwater	Moderate / Low Risk	Minor beneficial	Moderate / Low Risk		Moderate Risk	Minor beneficial	Moderate / Low Risk	Moderate beneficial
		Migration of contaminants entrained in surface water run-off	Moderate / Low Risk	Negligible	Low Risk		Moderate Risk	Negligible	Moderate / Low Risk	Minor beneficial
		Migration of contamination via surface waters	Moderate / Low Risk	Negligible	Low Risk		Moderate Risk	Negligible	Moderate / Low Risk	Minor beneficial
	Controlled Waters (off-site) Groundwater (localised superficial Secondary 'A' and Secondary (Undifferentiated) Aquifers; bedrock Principal and Secondary 'A' Aquifers). Groundwater abstractions and SPZs. Surface water (River Ebbsfleet, lakes and ponds associated with historical quarrying activities, unnamed ditches and attenuation ponds).	Leaching/ vertical migration of contaminants in soils to underlying groundwater	High Risk	Very High Risk	Minor adverse		Moderate Risk	Minor beneficial	Moderate / Low Risk	Moderate beneficial
		Lateral migration of contamination in groundwater	High Risk	Very High Risk	Minor adverse		Moderate Risk	Minor beneficial	Moderate / Low Risk	Moderate beneficial
		Migration of contaminants entrained in surface water run-off	Moderate Risk	Very High Risk	Moderate adverse		Moderate Risk	Negligible	Moderate / Low Risk	Minor beneficial
		Migration of contamination via surface waters	Moderate Risk	Very High Risk	Moderate adverse		Moderate Risk	Negligible	Moderate / Low Risk	Minor beneficial
	Ecology Darenth Wood SSSI, Beacon Wood Country Park and Ancient Woodland.	Lateral migration of contamination in shallow groundwater	Moderate Risk	High Risk	Minor adverse	Ground investigation and risk assessment as necessary to define risk. Remediation / removal of existing contamination if risk assessments deem necessary. Dewatering risk assessment if dewatering processes are to be implemented. Implementation of measures in the CEMP such as good management of stockpiles in accordance with EA PPG, implementation of	Moderate / Low Risk	Minor beneficial	Low Risk	Moderate beneficial
		Migration of contaminants entrained in surface water run-off	Moderate / Low Risk	High Risk	Moderate adverse		Moderate / Low Risk	Negligible	Low Risk	Minor beneficial

Source	Receptor	Pathway	Classification of risk		Assessed Impact	Mitigation measures	Construction with mitigation		Operation	
			Baseline	Construction without mitigation			Classification of risk	Assessed impact	Classification of risk	Assessed impact
						pollution incident control e.g. plant drip trays and spill kits. Control of run off and implementation of dust management systems.				
	Property (on-site) Piles and other foundations Underground services, historical features such as Roman Road (Watling Street).	Chemical attack from aggressive chemical constituents in soil or groundwater	Low Risk	Moderate Risk	Moderate adverse	Ground investigation and risk assessment as necessary to define risks. Remediation / removal of existing contamination if risk assessments deem necessary. Appropriate assessment and design of services resistant to chemical attack if risk assessments deem necessary. Additional monitoring and risk assessment if required to determine mitigation measures that may need to be incorporated into design of structures and services.	Very Low Risk	Minor beneficial	Very Low Risk	Minor beneficial
		Migration of ground gases or vapours along preferential pathways including permeable ground, services trenches and service entry points and accumulation in enclosed spaces such as services ducts or access points	Moderate Risk	High Risk	Minor adverse		Moderate Risk	Negligible	Moderate / Low Risk	Minor beneficial
	Property (off-site) Residential, commercial and industrial properties Underground services, historical features such as Roman Road (Watling Street).	Chemical attack from aggressive chemical constituents in soil or groundwater	Low Risk	Moderate Risk	Moderate adverse		Low Risk	Negligible	Very Low Risk	Minor beneficial
		Migration of ground gases or vapours along preferential pathways including permeable ground, services trenches and service entry points and accumulation in enclosed spaces such as services ducts or access points	Moderate Risk	High Risk	Minor adverse		Moderate Risk	Negligible	Moderate / Low Risk	Minor beneficial
Potential contaminants in soil / groundwater and gases / vapours associated with the following off-site sources: Made Ground of unknown provenance associated with the construction of local roads, railways and the infilling of ponds, pits and quarries. Operational and historical Landfills (Darenth Wood, Darenth Wood Road,	Human Health (on-site) Construction workers and site workers	Inhalation, ingestion and dermal contact with contaminants in windblown soil-derived dust/fibres	Moderate / Low Risk	Moderate Risk	Minor adverse	Ground investigation and risk assessment as necessary to define risks. RAMS to be completed prior to construction and risk management with appropriate PPE. Additional monitoring and risk assessment if required to determine mitigation measures that may need to be incorporated into	Moderate / Low Risk	Negligible	Moderate / Low Risk	Negligible
		Ingestion and dermal contact with contaminants within perched water and shallow groundwater	Moderate / Low Risk	Moderate / Low Risk	Negligible		Moderate / Low Risk	Negligible	Low Risk	Minor beneficial
		Migration and accumulation of ground gases followed by inhalation or ignition causing asphyxiation and/or explosion	Moderate Risk	Moderate Risk	Negligible		Moderate / Low Risk	Minor beneficial	Moderate / Low Risk	Minor beneficial

Source	Receptor	Pathway	Classification of risk		Assessed Impact	Mitigation measures	Construction with mitigation		Operation	
			Baseline	Construction without mitigation			Classification of risk	Assessed impact	Classification of risk	Assessed impact
Stone 9a, Northfleet Landfill extension and Southfleet Pit). Pollution incidents (notably oils, chemicals and sewage effluent). Active and previous potentially contaminative activities within the study area (including a car breakers, a haulage company, three timber suppliers, a concrete manufacturer, two garden centres, a clay pigeon shooting centre, National Grid electricity sub-stations (operational and historical), a waterworks, a pumping station, fuel stations (operational and former), six waste management facilities, historical quarrying activities, a historical 'works' and two historical nurseries). Of note is potentially uncontrolled land use within the Bean Triangle. Agricultural activities in the surrounding area. (Potential contaminants of concern include a range of inorganic and organic contaminants including heavy metals, hydrocarbons, fuels / oil, Polycyclic Aromatic Hydrocarbons (PAH), Total Petroleum Hydrocarbons (TPH), solvents, asbestos, Polychlorinated Biphenyls (PCBs), herbicides and pesticides, soil gas / landfill gas).		Inhalation of vapours in the soil and / or groundwater	Moderate / Low Risk	Moderate / Low Risk	Negligible	design of structures and services.	Moderate / Low Risk	Negligible	Low Risk	Minor beneficial
	Human Health (on-site) On-site residents (Ightham Cottages, Bean House, along Hall Road) Members of the public using public rights of way (non motorised users)	Inhalation, ingestion and dermal contact with contaminants in windblown soil-derived dust/fibres	Moderate / Low Risk	Receptor not present on-site during construction phase			Receptor not present on-site during operation phase		Moderate / Low Risk	Negligible
		Ingestion and dermal contact with contaminants within perched water and shallow groundwater	Moderate / Low Risk						Low Risk	Minor beneficial
		Migration and accumulation of ground gases followed by inhalation or ignition causing asphyxiation and/or explosion	Moderate Risk						Moderate / Low Risk	Minor beneficial
		Inhalation of vapours in the soil and / or groundwater	Moderate / Low Risk						Low Risk	Minor beneficial
	Controlled Waters (on-site) Groundwater (localised superficial Secondary 'A' and Secondary (Undifferentiated) Aquifers; bedrock Principal and Secondary 'A' Aquifers). Groundwater abstractions and SPZs, notably an SPZ1 and a number of Thames Water abstraction boreholes. Surface water (River Ebbsfleet, lakes and ponds associated with historical quarrying activities, unnamed ditches and attenuation ponds).	Lateral migration of contamination in groundwater	High Risk	High Risk	Negligible	Ground investigation and risk assessment as necessary to define risks. Dewatering risk assessment if dewatering processes are to be implemented. Additional monitoring and risk assessment if required to determine control measures that may need to be implemented if risk assessments deem necessary.	Moderate Risk	Minor beneficial	Moderate / Low Risk	Moderate beneficial
		Migration of contaminants entrained in surface water run-off	Moderate Risk	Moderate Risk	Negligible		Moderate Risk	Negligible	Moderate / Low Risk	Minor beneficial
		Migration of contamination via surface waters	Moderate Risk	Moderate Risk	Negligible		Moderate Risk	Minor beneficial	Low Risk	Moderate beneficial
	Property (on-site) Piles and other foundations Underground services, historical features such as Roman Road (Watling Street).	Chemical attack from aggressive chemical constituents in soil or groundwater	Low Risk	Low Risk	Negligible	Ground investigation and risk assessment as necessary to define risks. Dewatering risk assessment if dewatering processes are to be implemented. Additional monitoring and risk assessment if required to determine mitigation measures that may need to be incorporated into design of structures and services	Low Risk	Negligible	Very Low Risk	Minor beneficial
		Migration of ground gases or vapours along preferential pathways including permeable ground, services trenches and service entry points and accumulation in enclosed spaces such as services ducts or access points	Moderate Risk	Moderate Risk	Negligible		Moderate Risk	Negligible	Moderate / Low Risk	Minor beneficial

11. Appendix J. Cultural Heritage

11.1 Planning and policy context

Legislation and guidance

11.1.1 This PEIR chapter has been prepared with reference to the following legislation:

- Ancient Monuments and Archaeological Areas Act (1979); and
- Planning (Listed Building and Conservation Areas) Act (1990).

11.1.2 In addition, the chapter has considered the following guidance:

- Standards and guidance for historic environment desk-based assessment: Chartered Institute for Archaeologists (CIfA, 2014);
- The Setting of Heritage Assets Historic Environment Good Practice Advice in Planning Note 3 (Historic England, 2015); and
- Design Manual for Roads and Bridges (DMRB) Volume 11 (DfT, 2007).

National planning policy

The National Planning Policy Framework (NPPF)

11.1.3 The NPPF (DCLG, 2012) sets out 12 Core Planning Principles of which the conservation of historic environment is one. One of the NPPF's core principles is that *'planning should conserve heritage assets in a manner appropriate to their significance, so that they can be enjoyed for their contribution to the quality of life of this and future generations*' (DCLG, 2012, Para 17).

11.1.4 Where designated assets are concerned great weight should be given to the asset's conservation and loss of significance should require *'clear and convincing justification. Substantial harm to or loss of a grade II listed building, park or garden should be exceptional. Substantial harm to or loss of designated assets of the highest significance, notably scheduled monuments, protected wreck sites, battlefields, grade I and grade II* listed buildings, grade I and II* registered parks and gardens should be wholly exceptional'* (DCLG, 2012, Para 132).

11.1.5 Impacts upon non-designated heritage assets are also a pertinent planning consideration. Paragraph 135 states that 'in weighing applications that affect directly or indirectly non-designated heritage assets, a balanced judgement will be required having regard to the scale of any harm or loss and the significance of the heritage asset.' Paragraph 139 goes on to add that 'non-designated heritage assets of archaeological interest that are demonstrably of equivalent significance to scheduled monuments, should be considered subject to the policies for designated heritage assets'.

11.1.6 Where a heritage asset is to be lost, either in part or in whole, as a result of the development, the local planning authority should require developers to *'record and advance the understanding of the significance of the heritage asset's […] in a manner appropriate to their importance and the impact, and should make this evidence… publicly accessible. (Paragraph 141)'.*

Planning Practice Guidance (PPG) 2014

11.1.7 The DCLG published PPG online in 2014, to expand upon the NPPF. '18a: Conserving and Enhancing the Historic Environment' was published in April 2014. The Guidance notes that 'conservation is an active process of maintenance and managing change. It requires a flexible and thoughtful approach to get the best out of assets as diverse as listed buildings to as yet undiscovered, undesignated buried remains of archaeological interest'.

11.1.8 In relation to the Site, the key considerations are set out in the sections on non-designated heritage assets.

11.1.9 The NPPF and the PPG identify two categories of non-designated sites of archaeological interest:

- *'Those that are demonstrably of equivalent significance to scheduled monuments and are therefore considered subject to the same policies as those for designated heritage assets'* (PPG citing National Planning Policy Framework Paragraph 139); and
- *'Other non-designated heritage assets of archaeological interest. By comparison this is a much larger category of lesser heritage significance, although still subject to the conservation objective. On occasion the understanding of a site may change following assessment and evaluation prior to a planning decision and move it from this category to the first'* (PPG).

11.1.10 The approach to be taken during development management is outlined in Paragraph 128 of the NPPF which states that when determining applications *'local planning authorities should require an applicant to describe the significance of any heritage assets affected, including any contribution any contribution made by their setting. The level of detail should be proportionate to the assets' importance and no more than is sufficient to understand the potential impact of the proposal on their significance. As a minimum the relevant historic environment record should have been consulted and the heritage assets assessed using appropriate expertise where necessary. Where a site on which development is proposed includes or has the potential to include heritage assets with archaeological interest, local planning authorities should require developers to submit an appropriate desk-based assessment and, where necessary, a field evaluation'* (Para 128).

National Networks National Policy Statement (NN NPS)

11.1.11 In addition to the overarching regulatory and policy framework discussed above, the impacts and effects of the Scheme have been reviewed in light of relevant historic environment legislation and policy.

11.1.12 Policy with regard to assessment of the historic environment effects of nationally significant transport infrastructure is laid out in the NN NPS.

11.1.13 Historic Environment Policy is laid out in paragraphs 5.120 to 5.142 of the NN NPS. The key aspects which should be addressed are as follows:

- The significance, setting and viability of the heritage assets likely to be affected by the proposed development should be considered;
- When considering the impact of a proposed development on the significance of a designated heritage asset great weight should be given to the asset's

conservation. The more important the asset, the greater the weight should be; and

- Harm or loss affecting any designated heritage asset should require clear and convincing justification - substantial harm to or loss of a grade II Listed building or grade II Registered Park or Garden should be exceptional; substantial harm to or loss of designated assets of the highest significance should be wholly exceptional.

11.1.14 There is no definition of what constitutes 'substantial harm' in the NN NPS or other published policy documents. However, guidance in PPG, supporting policy advice and case law indicates that whilst clearly a step down from total loss, substantial harm still represents a considerable degree of change to the significance of an asset. This could, for example, be as the result of removal of significant elements of fabric or the degradation / removal of key aspects of an asset's setting that notably contribute to its significance.

11.1.15 If a scheme results in substantial harm to an archaeological feature, there is potential for objection against the development to be raised.

11.1.16 NN NPS embodies an underlying principle of balancing harm and benefit which places greater weight on the conservation of more important assets. Where less than substantial harm would occur, there is a need to ensure that harm is justified and minimised and that the wider public benefits of the proposal are appropriately articulated and that opportunities to better reveal the significance of assets are taken.

Local planning policy

Dartford Borough Council

11.1.17 The statutory development plan for Dartford Borough Council is outlined within the Core Strategy (2011); and complemented by the Development Policies Local Plan 2017. The Site is located within the Ebbsfleet to Stone Priority Area. Policy CS4 of the Core Strategy refers to this area and with regards to cultural heritage notes that:

11.1.18 'The archaeological potential of parts of the Ebbsfleet Valley should be assessed prior to development through a desk-top study, and investigated via fieldwork, where the desk-top study indicates this will be necessary, or through an archaeological watching brief. The approach to any finds of significance will be determined through an Archaeological Strategy or Framework, agreed in partnership with KCC. Where there is an approved archaeological strategy as part of an extant planning consent, this will take precedence over this part of the policy' (Dartford Borough Council Core Strategy 2011, 39).

11.1.19 The Development Policies Plan was adopted by Dartford Borough Council on 17 July 2017 and sets out the main planning policies that the Local Planning Authority will use to assess planning applications. The Plan replaces the remaining parts of the 1995 Borough Local Plan. Policies DP12 and DP13 concern cultural heritage and the historic environment.

11.1.20 Policy DP12: Historic Environment Strategy states that:

- Development should contribute to the conservation and enjoyment of the Borough's historic environment. The Local Planning Authority will work with

developers on strategies to realise this in the context of site heritage opportunities and constraints;

- Where heritage may be at risk, landowners will be expected to work proactively with the Local Planning Authority in bringing forward proposals to preserve or enhance these assets, to facilitate their successful rehabilitation and seek their viable reuse consistent with their heritage value and special interest;
- Development proposals which may affect the significance of heritage assets (both designated and non-designated) or their setting should demonstrate how these assets will be protected, conserved or enhanced as appropriate. Proposals should aim to reflect and interpret the historic character of a site and conserve its most significant historical and/or architectural aspects; and
- A heritage statement should accompany all planning applications affecting heritage assets. On archaeological sites, a desk-based assessment will be required as a minimum. Applications affecting designated heritage assets will be assessed under Policy DP13. Applications affecting non-designated assets will be assessed against the criteria below.

Non-Designated Heritage Assets

11.1.21 The Borough's non-designated heritage assets include:

- Archaeological sites, including sites holding an interest as defined in the NPPF;
- Applicable sites within Areas of Special Character, as defined on the Policies Map;
- Sites with significant industrial heritage;
- Land with historic landscape character; and
- Historic open space, parks and gardens.

11.1.22 Development proposals affecting non-designated heritage assets should establish the asset's significance. Development should conserve or enhance those aspects that have been identified as significant and, where possible, should seek to better reveal an asset's significance.

11.1.23 In determining planning applications affecting non-designated assets, the effect of the proposal on the asset's significance will be taken into account. A balanced judgement will be taken having regard to the significance of the heritage asset and the scale of any harm or loss of significance. Development resulting in a total loss of significance will not normally be permitted.

11.1.24 Policy DP13: Designated Heritage Assets states that:

7. *'Designated heritage assets are an irreplaceable resource and should be conserved in a manner appropriate to their significance. A heritage statement should establish the significance of the heritage asset in order to enable the assessment the impact of a development proposal (sic) Any harm or loss will require clear and convincing justification.*

8. *In determining planning applications, the Local Planning Authority will pay close regard to: a) the significance of the heritage asset; b) the desirability of maintaining and, where*
9. *possible, enhancing significance; and c) the desirability of ensuring viable uses are found for heritage assets, consistent with their conservation.*
10. *Where a proposal will lead to substantial harm or total loss of significance, permission will be refused unless it can be clearly demonstrated that the development is necessary for substantial public benefits to be achieved that will outweigh the harm or loss.*
11. *Where a proposal will lead to less than substantial harm, this will be weighed against the public benefits of the proposal.*
12. *Where a proposal will lead to less than substantial harm, this will be weighed against the public benefits of the proposal.*
13. *Development proposals affecting a conservation area should pay special attention to the desirability of preserving or enhancing the character or appearance of that area. Proposals that would result in harm or loss of significance will be determined in line with clauses 3 and 4 above.*
14. *The demolition of any building in a conservation area will only be permitted where it is clear that it will not adversely affect the character and appearance of the area.*
15. *Development proposals affecting Scheduled Monuments will only be permitted where they clearly conserve the asset or enhance its significance. Proposals resulting in loss or harm will only be permitted on a wholly exceptional basis and in line with clauses 3 and 4 above.'*

Gravesham Borough Council

11.1.25 The development plan for Gravesham Borough Council is outlined in the Local Plan which is currently undergoing review. Policies CS19 and CS20 relate to the historic environment.

11.1.26 Policy CS19: Development and Design Principles Heritage and the Historic Environment states that:

11.1.27 'The Council will expect any proposals for development to demonstrate a thorough understanding of the heritage significance of any affected assets, their context and setting. Proposals should have regard to any relevant Conservation Area appraisals and associated Management Plans, lists of buildings of national and local architectural or heritage interest and guidance relating to areas of archaeological interest adopted by the Borough Council.'

11.1.28 Policy C20: Heritage and the Historic Environment states that:

- *'The Borough Council will accord a high priority towards the preservation, protection and enhancement of its heritage and historic environment as a non-renewable resource, central to the regeneration of the area and the reinforcement of sense of place. Particular attention in this regard will be focused on those heritage assets most at risk through neglect, decay or other threats. Securing viable, sustainable and appropriate futures for such assets*

at risk will need to be reconciled with the sensitivity to change that many present.

- *Proposals and initiatives will be supported which preserve and, where appropriate, enhance the significance and setting of the borough's heritage assets, their interpretation and enjoyment, especially where these contribute to the distinct identity of the borough. These include: Gravesend Town Centre, its development as a heritage riverside town, and its setting; the borough's urban and rural conservation areas; and surviving built features and archaeology relating to the borough's maritime, military, industrial and transport history.*
- *When considering the impact of a proposed development on a designated heritage asset, the weight that will be given to the asset's conservation value will be commensurate with the importance and significance of the asset. For non-designated assets, decisions will have regard to the scale of any harm or loss and the significance of the heritage asset.*'

11.2 Study area

11.2.1 The size of the study area used to assess potential effects from the Scheme on cultural heritage was determine by the following factors; the local topography and whether in cutting or embankment, the quantity and extent of heritage assets and level of information currently know in determining their significance. For this scheme a 1 km study area (500 m either side of the scheme corridor) has been applied based on the proximity to modern conurbations, extensive transportation, industrial and shopping developments and quarrying in the immediate area in combination with an already good understanding of the archaeological and palaeoenvironmental potential. This is shown on Figures 11.1 and 11.2 in the PEIR Volume 3. This distance was established by professional judgement and relevant guidance, in particular guidance recommended by the Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3, Part 2 HA 208/07 Cultural Heritage.

11.3 Methodology

11.3.1 The historic environment comprises designated and non-designated heritage assets and other features or remains of historic interest as follows:

- World Heritage Sites;
- Scheduled Monuments;
- Listed Buildings;
- Registered Parks and Gardens;
- Conservation Areas;
- Registered Battlefield;
- Buildings and structures of historic interest (not listed);
- Known archaeological sites and areas of archaeological potential
- National Trust Inalienable Land;

- Historic landscapes; and
- Findspots.

11.3.2 The methodology for assessing potential beneficial or adverse impacts and therefore likely effects on the historic environment is based on guidance provided in the Design Manual for Roads and Bridges (DMRB) Volume 11, HA 208/07, Annex 5. DMRB guidance determines likely positive or negative effects through identifying an asset's value or significance against the degree of change that the Scheme would cause through construction and operational phases and under various types of impact including direct, indirect, permanent, temporary, residual and cumulative.

11.3.3 The guidance assigns a value to each type of heritage asset, whether individual or collective in the DMRB Volume 11, Section 3, Part 2 HA 208/07 Cultural Heritage. This is set out in Table 11.1 below.

Table 11.1: Value of heritage assets

Value	Description	Example
Very High	Internationally important or significant heritage assets.	World Heritage Sites, or buildings recognised as being of international importance.
High	Nationally important heritage assets generally recognised through designation as being of exceptional interest and value.	Grade I and II* Listed Buildings, Grade I and II* Registered Parks and Gardens, Scheduled Monuments, Protected Wreck Sites, Registered Historic Battlefields, Conservation Areas with notable concentrations of heritage assets and undesignated assets of national or international importance.
Medium	Nationally or regionally important heritage assets recognised as being of special interest, generally designated.	Grade II Listed Buildings, Grade II Registered Parks and Gardens, Conservation Areas and undesignated assets of regional or national importance, including archaeological remains, which relate to regional research objectives or can provide important information relating to particular historic events or trends that are of importance to the region.
Low	Assets that are of interest at a local level primarily for the contribution to the local historic environment.	Undesignated heritage assets such as locally listed buildings, undesignated archaeological sites, undesignated historic parks and gardens etc. Can also include degraded designated assets that no longer warrant designation.
Negligible	Elements of the historic environment which are of insufficient significance to merit consideration in planning decisions and hence be classed as heritage assets.	Undesignated features with very limited or no historic interest. Can also include highly degraded designated assets that no longer warrant designation.
Unknown	The importance of an asset has not been ascertained.	

11.3.4 The scale of change the proposed development would have on the significance of the asset is assessed by determining the magnitude of impact.

11.3.5 Table 11.2 below identifies the criteria for establishing the magnitude of impacts on heritage assets.

Table 11.2: Magnitude of impact

Magnitude of impact	Description of nature of change
Major Adverse	Substantial harm to, or loss of an asset's significance as a result of changes to its physical form or setting. For example, this would include demolition, removal of physical attributes critical to an asset, loss of all archaeological interest or the transformation of an asset's setting in a way that fundamentally compromises its ability to be understood or appreciated. The scale of change would be such that it could result in a designated asset being undesignated or having its level of designation lowered.
Moderate Adverse	Less than substantial harm to an asset's significance as a result of changes to its physical form or setting. For example, this could include: physical alterations that remove or alter some elements of significance, but do not substantially alter the overall significance of the asset; notable alterations to the setting of an asset that affect our appreciation of it and its significance; or the unrecorded loss of archaeological interest.
Minor Adverse	Limited harm to an asset's significance as a result of changes to its physical form or setting. For example, this could include: physical changes that alter some elements of significance but do not noticeably alter the overall significance of the asset; and small-scale alterations to the setting of an asset that hardly affect its significance.
Negligible	Very minor changes to setting or form of the asset.
No Change/ Neutral	No appreciable change to an asset's significance.
Minor Beneficial	Limited improvement of an asset's significance as a result of changes to its physical form or setting. For example, this could include: physical changes that reveal or conserve some elements of significance but do not noticeably alter the overall significance of the asset; or small-scale alterations to the setting of an asset that improve our ability to appreciate it.
Moderate Beneficial	Notable enhancement of an asset's significance as a result of changes to its physical form or setting. For example, this could include: physical alterations that conserve or restore elements of significance; notable alterations to the setting of an asset that improve our appreciation of it and its significance; or changes in use that help safeguard an asset.
Major Beneficial	Substantial enhancement of an asset's significance as a result of changes to its physical form or setting. For example, this could include: major changes that conserve or restore elements of high significance; alterations to the setting of an asset that very substantially improve our appreciation of it and its significance; or changes in use that safeguard an asset, e.g. by taking it off the At Risk Register.

11.3.6 Table 11.3 shows how the significance of effect is determined. This combines the value of the heritage asset and the scale of change (impact) to provide the measure of effect.

Table 11.3: Significance of effects

Value/ Sensitivity	Magnitude of impact				
	Major	Moderate	Minor	Negligible	No change
Very high	Very large	Large or very large	Moderate or large	Slight	Neutral
High	Large or very large	Moderate or large	Slight or moderate	Slight	Neutral
Medium	Moderate or large	Moderate	Slight	Neutral or slight	Neutral
Low	Slight or moderate	Slight	Neutral or slight	Neutral or slight	Neutral
Negligible	Slight	Neutral or slight	Neutral or slight	Neutral	Neutral

11.3.7 Generally, moderate to major adverse or beneficial effects are considered to be 'significant' in terms of EIA regulations.

Further considerations

11.3.8 An archaeological desk-based assessment (DBA) was commissioned by Atkins in September 2017 (AOC 2017) to inform this PEIR. This desk based assessment will also be used as part of the evidence base in the forthcoming Environmental Impact Assessment.

11.3.9 Historic environment baseline data was collected from the following sources:

- Kent Historic Environment Record (KHER);
- Historic England's National Heritage List for England (NHLE); and
- Secondary sources which have primarily been discussed in the desk-based assessment.

11.3.10 The KHER and NHLE data was ordered in September 2017 so is an updated dataset from what was used at the Option Selection Stage.

11.3.11 At this preliminary stage, the archaeological desk-based assessment has only considered potential impacts on palaeoenvironmental and archaeological remains that survive or may survive within the scheme corridor itself. A detailed assessment covering the full 1 km Study Area will be undertaken at the Environmental Impact Assessment stage following final design fix.

11.3.12 The KHER datasets will be updated, any assets yet to be uploaded onto the HER database will be included and statutory consultations will be undertaken to ensure all available asset information is considered and appropriate advice given as part of the EIA process.

11.3.13 This PEIR document therefore presents baseline data against the current design information and makes a preliminary assessment of the likely effects on heritage assets. It takes into account the Option Selection Stage EAR document findings and recommendations, the Scoping Report produced at this Preliminary Design Stage and consultee comments, updated datasets from September 2017 and information from the archaeological desk based assessment.

11.3.14 A gazetteer of designated and non-designated heritage assets which are located within the site and study area, is presented in Table 11.7 below and Figures 11.1 and 11.2 in the PEIR Volume 3. A gazetteer of non-designated findspots which are located within the site and study area, are presented in Table 11.8 below and Figures 11.5. A gazetteer of archaeological events which are located within the site and study area, are presented in Table 11.9 below and on Figures 11.3 and 11.4. Heritage assets are referred to by their unique ID which, for designated assets, are their NHLE entry numbers, whilst non-designated assets are referred to by their preferred KHER ID (prefixed with either ‘TQ’ or ‘MKE’).

11.4 Potential impacts – Tables

Table 11.4: Potential impacts from construction

Site reference number	Site name	Value	Type of impact	Potential scale of impact
1013378	Medieval woodland boundary in Darenth Wood.	Very High	Temporary setting impacts during construction of the Bean junction north roundabout enlargement works and the construction of the proposed Bean bridge	Minor adverse
1005140	Spinghead Roman Site.	Very High	Temporary setting impacts during construction of the works to be undertaken at the Ebbsfleet junction.	Minor adverse
1004206	Neolithic sites near Ebbsfleet	Very High	Temporary setting impacts during construction of the works to be undertaken at the Ebbsfleet junction and A2260 roundabouts.	Minor adverse
1119762	Swanscombe Cutting Footbridge crossing A2 east of A296 Junction (Grade II).	Medium	No physical impacts anticipated. The asset will likely experience minor temporary setting impacts due to the construction activities associated with the new eastbound slip road to the A2.	Minor adverse
MKE1632	Vagniacae (this is the defined limit of the Roman town as per KHER record, not the Scheduled Monument boundary as per Historic England). NB. the extent of this asset covers multiple grouped non-designated heritage assets which are not discussed here individually.	High	Physical and setting impacts likely due to the construction of the scheme at the Ebbsfleet junction. Furthermore, depending on the construction details associated with the A2 eastbound slip road widening at Ebbsfleet junction, the construction phase of the Scheme is likely to directly impact heritage assets, or their setting, associated with the non-designated heritage asset of Vagniacae [MKE1632]. Such assets would likely experience moderate to major impacts, but this will need to be confirmed once construction details are known.	Moderate/ Major adverse
MKE77177	Cropmark of a possible field system.	Medium	Physical and setting impacts likely due to the construction of the scheme at the Ebbsfleet junction, particularly works in relation to the link road to be widened between the two roundabouts.	Moderate adverse
MKE99967	Medieval boundary.	Medium	Physical and setting impacts likely due to the construction of the scheme at Ebbsfleet junction.	Moderate adverse

Site reference number	Site name	Value	Type of impact	Potential scale of impact
MKE404	Watling Street	Medium	Physical and setting impacts likely due to the construction of the Scheme at Bean and Ebbsfleet junction.	Moderate adverse
MKE20535	Watling Street Junction.	Medium	Physical and setting impacts likely due to the construction of the Scheme at Bean and Ebbsfleet junction.	Minor adverse
MKE99362	Springhead ritual pools.	Medium	Temporary setting impacts during construction activities at the Ebbsfleet junction.	Minor adverse
MKE99355	2nd century Roman temple preserved beneath slip-road, Springhead.	High	Physical and setting impacts likely due to the construction of the scheme at Ebbsfleet junction.	Moderate adverse
MWX20794	Roman features at Station Quarter South	Medium	Temporary setting impacts during construction activities at the Ebbsfleet junction.	Minor adverse
MKE20535	Roman Road	Medium	Temporary setting impacts during construction activities at the Ebbsfleet junction.	Minor adverse
1099940	Lower Bean Farmhouse	Medium	No physical impacts are anticipated as part of the Scheme; however, the asset will likely experience temporary setting impacts as a result of the construction of the Scheme. However, these are thought to be negligible due to its existing setting to the south of the A2.	Negligible
1085808	Barn to south east of Lower Bean Farmhouse	Medium	No physical impacts are anticipated as part of the Scheme; however, the asset will likely experience permanent setting impacts as a result of the operation of the Scheme. However, these are thought to be negligible due to its existing setting to the south of the A2.	Negligible
1099902	Stone Castle	Medium	No physical impacts are anticipated as part of the Scheme; however, the asset will likely experience permanent setting impacts as a result of the operation of the Scheme. However, these are thought to be negligible due to its existing setting to the north of Bluewater Retail Park.	Negligible

Site reference number	Site name	Value	Type of impact	Potential scale of impact
1336457	Blue House	Medium	No physical impacts are anticipated as part of the Scheme; however, the asset will likely experience permanent setting impacts as a result of the operation of the Scheme. However, these are thought to be negligible due to its existing setting to the south of the A2, north-east of Bean.	Negligible
N/A	Potential unknown archaeological remains	Low to High	There is potential for undiscovered archaeological remains to be uncovered during the construction of the Scheme. Further assessment is required in order to establish the location, extent, condition and significance of any such remains.	Moderate/ Major adverse

Table 11.5: Potential Impacts during operation

Site reference number	Site name	Value	Type of impact	Potential scale of impact
1119762	Swanscombe Cutting Footbridge crossing A2 east of A296 Junction (Grade II)	Medium	No physical impacts likely. The asset will likely experience permanent setting impacts as a result of the operation of the scheme. However, these are thought to be negligible due to its existing setting on the A2 alignment.	Negligible
1099940	Lower Bean Farmhouse	Medium	No physical impacts are anticipated as part of the Scheme; however, the asset will likely experience permanent setting impacts as a result of the operation of the Scheme. However, these are not considered significant due to its existing setting to the south of the A2.	Minor
1085808	Barn to south east of Lower Bean Farmhouse	Medium	No physical impacts are anticipated as part of the Scheme; however, the asset will likely experience permanent setting impacts as a result of the operation of the Scheme. However, these are thought to be negligible not considered significant due to its existing setting to the south of the A2.	Minor
1099902	Stone Castle	Medium	No physical impacts are anticipated as part of the Scheme; however, the asset will likely experience permanent setting impacts as a result of the operation of the Scheme. However,	Minor

Site reference number	Site name	Value	Type of impact	Potential scale of impact
			these are thought to be negligible not considered significant due to its existing setting to the south of the A2.	
1336457	Blue House	Medium	No physical impacts are anticipated as part of the Scheme; however, the asset will likely experience permanent setting impacts as a result of the operation of the Scheme. However, these are thought to be negligible not considered significant due to its existing setting to the south of the A2.	Minor

11.5 Cumulative effects – Table

Table 11.6: Potential cumulative effects on the historic environment

Proposal and Planning Reference (if applicable)	Potential cumulative effects (Yes/ No)	Comments
Mixed use development at Ebbsfleet Reference: 96/00047/OUT Dartford Borough Council	Yes	The development is located within an area of high archaeological potential and includes a Scheduled Monument covering Neolithic sites near Ebbsfleet [1004206]. The sites were initially investigated between 1930-1960 and were scheduled as they represent a type site of Ebbsfleet Neolithic culture. A trackway and timber construction on the site of previous pottery finds has been identified. It's most southern boundary is located immediately north-west of the scheduled Roman settlement site of Springhead [1005140] and incorporates part of the eastern section of the Scheme. The proposed development is likely to have an adverse cumulative effect on the asset and wider historic environment in this area.
Outline application for residential development at Croxton Garry Site (E of Ingress Park) Reference: EDC/17/0110 Dartford Borough Council	TBC	To be assessed in ES; detailed information currently not available.
Outline application for residential development at Craylands Lane	Yes	The proposed development is located within Swanscombe (north of the Scheme), an area north of the scheme with high archaeological potential. The

Proposal and Planning Reference (if applicable)	Potential cumulative effects (Yes/ No)	Comments
Reference: 14/01689/OUT Dartford Borough Council		development may remove buried archaeological and/or palaeoenvironmental remains of significance resulting in an adverse cumulative effect on these important resources.
Residential development at Hedge Place Road Reference: 12/01150/FUL Dartford Borough Council	Yes	The proposed development is located north of Bluewater, approximately 700m north-west of the Scheme at its most northern point at Bean, within an area of high archaeological potential. The development may remove buried archaeological and/or palaeoenvironmental remains of significance resulting in an adverse cumulative effect on these important resources.
Outline planning for demolition of existing dwellings and erection of residential properties at Knockhall Road Reference: 13/01522/OUT Dartford Borough Council	Yes	The proposed development is located at Knockhall, Swanscombe to the north-west of the Scheme at Ebbsfleet, within an area of high archaeological potential. The development may remove buried archaeological and/or palaeoenvironmental remains of significance resulting in an adverse cumulative effect on these important resources.
Mixed use development at Eastern Quarry Reference: 12/01451/EQVAR Dartford Borough Council	Yes	The development is located within the extent of the Eastern Quarry at Swanscombe and borders the Scheme along the B255, A296, A2 and the B259. The area surrounding it is known for its high archaeological potential. The development may remove buried archaeological and/or palaeoenvironmental remains of significance resulting in an adverse cumulative effect on these important resources. Furthermore, it must be noted that the proposed development would impact on the historic landscape type associated with minerals extraction and other industries (Type 12). As the historic quarrying landscape surrounding the Scheme, especially at Swanscombe, has influenced the surrounding landscape, the loss of the quarry is likely to have a moderate adverse impact on the historic landscape.
Mixed use development at St James Lane Pit Reference: 05/00221/OUT Dartford Borough Council	Yes	The development is located east of Bluewater Retail Park, approximately 1km west of the Scheme at the B255. The area is known for its archaeological potential. The development may remove buried archaeological and/or palaeoenvironmental remains of significance resulting in an adverse cumulative effect on these important resources.
Mixed use development at St Clements Valley	Yes	The development is located approximately 500m north of the Scheme. The area surrounding it is known for its high archaeological potential. The

Proposal and Planning Reference (if applicable)	Potential cumulative effects (Yes/ No)	Comments
Reference: 14/01344/FUL (part of 12/01404/FUL) Dartford Borough Council		development may remove buried archaeological and/or palaeoenvironmental remains of significance resulting in an adverse cumulative effect on these important resources.
Residential development at Former Empire Sports Ground, Knockhall Reference: 15/01497/REM Dartford Borough Council	Yes	The proposed development is located at Knockhall, Swanscombe to the north-west of the Scheme at Ebbsfleet, within an area of high archaeological potential. The development may remove buried archaeological and/or palaeoenvironmental remains of significance resulting in an adverse cumulative effect on these important resources.
Mixed use development at Village Heights Reference: 16/00016/OUT Dartford Borough Council	Yes	The proposed development is located at Greenhithe, north of Swanscombe. The area is known for its archaeological potential, and, although located approximately 2km north of the northern point of the Scheme, this development will have an impact on unknown, buried archaeological resource, thus reducing the archaeological resource in the wider area. The development may remove buried archaeological and/or palaeoenvironmental remains of significance resulting in an adverse cumulative effect on these important resources.
Construction of building to accommodate plant of waste a land rear unit G1 Manor Way Bus Park Reference: 14/00679/CPO Dartford Borough Council	Yes	The proposed development is located within Swanscombe (north of the Scheme), an area north of the scheme with high archaeological potential. The development may remove buried archaeological and/or palaeoenvironmental remains of significance resulting in an adverse cumulative effect on these important resources.
Outline planning permission in relation to Major Space Unit MSU8 including demolition and extension at West Village and Service Yards, Bluewater Reference: 17/01202/REM Dartford Borough Council	TBC	The proposed development is located within the footprint of the existing Bluewater Retail Park And as such it is unlikely that any additional impacts will occur within this former quarry site.
Mixed use development a Ebbsfleet Green (Northfleet West Sub Station, Southfleet Road) Reference: 05/00308/OUT	Yes	The proposed development is located to the east of the Scheme at Ebbsfleet roundabouts. The proposed site has already undergone a series of archaeological evaluations. The development may, however, remove buried archaeological and/or palaeoenvironmental remains of significance where not

Proposal and Planning Reference (if applicable)	Potential cumulative effects (Yes/ No)	Comments
Dartford Borough Council		previously investigated, resulting in an adverse cumulative effect on these important resources.
Residential development at Northfleet Embankment East Crete Hall Road Reference: EDC/17/0038 Gravesham Borough Council	Yes	The proposed development is located at Northfleet, circa 3-4km north-east of the most northern section of the Scheme at Ebbsfleet. Northfleet is known for its high archaeological potential. The development may remove buried archaeological and/or palaeoenvironmental remains of significance resulting in an adverse cumulative effect on these important resources.
Mixed use development at Ebbsfleet Green (Northfleet West Grid Substation, Southfleet Road) Reference: EDC/16/0071 Dartford Borough Council	TBC	To be assessed in ES; detailed information currently not available.

11.6 Gazetteer

Table 11.7: Gazetteer of designated and non-designated heritage assets

Reference (NHLE and/or KHER)	Type	Description	Grade	Location	Period
1013378 MKE814/TQ 57 SE 38	Scheduled Monument	Medieval woodland boundary in Darenth Wood. Although sections have been partly destroyed by modern road building, the medieval woodland boundary in Darenth Wood survives well and is of an early date. Its earthworks are comparatively large for such a monument.	N/A	TQ 57786 72400 TQ 57857 72929 TQ 58125 72440 TQ 58151 73026	Medieval
1005140	Scheduled Monument	Springhead Roman Site.	N/A	TQ 61465 72455	Roman

Reference (NHLE and/or KHER)	Type	Description	Grade	Location	Period
		The record has been generated from an “old county number” (OCN) scheduling record, thus there is no full description.		TQ 61850 72406	
1004226	Scheduled Monument	Roman enclosure SE of Vagniacae. The record has been generated from an “old county number” (OCN) scheduling record, thus there is no full description.	N/A	TQ 61995 72096 TQ 62084 72067	Roman
1004206 MKE1665/TW 67 SW 39	Scheduled Monument	Neolithic sites near Ebbsfleet. The record has been generated from an “old county number” (OCN) scheduling record, thus there is no full description.	N/A	TQ 61568 73077 TQ 61746 73613	Neolithic
1099940 MKE25473/TQ 57 SE 1034	Listed Building	Lower Bean Farmhouse. 17th century or earlier L-shaped timber framed building faced with plaster (and some roughcast) on the south-west front and with weatherboarding on the south-east front.	II	TQ 58501 72214	Post-medieval
1085808 MKE25519/TQ 57 SE 1042	Listed Building	Barn to south east of Lower Bean Farmhouse. 18th century or earlier weatherboarded barn. Roof now covered with corrugated iron.	II	TQ 58504 72191	Post-medieval
1099902 MKE25472/TQ 57 SE 1031	Listed Building	Stone Castle. Medieval and circa 1825. A medieval late 12th century tower is in the south-east corner of the building faced with knapped flints and some stone quoins. Now an office building.	II	TQ 58395 74061	Medieval/ Post-medieval
1336457 MKE25613/TW 57 SE 1040	Listed Building	Blue House. 17th century timber-framed cottage refaced with brick, now painted, on the ground floor which has been underbuilt and with tarred weatherboarding above.	II	TQ 59688 72381	Post-medieval
1119762 MKE25561/TQ 67 SW 1335	Listed Building	Swanscombe Cutting Footbridge crossing A2 east of A296 Junction. Footbridge over trunk road (1964). First of several similar bridges built in Kent. An elegant example of an arch over dual carriageway. Crosses cutting at top of hill and closes notch in skyline.	II	TQ 59865 72668	Post-medieval

Reference (NHLE and/or KHER)	Type	Description	Grade	Location	Period
MKE15143/ TQ 67 SW 176	Non-designated monument	Romano-British settlement and cemetery, Station Road, Southfleet.	N/A	TQ 6187 7228	Roman
MKE15364/ TQ 67 SW 183	Non-designated monument	Royal Observer Corps post west of Southfleet Road, Swanscombe	N/A	TQ 608 734	Post-medieval/Modern
MKE15610/ TQ 57 SE 125	Non-designated monument	Brickworks at Badgers Mount, Darenth	N/A	TQ 5775 7210	Post-medieval
MKE1627/ TQ 67 SW 1	Non-designated monument	Clabberlabber/clapper-napper's hole. Collapsed cave.	N/A	TQ 6054 7280	Unknown
MKE1632/ TQ 67 SW 6	Non-designated monument	Vagniacae (Springhead), Iron Age and Roman religious centre.	N/A	TQ 6158 7252	Roman
MKE1665/ TQ 67 SW 39	Non-designated monument	Neolithic pottery find scatter, Ebbsfleet	N/A	TQ 6165 7332	Neolithic
MKE1710/ TQ 67 SW 86	Non-designated monument	Six Roman temples found at Springhead, Southfleet	N/A	TQ 6176 7246	Romano-British
MKE1711/ TQ 67 SW 87	Non-designated monument	Romano-British kiln (site of)	N/A	TQ 6170 7259	Romano-British
MKE1712/ TQ 67 SW 88	Non-designated monument	Romano-British burial ground	N/A	TQ 6203 7243	Romano-British
MKE1713/ TQ 67 SW 89	Non-designated monument	Walled Roman Cemetery, Springhead, Southfleet	N/A	TQ 6206 7211	Romano-British

Reference (NHLE and/or KHER)	Type	Description	Grade	Location	Period
MKE17182/ TQ 57 SE 145	Non-designated monument	Roman pit, gully, potter	N/A	TQ 5942 7250	Romano-British
MKE1734/ TQ 67 SW 112	Non-designated monument	Rectilinear enclosure, possibly a building - cropmark	N/A	TQ 6161 7235	Romano-British
MKE20044/ TQ 57 SE 147	Non-designated monument	Southern Hospital (Site of) Darenth	N/A	TQ 571 722	Post-medieval
MKE20070/ TQ 67 SW 240	Non-designated monument	Site of Small Clay Pit, West of Southfleet Roadlly	N/A	TQ 6090 7350	Post-medieval
MKE20099/ TQ 57 SE 162	Non-designated monument	Branton's Brickfield	N/A	TQ 5859 7290	Post-medieval
MKE20221/ TQ 67 SW 258	Non-designated monument	Medieval site at Northfleet East GIS Substation, Springhead	N/A	TQ 6216 7253	Medieval
MKE20234/ TQ 67 SW 271	Non-designated monument	Prehistoric feature, Springhead evaluation, Gravesend, Kent	N/A	TQ 6166 7329	Unknown
MKE20239/ TQ 67 SW 275	Non-designated monument	Iron Age Ditches, Springhead Evaluation, Gravesend, Kent	N/A	TQ 6169 7287	Late Bronze Age/Iron Age
MKE20241/ TQ 67 SW 276	Non-designated monument	Watercress beds, Springhead evaluation, Gravesend, Kent	N/A	TQ 6175 7261	Post-medieval
MKE20264/ TQ 57 SE 174	Non-designated monument	Prehistoric Site/Structure?, Waterstone Park, Stone	N/A	TQ 58172 74196	Neolithic to Romano-British

Reference (NHLE and/or KHER)	Type	Description	Grade	Location	Period
MKE20265/ TQ 57 SE 178	Non-designated monument	Late Iron Age/ Early Romano-British Farmstead?, Waterstone Park, Stone	N/A	TQ 58358 74182	Iron Age/Romano-British
MKE20294/ TQ 67 SW 307	Non-designated monument	Upper Palaeolithic knapping site, Springhead	N/A	TQ 6177 7261	Palaeolithic
MKE20295/ TQ 67 SW 309	Non-designated monument	Two Bell Barrows, Springhead	N/A	TQ 6179 7261	Bronze Age
MKE20296/ TQ 67 SW 310	Non-designated monument	Group of Bronze Age Pits , Springhead	N/A	TQ 6179 7264	Bronze Age
MKE20297/ TQ 67 SW 312	Non-designated monument	Possible Late Bronze Age/Early Iron Age Boundary Features, Springhead	N/A	TQ 6168 7297	Bronze Age/Iron Age
MKE20298/ TQ 67 SW 311	Non-designated monument	Iron Age ritual site, Springhead	N/A	TQ 6176 7285	Iron Age/Romano-British
MKE20299/ TQ 67 SW 313	Non-designated monument	Possible Defended Roman Enclosure and Road, Springhead	N/A	TQ 67 SW 313	Romano-British
MKE20302/ TQ 67 SW 316	Non-designated monument	Early Roman Quarry Pits, Springhead	N/A	TQ 6183 7257	Romano-British
MKE20303/ TQ 67 SW 317	Non-designated monument	Early Medieval Sunken-Featured Building, Springhead	N/A	TQ 61796 72590	Medieval
MKE20305/ TQ 67 SW 319	Non-designated monument	Early Medieval Corn Dryers, Springhead	N/A	TQ 61814 72594	Medieval

Reference (NHLE and/or KHER)	Type	Description	Grade	Location	Period
MKE20308/ TQ 67 SW 322	Non-designated monument	Palaeolithic Flint Finds, Springhead, Northfleet	N/A	TQ 6199 7276	Palaeolithic
MKE20309/ TQ 67 SW 323	Non-designated monument	Middle to Late Iron Age enclosure, Springhead, Northfleet	N/A	TQ 6210 7286	Iron Age
MKE20310/ TQ 67 SW 324	Non-designated monument	Iron Age Ditch, Springhead Nursery	N/A	TQ 6160 7277	Iron Age
MKE20529/ TQ 67 SW 326	Non-designated monument	Cobbled yard surface and small Romano-British finds discovered during evaluation in 2003	N/A	TQ 61702 72536	Romano-British
MKE20530/ TQ 67 SW 328	Non-designated monument	Romano-British occupation remains discovered during CTRL works in 2003	N/A	TQ 61773 72486	Romano-British
MKE20532/ TQ 67 SW 329	Non-designated monument	Possible Roman road discovered by resistance survey south of the A2	N/A	TQ 61647 72513	Romano-British
MKE20533/ TQ 67 SW 330	Non-designated monument	Two large features detected by resistivity survey south of the A2 at Springhead	N/A	TQ 61648 72500	Romano-British
MKE20534/ TQ 67 SW 331	Non-designated monument	Roman ground surface layer discovered in works during electrical works associated with the Channel Tunnel Rail Link	N/A	TQ 62015 72285	Romano-British
MKE20535/ TQ 67 SW 332	Non-designated monument	Roman road north from Springhead	N/A	TQ 61503 72935	Romano-British
MKE20537/ TQ 67 SW 333	Non-designated monument	Probable Romano-British surface observed during cabling works in 1992	N/A	TQ 61650 72642	Romano-British

Reference (NHLE and/or KHER)	Type	Description	Grade	Location	Period
MKE20539/ TQ 67 SW 335	Non-designated monument	Metalworking pits south of Springhead Roman town	N/A	TQ 61794 72339	Romano-British
MKE20540/ TQ 67 SW 336	Non-designated monument	Roman occupation site south of Springhead Roman town	N/A	TQ 61819 72339	Romano-British
MKE20545/ TQ 67 SW 339	Non-designated monument	Late Iron Age / Romano-British ditch found east of New Barn Road	N/A	TQ 6206 7192	Iron Age/Romano-British
MKE20546/ TQ 67 SW 340	Non-designated monument	Prehistoric ditch found during trenching east of New Barn Road	N/A	TQ 623 718	Unknown (prehistoric)
MKE20547/ TQ 67 SW 341	Non-designated monument	Four undated postholes found during trial trenching	N/A	TQ 62270 71889	Unknown
MKE20555/ TQ 67 SW 347	Non-designated monument	Roman bakery at Springhead Roman religious complex	N/A	TQ 61712 72494	Romano-British
MKE20556/ TQ 67 SW 348	Non-designated monument	Large Roman building east of Watling Street, Springhead	N/A	TQ 61713 72571	Romano-British
MKE20557/ TQ 67 SW 349	Non-designated monument	Roman building found west of Watling St, Springhead	N/A	TQ 61656 72591	Romano-British
MKE20558/ TQ 67 SW 350	Non-designated monument	Two Roman buildings found north of Watling St beneath the A2	N/A	TQ 61772 72509	Romano-British
MKE20559/ TQ 67 SW 351	Non-designated monument	Roman shop beneath the A2 at Springhead	N/A	TQ 61810 72487	Romano-British

Reference (NHLE and/or KHER)	Type	Description	Grade	Location	Period
MKE20560/ TQ 67 SW 352	Non-designated monument	Substantial structure discovered at Springhead	N/A	TQ 61789 72464	Romano-British
MKE20561/ TQ 67 SW 353	Non-designated monument	Roman flint building discovered to the south of Springhead	N/A	TQ 61830 72395	Romano-British
MKE20562/ TQ 67 SW 354	Non-designated monument	Area of probable Romano-British occupation immediately north of Roman Watling St, Springhead	N/A	TQ 61708 72555	Romano-British
MKE20563/ TQ 67 SW 355	Non-designated monument	Area of probable Romano-British occupation north of Roman Watling St, Southfleet	N/A	TQ 61739 72516	Romano-British
MKE20564/ TQ 67 SW 356	Non-designated monument	Courtyard and well, probably of Romano-British date, at Springhead, Southfleet	N/A	TQ 61629 72653	Romano-British
MKE20565/ TQ 67 SW 357	Non-designated monument	Romano-British bath-house found beneath current route of A2 at Springhead	N/A	TQ 61729 72554	Romano-British
MKE20566/ TQ 67 SW 358	Non-designated monument	Length of Roman ditch at Springhead, Southfleet	N/A	TQ 61883 72504	Romano-British
MKE20567/ TQ 67 SW 359	Non-designated monument	Romano-British ditch discovered during the 1960s at Springhead	N/A	TQ 6190 7241	Romano-British
MKE20568/ TQ 67 SW 360	Non-designated monument	Area of probable Romano-British activity at Springhead, Southfleet	N/A	TQ 61898 72444	Romano-British
MKE20569/ TQ 67 SW 361	Non-designated monument	Area of Romano-British activity immediately north of the A2 at Springhead	N/A	TQ 6196 7243	Romano-British

Reference (NHLE and/or KHER)	Type	Description	Grade	Location	Period
MKE20575/ TQ 67 SW 348	Non-designated monument	Watercress Beds at Springhead	N/A	TQ 6164 7280	Post-medieval
MKE20577/ TQ 67 SW 362	Non-designated monument	Flint spread found during an archaeological evaluation of land east of Springhead	N/A	TQ 61840 73150	Mesolithic to Iron Age
MKE20578/ TQ 67 SW 1352	Non-designated monument	Posthole east of Springhead, Southfleet	N/A	TQ 619 730	Unknown (prehistoric)
MKE20584/ TQ 67 SW 363	Non-designated monument	Flints found capping two postholes east of Springhead	N/A	TQ 61910 72988	Unknown (prehistoric)
MKE20586/ TQ 67 SW 364	Non-designated monument	Two prehistoric ditches east of Springhead	N/A	TQ 61900 73030	Neolithic to Romano-British
MKE20587/ TQ 67 SW 365	Non-designated monument	Early / Middle Iron Age ditch discovered east of Springhead	N/A	TQ 62138 72776	Iron Age
MKE20588/ TQ 67 SW 366	Non-designated monument	Concentration of prehistoric features discovered east of Springhead	N/A	TQ 62102 72891	Iron Age
MKE20592/ TQ 67 SW 368	Non-designated monument	Possible Romano-British field system discovered east of Springhead	N/A	TQ 6208 7287	Romano-British
MKE4004/ TQ 86 SW 132	Non-designated monument	Watling Street Roman Road	N/A	TQ 8047 6107	Romano-British
MKE40098/ TQ 67 SW 607	Non-designated monument	Post Medieval field system, Wingfield Bank, Northfleet	N/A	TQ 6224 7253	Post-medieval

Reference (NHLE and/or KHER)	Type	Description	Grade	Location	Period
MKE41660/ TQ 67 SW 1300	Non-designated monument	Pepper Hill Second World War light anti-aircraft battery, Northfleet	N/A	TQ 6264 7238	Modern
MKE41729/ TQ 67 SW 1181	Non-designated monument	Pepper Hill Second World War Battle Headquarters, Northfleet	N/A	TQ 6200 7250	Modern
MKE41781/ TQ 67 SW 1304	Non-designated monument	Springhead Second World War light anti-aircraft battery	N/A	TQ 6200 7300	Modern
MKE43400/ TQ 67 SW 470	Non-designated monument	Palaeolithic (Clactonian) elephant butchery site, Southfleet Road, Ebbsfleet	N/A	TQ 61160 73270	Palaeolithic
MKE43970/ TQ 67 SW 474	Non-designated monument	Wombwell Park, Gravesend	N/A	TQ 6255 7276	Modern
MKE44039/ TQ 67 SW 479	Non-designated monument	Fawkham Junction and Gravesend Branch Railway	N/A	TQ 67 SW 479	Modern
MKE77177/ TQ 67 SW 489	Non-designated monument	Cropmark of a possible field system, Springhead	N/A	TQ 6139 7284	Unknown
MKE782/ TQ 57 SE 6	Non-designated monument	Romano-British Cemetery, Stone Castle, Stone	N/A	TQ 5848 7436	Romano-British
MKE785/ TQ 57 SE 9	Non-designated monument	Former site of an earthwork, thought to be either a barrow, denehole or barrow mound	N/A	TQ 5885 7350	Unknown
MKE786/ TQ 57 SE 10	Non-designated monument	Mount's wood denehole	N/A	TQ 5900 7317	Unknown

Reference (NHLE and/or KHER)	Type	Description	Grade	Location	Period
MKE80274/ TQ 67 SW 522	Non-designated monument	Middle Iron Age burial, Pepper Hill	N/A	TQ 6183 7197	Iron Age
MKE80275/ TQ 67 SW 523	Non-designated monument	Late Iron Age/Roman ritual shaft/well, Pepper Hill	N/A	TQ 6186 7194	Iron Age/Romano-British
MKE80329/ TQ 67 SW 532	Non-designated monument	Two Saxo-Norman ditches and an undated pit, Site K, A2 widening scheme	N/A	TQ 6272 7189	Medieval
MKE80357/ TQ 67 SW 537	Non-designated monument	A medieval denehole west of Springhead Road, Northfleet	N/A	TQ 6191 7304	Medieval
MKE80416/ TQ 67 SW 541	Non-designated monument	Bronze Age features, east of Springhead	N/A	TQ 6219 7189	Bronze Age
MKE805/ TQ 57 SE 29	Non-designated monument	Early Medieval Cemetery	N/A	TQ 5835 7397	Medieval
MKE80564/ TQ 67 SW 1354	Non-designated monument	Early Neolithic flints and pottery, Springhead	N/A	TQ 6197 7281	Neolithic
MKE80565/ TQ 67 SW 1355	Non-designated monument	Early Bronze Age activity, Springhead	N/A	TQ 6197 7282	Bronze Age
MKE80566/ TQ 67 SW 1356	Non-designated monument	Bronze Age field system, Springhead	N/A	TQ 6191 7291	Bronze Age
MKE80568/ TQ 67 SW 1358	Non-designated monument	Small Roman enclosure, Springhead	N/A	TQ 6192 7286	Romano-British

Reference (NHLE and/or KHER)	Type	Description	Grade	Location	Period
MKE80569/ TQ 67 SW 1359	Non-designated monument	Roman inhumation burials, Springhead	N/A	TQ 6210 7281	Romano-British
MKE80570/ TQ 67 SW 1360	Non-designated monument	Large early medieval cemetery, Springhead, Gravesend	N/A	TQ 6186 7287	Medieval
MKE80571/ TQ 67 SW 1361	Non-designated monument	Anglo-Saxon pit, Springhead	N/A	TQ 6188 7284	Medieval
MKE80572/ TQ 67 SW 1362	Non-designated monument	Anglo-Saxon pit, Springhead	N/A	TQ 6207 7290	Medieval
MKE80573/ TQ 67 SW 1363	Non-designated monument	Medieval and post medieval field system, Springhead	N/A	TQ 6203 7286	Medieval
MKE80591/ TQ 67 SW 557	Non-designated monument	Anglo-Saxon occupation site, Springhead	N/A	TQ 6168 7335	Medieval
MKE80592/ TQ 67 SW 558	Non-designated monument	Medieval/post medieval quarry pits, Springhead	N/A	TQ 6176 7334	Medieval/Post-medieval
MKE80654/ TQ 57 SE 292	Non-designated monument	Late Iron Age/early Roman enclosures, pits and field systems, Waterstone Park, Stone Castle	N/A	TQ 5835 7397	Iron Age/Romano-British
MKE80655/ TQ 57 SE 293	Non-designated monument	19th century avenue, Waterstone Park, Stone Castle	N/A	TQ 5836 7395	Post-medieval/Modern
MKE808/ TQ 57 SE 32	Non-designated monument	Twopits containing Romano-British pottery at Branton's Brickfield	N/A	TQ 5852 7465	Pot-medieval/Modern

Reference (NHLE and/or KHER)	Type	Description	Grade	Location	Period
MKE817/ TQ 57 SE 41	Non-designated monument	Darenth wood deneholes	N/A	TQ 580 726	Medieval/Post-medieval
MKE824/ TQ 57 SE 41	Non-designated monument	Iron Age put found at Stone Castle Chalk Pit	N/A	TQ 580 726	Iron Age
MKE830/ TQ 57 SE 54	Non-designated monument	Iron Age and Romano-British settlement at Stone Castle Quarry	N/A	TQ 5824 7327	Iron Age/Romano-British
MKE83928	Non-designated monument	Darenth Asylum Farm	N/A	TQ 5720 7240	Post-medieval
MKE83934	Non-designated monument	Stone Castle Farmstead	N/A	TQ 5839 7404	Post-medieval
MKE83935	Non-designated monument	Outfarm north west of Stone Castle	N/A	TQ 5830 7411	Post-medieval
MKE83936	Non-designated monument	Newbarn Farm	N/A	TQ 5806 7376	Post-medieval
MKE83938	Non-designated monument	Bean Farm	N/A	TQ 5848 7221	Post-medieval
MKE83939	Non-designated monument	Upper Bean Farm	N/A	TQ 5848 7221	Post-medieval
MKE83940	Non-designated monument	Darenth Wood Farm	N/A	TQ 5777 7197	Post-medieval

Reference (NHLE and/or KHER)	Type	Description	Grade	Location	Period
MKE83993	Non-designated monument	Western Cross Farm	N/A	TQ 5904 7404	Post-medieval
MKE83995	Non-designated monument	Custon's Place	N/A	TQ 5951 7240	Post-medieval
MKE84108	Non-designated monument	New Barn	N/A	TQ 6125 7345	Post-medieval
MKE84162	Non-designated monument	Farmstead at Winfield Bank	N/A	TQ 6224 7264	Post-medieval
MKE863/ TQ 57 SE 88	Non-designated monument	Romano-British ritual pit	N/A	TQ 59 74	Romano-British
MKE864/ TQ 57 SE 89	Non-designated monument	Site of old Telegraph	N/A	TQ 59 72	Post-medieval
MKE88542	Non-designated monument	Outfarm south east of Upper Bean Farm	N/A	TQ 5882 7230	Post-medieval
MKE89544/ TQ 67 SW 1368	Non-designated monument	Roman pit, North Kent Community Church, Springhead	N/A	TQ 6187 7298	Romano-British
MKE90514/ TQ 67 SW 567	Non-designated monument	Springhead Second World War air raid shelter, Dartford, Kent	N/A	TQ 6189 7243	Modern
MKE90554/ TQ 57 SE 327	Non-designated monument	Metraro, Cobham Terrace Road, Greenhithe, Dartford, Kent	N/A	TQ 5877 7411	Modern

Reference (NHLE and/or KHER)	Type	Description	Grade	Location	Period
MKE90560/ TQ 57 SE 330	Non-designated monument	Cobham Terrace Road Second World War air raid shelter tunnel, Greenhithe, Dartford, Kent	N/A	TQ 5874 7408	Modern
MKE90740/ TQ 67 SW 1370	Non-designated monument	Mid to Late Bronze Age ditch, Wingfield Bank, Northfleet	N/A	TQ 6214 7263	Bronze Age
MKE90741/ TQ 67 SW 1371	Non-designated monument	Late Iron Age/Roman activity, Wingfield Bank, Northfleet	N/A	TQ 6219 7259	Iron Age/Romano-British
MKE90887/ TQ 67 SW 619	Non-designated monument	A medieval dene hole, Northfleet	N/A	Q 62188 72901	Medieval
MKE91420/ TQ 57 SE 1070	Non-designated monument	Undated pit, St Clements Valley, Greenhithe, Kent	N/A	TQ 5860 7427	Unknown
MKE9465/ TQ 67 SW 138	Non-designated monument	Roman road, south from Springhead via Pepper Hill cemetery	N/A	TQ 6176 7291	Romano-British
MKE97548/ TQ 57 SE 211	Non-designated monument	Undated cremation in pottery vessel	N/A	TQ 5842 7210	Unknown
MKE97549/ TQ 57 SE 216	Non-designated monument	Roman Ditch	N/A	TQ 5843 7210	Romano-British
MKE97550/ TQ 57 SE 217	Non-designated monument	Post-Medieval Pit	N/A	TQ 5835 7239	Post-medieval
MKE97553/ TQ 67 SW 644	Non-designated monument	Lower Palaeolithic 'Clactonian' occupation surface, Ebbsfleet	N/A	TQ 61060 73300	Palaeolithic

Reference (NHLE and/or KHER)	Type	Description	Grade	Location	Period
MKE97554/ TQ 67 SW 645	Non-designated monument	Possible Bronze Age-Iron Age features, Ebsfleet	N/A	TQ 6104 7331	Bronze Age
MKE97555/ TQ 67 SW 646	Non-designated monument	Late Upper Palaeolithic (Long Blade) knapping scatter, Ebbsfleet Green	N/A	TQ 6090 7327	Palaeolithic
MKE97557/ TQ 67 SW 747	Non-designated monument	Bronze Age and Iron Age features	N/A	TQ 6100 7315	Bronze Age/Iron Age
MKE97577	Non-designated monument	Geoarchaeological evaluation at Northfleet Substation	N/A	TQ 60792 73262	Iron Age
MKE98979/ TQ 57 SE 1085	Non-designated monument	Dartford War Hospital	N/A	TQ 5704 7222	Modern
MKE99355/ TQ 76 SW 1384	Non-designated monument	2nd century Roman temple preserved beneath slip-road, Springhead	N/A	TQ 6167 7265	Romano-British
MKE99356/ TQ 67 SW 1384	Non-designated monument	Possible late iron age processional way, Springhead	N/A	TQ 6176 7291	Iron Age
MKE99357/ TQ 67 SW 1385	Non-designated monument	Late iron Age enclosure, Springhead	N/A	TQ 6184 7281	Iron Age
MKE99358/ TQ 67 SW 1386	Non-designated monument	Late iron Age enclosure, Springhead	N/A	TQ 6188 7253	Iron Age
MKE99359/ TQ 67 SW 1386	Non-designated monument	Dartford War Hospital	N/A	TQ 6188 7253	Post-medieval

Reference (NHLE and/or KHER)	Type	Description	Grade	Location	Period
MKE99360/ TQ 67 SW 1387	Non-designated monument	Late iron Age pit groups, Springhead	N/A	TQ 6181 7267	Iron Age
MKE99362/ TQ 67 SW 323	Non-designated monument	Approximate location of springs and ritual pool in early Roman period, Springhead, Northfleet	N/A	TQ 6176 7261	Romano-British
MKE99365/ TQ 67 SW 1388	Non-designated monument	Early Roman road leading to ritual pool, Springhead, Northfleet	N/A	TQ 6180 7258	Romano-British
MKE99368/ TQ 67 SW 1389	Non-designated monument	Six early Roman burials, Springhead, Northfleet	N/A	TQ 6180 7258	Romano-British
MKE99370/ TQ 67 SW 1391	Non-designated monument	Mid-Roman temple building, Springhead, Northfleet	N/A	TQ 6180 7258	Romano-British
MKE99371/ TQ 67 SW 1400	Non-designated monument	Early Roman pits, ovens, trackway and burials, Springhead, Northfleet	N/A	TQ 6181 7259	Romano-British
MKE99375/ TQ 67 SW 1392	Non-designated monument	Early Roman trackway Springhead, Northfleet	N/A	TQ 6187 7257	Romano-British
MKE99380/ TQ 67 SW 1393	Non-designated monument	Early Roman cenotaph Springhead, Northfleet	N/A	TQ 6180 7258	Romano-British
MKE99382/ TQ 67 SW 1394	Non-designated monument	Early Roman building Springhead, Northfleet	N/A	TQ 6181 7258	Romano-British
MKE99383/ TQ 67 SW 1401	Non-designated monument	Mid-Roman wall and possible building, Springhead, Northfleet	N/A	TQ 6181 7261	Romano-British

Reference (NHLE and/or KHER)	Type	Description	Grade	Location	Period
MKE99384/ TQ 67 SW 1395	Non-designated monument	Roman pit alignment, Springhead, Northfleet	N/A	TQ 6180 7262	Romano-British
MKE99385/ TQ 67 SW 1396	Non-designated monument	Roman structure, Springhead, Northfleet	N/A	TQ 6183 7262	Romano-British
MKE99386/ TQ 67 SW 1402	Non-designated monument	Roman structure, Springhead, Northfleet	N/A	TQ 6183 7261	Romano-British
MKE99389/ TQ 67 SW 1398	Non-designated monument	Enclosing ditch to Roman sanctuary complex, Springhead, Northfleet	N/A	TQ 6160 7271	Romano-British
MKE99390/ TQ 67 SW 1399	Non-designated monument	Possible bath-house, Springhead, Northfleet	N/A	TQ 6172 7261	Romano-British
MKE99392/ TQ 67 SW 1403	Non-designated monument	Roman fence-lines / property boundaries, Springhead	N/A	TQ 6166 7264	Romano-British
MKE99393/ TQ 67 SW 1404	Non-designated monument	Semi-sunken feature Roman building, Springhead	N/A	TQ 6164 7267	Romano-British
MKE99395/ TQ 67 SW 1405	Non-designated monument	'Property 1' at Roman settlement, Springhead	N/A	TQ 6172 7261	Romano-British
MKE99397/ TQ 67 SW 1407	Non-designated monument	'Property 2' at Roman settlement, Springhead	N/A	TQ 6168 7264	Romano-British
MKE99400/ TQ 67 SW 1409	Non-designated monument	'Property 3' at Roman settlement, Springhead	N/A	TQ 6165 7266	Romano-British

Reference (NHLE and/or KHER)	Type	Description	Grade	Location	Period
MKE99401/ TQ 67 SW 1410	Non-designated monument	'Property 4' at Roman settlement, Springhead	N/A	TQ 6164 7269	Romano-British
MKE99402/ TQ 67 SW 1412	Non-designated monument	'Property 5' at Roman settlement, Springhead	N/A	TQ 6163 7271	Romano-British
MKE99403/ TQ 67 SW 1413	Non-designated monument	'Property 6' at Roman settlement, Springhead	N/A	TQ 6161 7273	Romano-British
MKE99404/ TQ 67 SW 1414	Non-designated monument	Romano-British building within 'Property 7' at Roman settlement, Springhead	N/A	TQ 6159 7275	Romano-British
MKE99405/ TQ 67 SW 1415	Non-designated monument	'Property 8' at Roman settlement, Springhead	N/A	TQ 6159 7277	Romano-British
MKE99407/ TQ 67 SW 1416	Non-designated monument	'Property 9' at Roman settlement, Springhead	N/A	TQ 6162 7267	Romano-British
MKE99408/ TQ 67 SW 1417	Non-designated monument	'Property 10' including blacksmiths workshop at Roman settlement, Springhead	N/A	TQ 6159 7269	Romano-British
MKE99409/ TQ 67 SW 1418	Non-designated monument	'Property 11' at Roman settlement, Springhead	N/A	TQ 6158 7271	Romano-British
MKE99410/ TQ 67 SW 1419	Non-designated monument	'Property 12' at Roman settlement, Springhead	N/A	TQ 6154 7274	Romano-British
MKE99412/ TQ 67 SW 1420	Non-designated monument	Roman road-side shrine, Springhead	N/A	TQ 6160 7270	Romano-British

Reference (NHLE and/or KHER)	Type	Description	Grade	Location	Period
MKE99424/ TQ 67 SW 1421	Non-designated monument	'Property 7' at Roman settlement, Springhead	N/A	TQ 6160 7275	Romano-British
MKE99428/ TQ 67 SW 1422	Non-designated monument	1st/2nd century aisled barn, Springhead	N/A	TQ 6156 7274	Romano-British
MKE99900/ TQ 67 SW 1438	Non-designated monument	Castle Hill (formerly Eastern Quarry, Area B): Palaeolithic artefacts and mollusc remains	N/A	TQ 6097 7372	Palaeolithic
MKE99901/ TQ 67 SW 1439	Non-designated monument	Three Palaeolithic handaxes from TP 127, Castle Hill (formerly Eastern Quarry, Area B)	N/A	TQ 60970 73667	Palaeolithic
MKE99903/ TQ 67 SW 1440	Non-designated monument	One (very fine) Palaeolithic handaxe from Ebbsfleet, Station Quarter South, TP 25	N/A	TQ 61100 73485	Palaeolithic
MKE99923/ TQ 67 SW 1445	Non-designated monument	Roman northern 'viewing platform', Springhead, Northfleet	N/A	TQ 6182 7267	Romano-British
MKE99924/ TQ 67 SW 1446	Non-designated monument	Roman south 'viewing platform', Springhead, Northfleet	N/A	TQ 6183 7261	Romano-British
MKE99929/ TQ 67 SW 1447	Non-designated monument	Early medieval sunken-feature building, Springhead	N/A	TQ 6181 7257	Medieval
MKE99935/ TQ 67 SW 1449	Non-designated monument	Early Anglo-Saxon pit, Springhead	N/A	TQ 6166 7339	Medieval
MKE99936/ TQ 67 SW 1450	Non-designated monument	Early Anglo-Saxon pit, Springhead	N/A	TQ 6166 7330	Medieval

Reference (NHLE and/or KHER)	Type	Description	Grade	Location	Period
MKE99942/ TQ 67 SW 1452	Non-designated monument	Early medieval sunken-feature building, pit and gully Springhead	N/A	TQ 62220 72080	Medieval
MKE99945/ TQ 67 SW 1454	Non-designated monument	Middle Saxon inhumation cemetery, Springhead	N/A	TQ 6182 7282	Medieval
MKE99966/ TQ 67 SW 1455	Non-designated monument	Large medieval trackway, Springhead	N/A	TQ 6165 7269	Medieval
MKE99967/ TQ 67 SW 1456	Non-designated monument	Medieval Boundary Ditch, Near Springhead Nursery, Springhead	N/A	TQ 6151 7275	Medieval
MKE99968/ TQ 67 SW 1457	Non-designated monument	Medieval tile kiln west of Springhead	N/A	TQ 6095 7261	Medieval
MKE99972/ TQ 67 SW 1461	Non-designated monument	Romano-British trackway discovered during evaluation in 2001.	N/A	TQ 6160 7275	Romano-British
MKE99973/ TQ 67 SW 1462	Non-designated monument	Prehistoric ditch found east of New Barn Road	N/A	TQ 6202 7193	Unknown (prehistoric)
MKE99976/ TQ 67 SW 1465	Non-designated monument	Late Neolithic features, Ebbsfleet	N/A	TQ 61660 73300	Neolithic
MKE99977/ TQ 67 SW 1466	Non-designated monument	Late Neolithic features, Ebbsfleet	N/A	TQ 6165 7319	Neolithic
MKE99978/ TQ 67 SW 1467	Non-designated monument	Undated later prehistoric ditch, Ebbsfleet	N/A	TQ 6165 7327	Unknown (prehistoric)

Reference (NHLE and/or KHER)	Type	Description	Grade	Location	Period
MKE99979/ TQ 67 SW 1468	Non-designated monument	Early Roman gully, Ebbsfleet	N/A	TQ 6165 7327	Romano-British
MKE99980/ TQ 67 SW 1469	Non-designated monument	Early Roman alluvial deposits, peat, pottery, ceramics and coins, Ebbsfleet	N/A	TQ 6165 7328	Romano-British
MWX17732/ TQ 67 SW 1015	Non-designated monument	Possible linear crop mark	N/A	TQ 61153 73434	Unknown
MWX19229/ TQ 67 SW 1051	Non-designated monument	Mesolithic flint scatter site (working floor)	N/A	TQ 615 730	Mesolithic
MWX20685/ TQ 67 SW 417	Non-designated monument	Pepper Hill Roman Cemetery	N/A	TQ 61848 71937	Romano-British
MWX20780/ TQ 57 SW 267	Non-designated monument	Possible Mesolithic Pit	N/A	TQ 5901 7318	Mesolithic
MWX20794/ TQ 67 SW 406	Non-designated monument	Roman features at Station Quarter South, Ebbsfleet, Kent	N/A	TQ 61488 72883	Romano-British
MWX20796/ TQ 67 SW 408	Non-designated monument	Late Iron Age and Roman features at Station Quarter South, Ebbsfleet, Kent	N/A	TQ 61560 72974	Iron Age/Romano-British
MWX20809/ TQ 67 SW 409	Non-designated monument	Wall structure at Station Quarter South, Ebbsfleet, Kent	N/A	TQ 61560 72967	Romano-British
MWX20812/ TQ 67 SW 410	Non-designated monument	23 Features at Station Quarter South, Ebbsfleet, Kent	N/A	TQ 61560 72962	Romano-British

Reference (NHLE and/or KHER)	Type	Description	Grade	Location	Period
MWX20831/ TQ 67 SW 411	Non-designated monument	Ditch at station Quarter South, Ebbsfleet, Kent	N/A	TQ 61579 72886	Post-medieval
MWX20833/ TQ 67 SW 413	Non-designated monument	Animal burrow at station Quarter South, Ebbsfleet, Kent	N/A	TQ 61554 72880	Unknown
MWX20876/ TQ 67 SW 456	Non-designated monument	Numerous Palaeolithic handaxes (and other flint artefacts) from gravel overlying the Southfleet Road "Ebbsfleet elephant" site	N/A	TQ 61175 73260	Palaeolithic
MWX20879/ TQ 67 SW 457	Non-designated monument	Castle Hill (formerly Eastern Quarry): Area E5, abundant Palaeolithic handaxes and debitage on palaeo-landsurfaces (now deeply buried)	N/A	TQ 60900 73650	Palaeolithic
MWX20898/ TQ 67 SW 420	Non-designated monument	Late Iron Age ditch and pits, Pepper Hill	N/A	TQ 6183 7194	Iron Age
MWX20913/ TQ 57 SE 207	Non-designated monument	Bronze Age Ring Ditch, Waterstone Park	N/A	TQ 5825 7425	Bronze Age to Iron Age
MWX20914/ TQ 57 SE 208	Non-designated monument	Middle Iron Age (?) Inhumation, Waterstone Park	N/A	TQ 5825 7425	Iron Age
MWX20915/ TQ 57 SE 209	Non-designated monument	Late Iron Age - Roman Pits and Field System, Waterstone Park	N/A	TQ 5828 7418	Iron Age/Romano-British
MWX20916/ TQ 57 SE 210	Non-designated monument	Post Medival Ditch, Waterstone Park	N/A	TQ 5834 7417	Post-medieval
MWX20928/ TQ 67 SW 428	Non-designated monument	Neolithic or Early Bronze Age features along a spring line east of Springhead.	N/A	TQ 6239 7201	Neolithic/Bronze Age

Reference (NHLE and/or KHER)	Type	Description	Grade	Location	Period
MWX20929/ TQ 67 SW 429	Non-designated monument	Late Bronze Age Pit	N/A	TQ 6220 7198	Neolithic/Bronze Age
MWX20932/ TQ 67 SW 432	Non-designated monument	Denehole	N/A	TQ 6250 7169	Post-medieval

Table 11.8: Gazetteer of Findspots

Atkins Heritage Reference (AH)	Monument ID (as per KHER)	Preferred Reference (as per KHER)	Description	Period
AH001	MKE1727	TQ 67 SW 103	Palaeolithic handaxes from near New Barn Farm House	Palaeolithic
AH002	MKE20076	TQ 67 SW 244	Surface Flint Lithics, Eastern Quarry, Swanscombe	Neolithic
AH003	MKE1716	TQ 67 SW 92	Palaeolithic Handaxes from Bevan's Wash-pit, opposite New Barn Farmhouse	Palaeolithic
AH004	MKE99907	TQ 67 SW 1444	Surface finds of one handaxe and some debitage from sloping cut forming a brickearth bank to north of HS1 elephant butchery site	Palaeolithic
AH005	MWX20863	TQ 67 SW 450	Residual Palaeolithic handaxe and debitage finds near Treadwell's Farm, Swanscombe	Palaeolithic
AH006	MKE97486	MKE97486	3 Lower Paleolithic flint flakes, located at Swanscombe	Palaeolithic
AH007	MWX20858	TQ 67 SW 441	Palaolithic handaxes and debitage from "Treadwell's Hop Ground", Swanscombe	Palaeolithic
AH008	MKE1698	TQ 67 SW 72	Probable Bronze Age Macehead	Bronze Age
AH009	MKE20250	TQ 67 SW 285	Worked flint assemblage Springhead Evaluation, Gravesend, Kent	Mesolithic to Neolithic
AH010	MKE78453	TQ 67 SW 506	Neolithic/Early Bronze Age struck and burnt unworked flints, Ebbsfleet	Neolithic to Bronze Age

Atkins Heritage Reference (AH)	Monument ID (as per KHER)	Preferred Reference (as per KHER)	Description	Period
AH011	MKE80575	TQ 67 SW 1365	Roman coins, Springhead	Romano-British
AH012	MKE80576	TQ 67 SW 1366	An Anglo-Saxon sceat, Springhead	Early Medieval
AH013	MKE80574	TQ 67 SW 1364	Late Iron Age coins, Springhead	Iron Age
AH014	MKE80563	TQ 67 SW 1353	Palaeolithic flints, Springhead	Palaeolithic
AH015	MKE78454	TQ 67 SW 507	Roman Pottery, Ebbsfleet	Romano-British
AH016	MWX20814	TQ 67 SW 434	Springhead area, surface finds of 3 Palaeolithic handaxes and a flake	Palaeolithic
AH017	MWX20832	TQ 67 SW 412	Findspot at station Quarter South, Ebbsfleet, Kent	Romano-British
AH018	MKE20226	TQ 67 SW 261	Prehistoric flint. Springhead Nursey Southfleet, Kent, Archaeological Evaluation	Neolithic to Bronze Age
AH019	MWX20783	TQ 67 SW 405	Animal Bone at Station Quarter South, Ebbsfleet, Kent	
AH020	MKE99981	TQ 67 SW 1470	Roman pottery, Near Springhead Nursery, Springhead	Romano-British
AH021	MKE1644	TQ 67 SW 18	Bronze Age socketed spearhead	Bronze Age
AH022	MKE20222	TQ 67 SW 259	Prehistoric Flint, Northfleet Substation, Springhead	Unknown (later Prehistoric)
AH022	MKE20223	TQ 67 SW 260	Roman Finds Scatter, Northfleet Substation, Springhead	Romano-British
AH023	MKE20292	TQ 67 SW 306	Palaeolithic Hand Axes, Springhead	Palaeolithic
AH024	MKE20293	TQ 67 SW 308	Possible Mesolithic Finds, Springhead	Mesolithic
AH025	MKE1740	TQ 67 SW 119	Roman bronze hackamore and pottery from two different features at Springhead	Romano-British
AH026	MKE58243	MKE58243	Roman copper alloy coin	Romano-British
AH026	MKE58240	MKE58240	Roman silver coin	Romano-British
AH026	MKE58241	MKE58241	Roman copper alloy coin	Romano-British

Atkins Heritage Reference (AH)	Monument ID (as per KHER)	Preferred Reference (as per KHER)	Description	Period
AH026	MKE58242	MKE58242	Roman copper alloy coin	Romano-British
AH027	MKE58783	MKE58783	Iron Age copper alloy coin	Iron Age
AH027	MKE58779	MKE58779	Iron Age copper alloy coin	Iron Age
AH028	MKE79313	MKE79313	Roman ceramic vessel	Romano-British to Early Medieval
AH028	MKE79314	MKE79314	Roman ceramic vessel	Romano-British to Early Medieval
AH028	MKE79315	MKE79315	Roman ceramic vessel	Romano-British to Early Medieval
AH028	MKE79316	MKE79316	Roman ceramic vessel	Romano-British to Early Medieval
AH028	MKE79317	MKE79317	Early Medieval ceramic vessel	Early Medieval to Medieval
AH029	MKE95458	MKE95458	Roman Copper alloy coin	Romano-British
AH030	MKE58391	MKE58391	Iron Age copper alloy coin	Iron Age
AH031	MKE58438	MKE58438	Iron Age copper alloy brooch	Iron Age to Romano-British
AH031	MKE58439	MKE58439	Medieval copper alloy harness	Medieval
AH032	MKE20541	TQ 67 SW 337	Neolithic and Bronze Age burnt flint found south of Springhead Roman town	Neolithic to Bronze Age
AH033	MKE58378	MKE58378	Roman copper alloy coin	Romano-British
AH034	MKE58172	MKE58172	Roman copper alloy coin	Romano-British
AH034	MKE58173	MKE58173	Roman copper alloy coin	Romano-British
AH034	MKE58174	MKE58174	Roman copper alloy coin	Romano-British

Atkins Heritage Reference (AH)	Monument ID (as per KHER)	Preferred Reference (as per KHER)	Description	Period
AH034	MKE58291	MKE58291	Iron Age copper alloy coin	Iron Age
AH034	MKE58292	MKE58292	Roman copper alloy lock	Romano-British to Early Medieval
AH034	MKE58293	MKE58293	Roman copper alloy coin	Romano-British
AH034	MKE58294	MKE58294	Roman copper alloy coin	Romano-British
AH034	MKE58295	MKE58295	Roman copper alloy coin	Romano-British
AH034	MKE58296	MKE58296	Roman copper alloy coin	Romano-British
AH034	MKE58297	MKE58297	Roman copper alloy coin	Romano-British
AH034	MKE58298	MKE58298	Roman copper alloy coin	Romano-British
AH034	MKE58299	MKE58299	Roman copper alloy coin	Romano-British
AH034	MKE58300	MKE58300	Roman copper alloy coin	Romano-British
AH034	MKE58301	MKE58301	Roman copper alloy coin	Romano-British
AH034	MKE58302	MKE58302	Roman copper alloy coin	Romano-British
AH034	MKE58303	MKE58303	Roman copper alloy coin	Romano-British
AH034	MKE58304	MKE58304	Roman copper alloy coin	Romano-British
AH034	MKE58305	MKE58305	Roman copper alloy coin	Romano-British
AH034	MKE58306	MKE58306	Roman copper alloy coin	Romano-British
AH034	MKE58307	MKE58307	Roman copper alloy coin	Romano-British
AH034	MKE58308	MKE58308	Roman copper alloy coin	Romano-British
AH034	MKE58309	MKE58309	Roman copper alloy coin	Romano-British
AH034	MKE58310	MKE58310	Roman copper alloy coin	Iron Age to Romano-British

Atkins Heritage Reference (AH)	Monument ID (as per KHER)	Preferred Reference (as per KHER)	Description	Period
AH034	MKE58311	MKE58311	Roman copper alloy coin	Romano-British
AH034	MKE58312	MKE58312	Roman copper alloy coin	Romano-British
AH034	MKE58313	MKE58313	Roman copper alloy coin	Romano-British
AH034	MKE58314	MKE58314	Roman copper alloy coin	Romano-British
AH034	MKE58315	MKE58315	Roman copper alloy coin	Romano-British
AH034	MKE58316	MKE58316	Roman copper alloy coin	Romano-British
AH034	MKE58317	MKE58317	Roman copper alloy coin	Romano-British
AH034	MKE58318	MKE58318	Roman copper alloy coin	Romano-British
AH034	MKE58319	MKE58319	Roman copper alloy coin	Romano-British
AH034	MKE58320	MKE58320	Roman copper alloy coin	Romano-British
AH034	MKE58321	MKE58321	Roman copper alloy coin	Romano-British
AH034	MKE58322	MKE58322	Roman copper alloy key (locking)	Iron Age to Early Medieval
AH034	MKE58323	MKE58323	Roman copper alloy coin	Romano-British
AH034	MKE58324	MKE58324	Roman copper alloy coin	Romano-British
AH034	MKE58325	MKE58325	Roman copper alloy coin	Romano-British
AH034	MKE58326	MKE58326	Roman copper alloy coin	Romano-British
AH034	MKE58327	MKE58327	Roman copper alloy coin	Romano-British
AH034	MKE58328	MKE58328	Roman copper alloy coin	Romano-British
AH034	MKE58329	MKE58329	Roman copper alloy coin	Romano-British
AH034	MKE58330	MKE58330	Roman copper alloy coin	Romano-British
AH034	MKE58331	MKE58331	Roman copper alloy coin	Romano-British

Atkins Heritage Reference (AH)	Monument ID (as per KHER)	Preferred Reference (as per KHER)	Description	Period
AH034	MKE58332	MKE58332	Roman copper alloy coin	Romano-British
AH034	MKE58333	MKE58333	Roman copper alloy coin	Romano-British
AH034	MKE58334	MKE58334	Roman copper alloy coin	Romano-British
AH034	MKE58160	MKE58160	Roman copper alloy coin	Romano-British
AH034	MKE58161	MKE58161	Roman copper alloy coin	Romano-British
AH034	MKE58162	MKE58162	Roman copper alloy coin	Romano-British
AH034	MKE58163	MKE58163	Roman copper alloy coin	Romano-British
AH034	MKE58164	MKE58164	Roman copper alloy coin	Romano-British
AH034	MKE58165	MKE58165	Roman copper alloy coin	Romano-British
AH034	MKE58166	MKE58166	Roman copper alloy coin	Romano-British
AH034	MKE58167	MKE58167	Roman copper alloy coin	Romano-British
AH034	MKE58168	MKE58168	Roman copper alloy coin	Romano-British
AH034	MKE58169	MKE58169	Roman copper alloy coin	Romano-British
AH034	MKE58170	MKE58170	Roman copper alloy coin	Romano-British
AH034	MKE58171	MKE58171	Roman copper alloy coin	Romano-British
AH034	MKE58271	MKE58271	Roman silver coin	Romano-British
AH034	MKE58272	MKE58272	Roman copper alloy coin	Romano-British
AH034	MKE58273	MKE58273	Roman copper alloy coin	Romano-British
AH034	MKE58274	MKE58274	Roman copper alloy brooch	Iron Age to Romano-British
AH034	MKE58343	MKE58343	Roman copper alloy brooch	Iron Age to Romano-British

Atkins Heritage Reference (AH)	Monument ID (as per KHER)	Preferred Reference (as per KHER)	Description	Period
AH034	MKE58344	MKE58344	Roman copper alloy brooch	Iron Age to Romano-British
AH034	MKE58345	MKE58345	Roman copper alloy brooch	Iron Age to Romano-British
AH034	MKE58346	MKE58346	Roman copper alloy finger ring	Romano-British to Early Medieval
AH034	MKE58347	MKE58347	Roman copper alloy bracelet	Romano-British to Early Medieval
AH034	MKE58348	MKE58348	Roman copper alloy coin	Romano-British
AH034	MKE58349	MKE58349	Roman copper alloy coin	Romano-British
AH034	MKE58350	MKE58350	Roman copper alloy coin	Romano-British
AH034	MKE58351	MKE58351	Roman copper alloy coin	Romano-British
AH034	MKE58352	MKE58352	Roman copper alloy coin	Romano-British
AH034	MKE58353	MKE58353	Roman copper alloy coin	Romano-British
AH034	MKE58354	MKE58354	Roman copper alloy coin	Romano-British
AH034	MKE58355	MKE58355	Roman copper alloy coin	Romano-British
AH034	MKE58356	MKE58356	Roman copper alloy coin	Romano-British
AH034	MKE58357	MKE58357	Roman copper alloy coin	Romano-British
AH034	MKE58358	MKE58358	Roman copper alloy coin	Romano-British
AH034	MKE58359	MKE58359	Roman copper alloy coin	Romano-British
AH034	MKE58360	MKE58360	Roman copper alloy coin	Romano-British
AH034	MKE58361	MKE58361	Roman copper alloy coin	Romano-British
AH034	MKE58362	MKE58362	Roman copper alloy coin	Romano-British

Atkins Heritage Reference (AH)	Monument ID (as per KHER)	Preferred Reference (as per KHER)	Description	Period
AH034	MKE58363	MKE58363	Roman copper alloy coin	Romano-British
AH034	MKE58364	MKE58364	Roman copper alloy coin	Romano-British
AH034	MKE58365	MKE58365	Roman copper alloy coin	Romano-British
AH034	MKE58366	MKE58366	Roman copper alloy coin	Romano-British
AH035	MKE58335	MKE58335	Roman lead figurine	Iron Age to Early Medieval
AH036	MKE58551	MKE58551	Iron Age copper alloy coin	Iron Age
AH036	MKE58552	MKE58552	Roman copper alloy coin	Romano-British
AH036	MKE58553	MKE58553	Roman copper alloy coin	Romano-British
AH036	MKE58554	MKE58554	Roman copper alloy coin	Romano-British
AH036	MKE58555	MKE58555	Roman copper alloy coin	Romano-British
AH036	MKE58556	MKE58556	Roman copper alloy coin	Romano-British
AH036	MKE58557	MKE58557	Roman copper alloy coin	Romano-British
AH036	MKE58558	MKE58558	Roman copper alloy brooch	Iron Age to Romano-British
AH036	MKE58827	MKE58827	copper alloy brooch	Romano-British
AH036	MKE58559	MKE58559	Roman copper alloy bracelet	Romano-British
AH037	MKE58448	MKE58448	Roman copper alloy brooch	Iron Age to Romano-British
AH037	MKE58449	MKE58449	Roman copper alloy coin	Romano-British
AH037	MKE58450	MKE58450	Roman copper alloy coin	Romano-British
AH037	MKE58451	MKE58451	Roman copper alloy coin	Romano-British
AH037	MKE58452	MKE58452	Roman copper alloy coin	Romano-British

Atkins Heritage Reference (AH)	Monument ID (as per KHER)	Preferred Reference (as per KHER)	Description	Period
AH037	MKE58453	MKE58453	Roman copper alloy coin	Romano-British
AH037	MKE58454	MKE58454	Roman silver coin	Romano-British
AH037	MKE58455	MKE58455	Roman copper alloy mount	Romano-British to Early Medieval
AH037	MKE58456	MKE58456	Roman pottery vessel	Romano-British
AH037	MKE58457	MKE58457	Iron Age copper alloy coin	Iron Age to Romano-British
AH037	MKE58458	MKE58458	Post Medieval silver coin	Post Medieval
AH037	MKE58459	MKE58459	Roman copper alloy brooch	Romano-British
AH037	MKE58460	MKE58460	Roman copper alloy brooch	Romano-British
AH037	MKE58461	MKE58461	Roman copper alloy brooch	Iron Age to Rom Romano-British
AH037	MKE58462	MKE58462	Roman iron unidentified object	Romano-British to Early Medieval
AH037	MKE58488	MKE58488	Roman copper alloy coin	Romano-British
AH037	MKE58489	MKE58489	Roman copper alloy coin	Romano-British
AH037	MKE58490	MKE58490	Roman copper alloy coin	Romano-British
AH037	MKE58491	MKE58491	Roman copper alloy coin	Romano-British
AH037	MKE58492	MKE58492	Roman copper alloy coin	Romano-British
AH037	MKE58493	MKE58493	Roman copper alloy coin	Romano-British
AH037	MKE58494	MKE58494	Roman copper alloy coin	Romano-British
AH037	MKE58495	MKE58495	Roman copper alloy coin	Romano-British
AH037	MKE58496	MKE58496	Roman copper alloy coin	Romano-British

Atkins Heritage Reference (AH)	Monument ID (as per KHER)	Preferred Reference (as per KHER)	Description	Period
AH037	MKE58497	MKE58497	Roman copper alloy coin	Romano-British
AH037	MKE58498	MKE58498	Roman copper alloy coin	Romano-British
AH037	MKE58499	MKE58499	Roman copper alloy coin	Romano-British
AH037	MKE58500	MKE58500	Roman copper alloy coin	Romano-British
AH037	MKE58501	MKE58501	Roman copper alloy coin	Romano-British
AH037	MKE58502	MKE58502	Roman copper alloy coin	Romano-British
AH037	MKE58503	MKE58503	Early Medieval gem crystal ball	Early Medieval
AH038	MKE58118	MKE58118	Medieval lead seal matrix	Medieval
AH038	MKE58119	MKE58119	Medieval copper alloy pin	Medieval to Post Medieval
AH039	MKE58379	MKE58379	Iron Age copper alloy coin	Iron Age to Romano-British
AH039	MKE94994	MKE94994	Copper alloy coin	Iron Age
AH039	MKE94995	MKE94995	Silver coin	Medieval
AH040	MKE58798	MKE58798	Iron Age copper alloy coin	Iron Age
AH041	MKE58792	MKE58792	Iron Age copper alloy coin	Iron Age
AH042	MKE13568	TQ 67 SW 154	Iron Age coin	Iron Age
AH042	MKE58794	MKE58794	Iron Age copper alloy coin	Iron Age
AH043	MWX20712	TQ 67 SW 391	Flint at Waterloo Connection, Southfleet, Kent	Mesolithic to Neolithic
AH044	MWX20711	TQ 67 SW 390	Flint at Waterloo Connection, Southfleet, Kent	Bronze Age
AH045	MKE79320	MKE79320	Bronze Age copper alloy palstave	Bronze Age

Atkins Heritage Reference (AH)	Monument ID (as per KHER)	Preferred Reference (as per KHER)	Description	Period
AH046	MKE1647	TQ 67 SW 21	Romano-British fibula, one of Iron Age form, Romano-British coins, Gaulish coin	Romano-British
AH046	MKE58470	MKE58470	Iron Age copper alloy coin	Iron Age
AH046	MKE58471	MKE58471	Iron Age copper alloy coin	Iron Age
AH046	MKE58472	MKE58472	Iron Age copper alloy coin	Iron Age
AH046	MKE58473	MKE58473	Iron Age copper alloy coin	Iron Age
AH046	MKE58474	MKE58474	Iron Age copper alloy coin	Iron Age
AH046	MKE58475	MKE58475	Iron Age copper alloy coin	Iron Age
AH046	MKE58476	MKE58476	Iron Age copper alloy coin	Iron Age
AH046	MKE58477	MKE58477	Iron Age copper alloy coin	Iron Age
AH046	MKE58478	MKE58478	Iron Age copper alloy coin	Iron Age
AH046	MKE58479	MKE58479	Iron Age copper alloy coin	Iron Age
AH046	MKE58734	MKE58734	Iron Age copper alloy coin	Iron Age
AH046	MKE58735	MKE58735	Iron Age copper alloy coin	Iron Age
AH046	MKE58736	MKE58736	Iron Age silver coin	Iron Age
AH046	MKE58737	MKE58737	Iron Age silver coin	Iron Age
AH046	MKE58738	MKE58738	Iron Age gold coin	Iron Age
AH046	MKE58739	MKE58739	Iron Age silver coin	Iron Age
AH046	MKE58740	MKE58740	Iron Age gold coin	Iron Age
AH046	MKE58741	MKE58741	Iron Age gold coin	Iron Age
AH046	MKE58742	MKE58742	Iron Age copper alloy coin	Iron Age
AH046	MKE58743	MKE58743	Iron Age copper alloy coin	Iron Age

Atkins Heritage Reference (AH)	Monument ID (as per KHER)	Preferred Reference (as per KHER)	Description	Period
AH046	MKE58744	MKE58744	Iron Age silver coin	Iron Age
AH046	MKE58745	MKE58745	Iron Age copper alloy coin	Iron Age
AH046	MKE58746	MKE58746	Iron Age copper alloy coin	Iron Age
AH046	MKE58747	MKE58747	Iron Age copper alloy coin	Iron Age
AH046	MKE58748	MKE58748	Iron Age copper alloy coin	Iron Age
AH046	MKE58749	MKE58749	Iron Age copper alloy coin	Iron Age
AH046	MKE58753	MKE58753	Iron Age silver coin	Iron Age
AH046	MKE58754	MKE58754	Iron Age copper alloy coin	Iron Age
AH046	MKE58755	MKE58755	Iron Age silver coin	Iron Age
AH046	MKE58756	MKE58756	Iron Age copper alloy coin	Iron Age
AH046	MKE58657	MKE58657	Iron Age silver coin	Iron Age
AH046	MKE58659	MKE58659	Iron Age copper alloy coin	Iron Age
AH046	MKE58661	MKE58661	Iron Age copper alloy coin	Iron Age
AH046	MKE58662	MKE58662	Iron Age gold coin	Iron Age
AH046	MKE58663	MKE58663	Iron Age copper alloy coin	Iron Age
AH046	MKE58725	MKE58725	Iron Age copper alloy coin	Iron Age
AH046	MKE58726	MKE58726	Iron Age copper alloy coin	Iron Age
AH046	MKE58727	MKE58727	Iron Age copper alloy coin	Iron Age
AH046	MKE58728	MKE58728	Iron Age copper alloy coin	Iron Age
AH046	MKE58729	MKE58729	Iron Age silver coin	Iron Age
AH046	MKE58730	MKE58730	Iron Age gold coin	Iron Age

Atkins Heritage Reference (AH)	Monument ID (as per KHER)	Preferred Reference (as per KHER)	Description	Period
AH046	MKE58731	MKE58731	Iron Age gold coin	Iron Age
AH046	MKE58732	MKE58732	Iron Age silver coin	Iron Age
AH046	MKE58733	MKE58733	Iron Age copper alloy coin	Iron Age
AH046	MKE58757	MKE58757	Iron Age copper alloy coin	Iron Age
AH046	MKE58758	MKE58758	Iron Age copper alloy coin	Iron Age
AH046	MKE58759	MKE58759	Iron Age silver coin	Iron Age
AH046	MKE58760	MKE58760	Iron Age copper alloy coin	Iron Age
AH046	MKE58761	MKE58761	Iron Age copper alloy coin	Iron Age
AH046	MKE58762	MKE58762	Iron Age copper alloy coin	Iron Age
AH046	MKE58763	MKE58763	Iron Age copper alloy coin	Iron Age
AH046	MKE58764	MKE58764	Iron Age copper alloy coin	Iron Age
AH046	MKE58765	MKE58765	Iron Age gold coin	Iron Age
AH046	MKE58766	MKE58766	Iron Age silver coin	Iron Age
AH046	MKE58767	MKE58767	Iron Age silver coin	Iron Age
AH046	MKE58768	MKE58768	Iron Age gold coin	Iron Age
AH046	MKE58769	MKE58769	Iron Age copper alloy coin	Iron Age
AH046	MKE58770	MKE58770	Iron Age copper alloy coin	Iron Age
AH046	MKE58771	MKE58771	Iron Age copper alloy coin	Iron Age
AH046	MKE58772	MKE58772	Iron Age copper alloy coin	Iron Age
AH046	MKE58773	MKE58773	Iron Age silver coin	Iron Age
AH046	MKE58668	MKE58668	Iron Age silver coin	Iron Age

Atkins Heritage Reference (AH)	Monument ID (as per KHER)	Preferred Reference (as per KHER)	Description	Period
AH046	MKE58669	MKE58669	Iron Age copper alloy coin	Iron Age
AH046	MKE58670	MKE58670	Iron Age copper alloy coin	Iron Age
AH046	MKE58671	MKE58671	Iron Age silver coin	Iron Age
AH046	MKE58672	MKE58672	Iron Age silver coin	Iron Age
AH046	MKE58673	MKE58673	Iron Age silver coin	Iron Age
AH046	MKE58674	MKE58674	Iron Age copper alloy coin	Iron Age
AH046	MKE58675	MKE58675	Iron Age copper alloy coin	Iron Age
AH046	MKE58676	MKE58676	Iron Age silver coin	Iron Age
AH046	MKE58677	MKE58677	Iron Age silver coin	Iron Age
AH046	MKE58701	MKE58701	Iron Age copper alloy coin	Iron Age
AH046	MKE58702	MKE58702	Iron Age copper alloy coin	Iron Age
AH046	MKE58703	MKE58703	Iron Age copper alloy coin	Iron Age
AH046	MKE58704	MKE58704	Iron Age copper alloy coin	Iron Age
AH046	MKE58705	MKE58705	Iron Age copper alloy coin	Iron Age
AH046	MKE58706	MKE58706	Iron Age copper alloy coin	Iron Age
AH046	MKE58707	MKE58707	Iron Age copper alloy coin	Iron Age
AH046	MKE58708	MKE58708	Iron Age copper alloy coin	Iron Age
AH046	MKE58709	MKE58709	Iron Age copper alloy coin	Iron Age
AH046	MKE58710	MKE58710	Iron Age copper alloy coin	Iron Age
AH046	MKE58711	MKE58711	Iron Age copper alloy coin	Iron Age
AH046	MKE58712	MKE58712	Iron Age copper alloy coin	Iron Age

Atkins Heritage Reference (AH)	Monument ID (as per KHER)	Preferred Reference (as per KHER)	Description	Period
AH046	MKE58713	MKE58713	Iron Age copper alloy coin	Iron Age
AH046	MKE58714	MKE58714	Iron Age copper alloy coin	Iron Age
AH046	MKE58715	MKE58715	Iron Age copper alloy coin	Iron Age
AH046	MKE58716	MKE58716	Iron Age copper alloy coin	Iron Age
AH046	MKE58717	MKE58717	Iron Age copper alloy coin	Iron Age
AH046	MKE58718	MKE58718	Iron Age copper alloy coin	Iron Age
AH046	MKE58719	MKE58719	Iron Age copper alloy coin	Iron Age
AH046	MKE58720	MKE58720	Iron Age copper alloy coin	Iron Age
AH046	MKE58721	MKE58721	Iron Age copper alloy coin	Iron Age
AH046	MKE58722	MKE58722	Iron Age silver coin	Iron Age
AH046	MKE58723	MKE58723	Iron Age silver coin	Iron Age
AH046	MKE58812	MKE58812	Iron Age silver coin	Iron Age
AH046	MKE58813	MKE58813	Iron Age silver coin	Iron Age
AH046	MKE58814	MKE58814	Iron Age gold coin	Iron Age
AH046	MKE58678	MKE58678	Iron Age copper alloy coin	Iron Age
AH046	MKE58679	MKE58679	Iron Age silver coin	Iron Age
AH046	MKE58681	MKE58681	Iron Age copper alloy coin	Iron Age
AH046	MKE58682	MKE58682	Iron Age copper alloy coin	Iron Age
AH046	MKE58683	MKE58683	Iron Age silver coin	Iron Age
AH046	MKE58684	MKE58684	Iron Age silver coin	Iron Age
AH046	MKE58685	MKE58685	Iron Age silver coin	Iron Age

Atkins Heritage Reference (AH)	Monument ID (as per KHER)	Preferred Reference (as per KHER)	Description	Period
AH046	MKE58686	MKE58686	Iron Age silver coin	Iron Age
AH046	MKE58687	MKE58687	Iron Age silver coin	Iron Age
AH046	MKE58688	MKE58688	Iron Age silver coin	Iron Age
AH046	MKE58689	MKE58689	Iron Age silver coin	Iron Age
AH046	MKE58690	MKE58690	Iron Age copper alloy coin	Iron Age
AH046	MKE58691	MKE58691	Iron Age copper alloy coin	Iron Age
AH046	MKE58692	MKE58692	Iron Age copper alloy coin	Iron Age
AH046	MKE58693	MKE58693	Iron Age copper alloy coin	Iron Age
AH046	MKE58694	MKE58694	Iron Age copper alloy coin	Iron Age
AH046	MKE58695	MKE58695	Iron Age copper alloy coin	Iron Age
AH046	MKE58696	MKE58696	Iron Age copper alloy coin	Iron Age
AH046	MKE58697	MKE58697	Iron Age copper alloy coin	Iron Age
AH046	MKE58698	MKE58698	Iron Age copper alloy coin	Iron Age
AH046	MKE58699	MKE58699	Iron Age copper alloy coin	Iron Age
AH046	MKE58700	MKE58700	Iron Age copper alloy coin	Iron Age
AH046	MKE58796	MKE58796	Iron Age silver coin	Iron Age
AH046	MKE58797	MKE58797	Iron Age silver coin	Iron Age
AH047	MKE99975	TQ 67 SW 1464	Medieval pottery sherd found east of New Barn Road	Medieval
AH048	MKE20549	TQ 67 SW 343	Two sherds of bronze age and late Iron Age / Romano-British pottery found during trial trenching	Iron Age to Romano-British
AH049	MKE99974	TQ 67 SW 1463	Sherd of probable bronze age pottery found during trial trenching	Iron Age to Romano-British

Atkins Heritage Reference (AH)	Monument ID (as per KHER)	Preferred Reference (as per KHER)	Description	Period
AH050	MKE20550	TQ 67 SW 344	Single sherd of late Iron Age / early Romano-British pottery found in 1997	Iron Age to Romano-British
AH051	MKE58644	MKE58644	Roman copper alloy coin	Romano-British
AH052	MKE1640	TQ 67 SW 14	Roman coins found 1923	Romano-British
AH053	MKE58855	MKE58855	copper alloy coin	Romano-British
AH053	MKE58858	MKE58858	copper alloy coin	Medieval
AH053	MKE67465	MKE67465	copper alloy brooch	Iron Age to Romano-British
AH054	MWX20821	TQ 67 SW 439	One Tree Field, near Southfleet Station	Palaeolithic
AH055	MKE57962	MKE57962	Roman copper alloy coin	Romano-British
AH056	MKE57961	MKE57961	Medieval silver coin	Medieval
AH057	MKE57963	MKE57963	Medieval copper alloy ring	Medieval to Post Medieval
AH058	MKE1656	TQ 67 SW 30	Saxon pot	Early Medieval
AH058	MKE1731	TQ 67 SW 107	Roman fibulae	Romano-British
AH058	MKE1737	TQ 67 SW 116	Vagniacae	Romano-British
AH058	MKE58065	MKE58065	Early Medieval copper alloy brooch	Early Medieval
AH058	MKE58290	MKE58290	Roman copper alloy coin	Romano-British
AH058	MKE58286	MKE58286	Roman copper alloy coin	Romano-British
AH058	MKE58287	MKE58287	Roman copper alloy coin	Romano-British
AH058	MKE58288	MKE58288	Roman copper alloy coin	Romano-British
AH058	MKE58289	MKE58289	Roman copper alloy coin	Romano-British
AH058	MKE58776	MKE58776	Iron Age copper alloy coin	Iron Age

Atkins Heritage Reference (AH)	Monument ID (as per KHER)	Preferred Reference (as per KHER)	Description	Period
AH058	MKE58777	MKE58777	Iron Age copper alloy coin	Iron Age
AH058	MKE67325	MKE67325	Iron Age copper alloy coin	Iron Age
AH058	MKE76966	TQ 67 SW 564	Anglo-Saxon silver penny, Spinghead Quarter	Early Medieval
AH059	MKE57980	MKE57980	Medieval silver coin	Medieval
AH059	MKE57981	MKE57981	Medieval silver coin	Medieval
AH059	MKE57982	MKE57982	Medieval silver coin	Medieval
AH059	MKE57983	MKE57983	Medieval silver coin	Medieval
AH059	MKE57984	MKE57984	Medieval silver coin	Medieval
AH060	MKE58097	MKE58097	Medieval lead seal matrix	Medieval to Post Medieval
AH061	MKE58903	MKE58903	Roman silver coin	Romano-British
AH062	MKE1714	TQ 67 SW 90	Two Iron Age Bronze Coins	Iron Age
AH062	MKE58781	MKE58781	Iron Age copper alloy coin	Iron Age
AH062	MKE58782	MKE58782	Iron Age copper alloy coin	Iron Age
AH062	MKE58790	MKE58790	Iron Age copper alloy coin	Iron Age
AH063	MKE58619	MKE58619	Roman copper alloy coin	Iron Age to Romano-British
AH064	MKE58828	MKE58828	copper alloy coin	Romano-British
AH064	MKE58841	MKE58841	ceramic vessel	Romano-British
AH064	MKE58842	MKE58842	ceramic tobacco pipe	Post Medieval
AH065	MWX20860	TQ 67 SW 443	Caerberlarber Hole, numerous Palaeolithic handaxes and other lithic artefacts, mostly debitage	Palaeolithic
AH066	MKE58069	MKE58069	Post Medieval silver coin	Post Medieval

Atkins Heritage Reference (AH)	Monument ID (as per KHER)	Preferred Reference (as per KHER)	Description	Period
AH067	MKE58403	MKE58403	Medieval copper alloy finger ring	Medieval
AH068	MKE58563	MKE58563	Iron Age silver coin	Iron Age
AH069	MKE58598	MKE58598	Roman copper alloy finger ring	Romano-British to Early Medieval
AH070	MWX20866	TQ 67 SW 453	Two Palaeolithic handaxes and nine debitage from "Dundel's Farm"	Palaeolithic
AH071	MKE58604	MKE58604	Roman copper alloy coin	Romano-British
AH072	MKE58902	MKE58902	Medieval silver coin	Medieval
AH073	MKE58597	MKE58597	Roman copper alloy brooch	Romano-British
AH074	MKE58533	MKE58533	Iron Age gold metal working debris	Iron Age to Romano-British
AH074	MKE58535	MKE58535	Medieval iron crossbow bolt	Medieval to Post Medieval
AH075	MKE94985	MKE94985	Medieval Copper alloy mount	Medieval
AH075	MKE94991	MKE94991	Medieval Copper alloy strap fitting	Medieval
	MKE58539	MKE58539	Medieval silver coin	Medieval
AH076	MWX20806	TQ 57 SE 215	Stonewood Brickyard	Palaeolithic
AH077	MKE20087	TQ 57 SE 161	Palaeolithic Find, Former Stonewood Brickyard (Site of)	Palaeolithic
AH078	MKE1649	TQ 67 SW 23	Romano-British pottery	Romano-British
AH079	MKE79335	MKE79335	Post Medieval copper alloy unidentified object	Post Medieval
AH080	MKE79336	MKE79336	Medieval copper alloy scabbard	Medieval to Post Medieval
AH080	MWX20861	TQ 67 SW 444	3 Palaeolithic handaxes and 9 pieces of debitage from Swanscombe Wood	Palaeolithic

Atkins Heritage Reference (AH)	Monument ID (as per KHER)	Preferred Reference (as per KHER)	Description	Period
AH081	MKE1718	TQ 67 SW 94	Palaeolithic Handaxe from Swanscombe Wood Clay Pit	Palaeolithic
AH082	MKE99872	TQ 57 SE 387	Late upper Palaeolithic core plus possible blades, surface-finds from 'The Mounts', Swanscombe	Palaeolithic
AH083	MWX20856	TQ 57 SE 218	The Mounts, Swanscombe - 11 Palaeolithic handaxes and 2 flakes, surface finds in the late 19th Century	Palaeolithic
AH084	MKE777	TQ 57 SE 1	Mounts wood	Unknown
AH085	MKE20155	TQ 57 SE 244	Bluewater, Stone, Dartford	Prehistoric or Romano-British
AH086	MKE853	TQ 57 SE 78	Three Potin Coins	Unknown
AH086	MKE862	TQ 57 SE 87	Small Acheulean Hand-axe findspot	Palaeolithic
AH086	MKE58774	MKE58774	Iron Age copper alloy coin	Iron Age
AH086	MKE58775	MKE58775	Iron Age copper alloy coin	Iron Age
AH086	MKE58778	MKE58778	Iron Age copper alloy coin	Iron Age
AH087	MKE99892	TQ 57 SE 1088	Palaeolithic handaxe from Stonewood Brickyard, Bean	Palaeolithic
AH088	MKE57972	MKE57972	Medieval copper alloy strap fitting	Medieval
AH088	MKE57973	MKE57973	Post Medieval silver thimble	Post Medieval
AH089	MKE58505	MKE58505	Early Medieval silver coin	Early Medieval
AH090	MKE57969	MKE57969	Post Medieval silver coin	Post Medieval
AH090	MKE58063	MKE58063	Medieval copper alloy spoon	Medieval to Post Medieval
AH090	MKE58083	MKE58083	Medieval silver coin	Medieval
AH090	MKE58093	MKE58093	Medieval copper alloy button	Medieval to Post Medieval

Atkins Heritage Reference (AH)	Monument ID (as per KHER)	Preferred Reference (as per KHER)	Description	Period
AH090	MKE58094	MKE58094	Post Medieval copper alloy token	Post Medieval
AH090	MKE58095	MKE58095	Post Medieval silver coin	Post Medieval
AH090	MKE58919	MKE58919	Silver coin	Medieval
AH091	MKE58339	MKE58339	Post Medieval copper alloy coin	Post Medieval
AH091	MKE58340	MKE58340	Medieval copper alloy vessel	Medieval to Post Medieval
AH092	MKE57943	MKE57943	Medieval silver coin	Medieval
AH093	MKE58189	MKE58189	Roman copper alloy coin	Iron Age to Romano-British
AH093	MKE58190	MKE58190	Medieval silver coin	Medieval
AH093	MKE58191	MKE58191	Post Medieval copper alloy coin	Post Medieval
AH093	MKE58192	MKE58192	Post Medieval copper alloy token	Post Medieval
AH093	MKE58193	MKE58193	Post Medieval copper alloy buckle	Medieval to Post Medieval
AH093	MKE58194	MKE58194	Medieval copper alloy dress fastener (unknown)	Medieval to Post Medieval
AH093	MKE58195	MKE58195	Medieval copper alloy belt	Medieval
AH093	MKE58196	MKE58196	Post Medieval copper alloy belt	Medieval to Post Medieval
AH093	MKE58197	MKE58197	Post Medieval copper alloy hasp	Post Medieval
AH093	MKE58245	MKE58245	Medieval copper alloy brooch	Medieval
AH093	MKE58108	MKE58108	Roman brooch	Romano-British
AH093	MKE58109	MKE58109	Medieval copper alloy buckle	Medieval

Atkins Heritage Reference (AH)	Monument ID (as per KHER)	Preferred Reference (as per KHER)	Description	Period
AH093	MKE58110	MKE58110	Medieval copper alloy thimble	Medieval to Post Medieval
AH093	MKE58122	MKE58122	Medieval copper alloy harness mount	Medieval
AH093	MKE58916	MKE58916	copper alloy bead	Romano-British to Early Medieval
AH093	MKE79343	MKE79343	Roman silver coin	Romano-British
AH094	MKE58263	MKE58263	Medieval copper alloy mount	Medieval
AH095	MKE57971	MKE57971	Medieval silver coin	Medieval
AH095	MKE58918	MKE58918	copper alloy pot	Medieval
AH096	MKE58238	MKE58238	Roman copper alloy buckle	Romano-British
AH097	MKE58264	MKE58264	Medieval copper alloy mount	Medieval to Post Medieval
AH098	MKE57952	MKE57952	Post Medieval silver coin	Post Medieval
AH098	MKE57966	MKE57966	Medieval silver coin	Medieval
AH098	MKE57967	MKE57967	Medieval copper alloy strap fitting	Medieval
AH098	MKE57968	MKE57968	Medieval copper alloy strap fitting	Medieval
AH099	MKE58092	MKE58092	Post Medieval copper alloy coin	Post Medieval
AH099	MKE58106	MKE58106	Post Medieval copper alloy token	Post Medieval
AH099	MKE58111	MKE58111	Medieval silver coin	Medieval
AH099	MKE58341	MKE58341	Medieval copper alloy belt	Medieval
AH099	MKE58342	MKE58342	Post Medieval copper alloy buckle	Medieval to Post Medieval
AH0100	MKE58186	MKE58186	Post Medieval silver coin	Post Medieval

Atkins Heritage Reference (AH)	Monument ID (as per KHER)	Preferred Reference (as per KHER)	Description	Period
AH0100	MKE58187	MKE58187	Post Medieval copper alloy jetton	Post Medieval
AH0100	MKE58188	MKE58188	Medieval copper alloy buckle	Medieval
AH0100	MKE58506	MKE58506	Post Medieval silver coin	Post Medieval
AH0100	MKE58507	MKE58507	Medieval silver coin	Medieval
AH0101	MKE57970	MKE57970	Medieval copper alloy key (locking)	Medieval
AH0102	MKE57946	MKE57946	Medieval copper alloy seal matrix	Medieval
AH0102	MKE57947	MKE57947	Medieval copper alloy buckle	Medieval
AH0103	MKE58099	MKE58099	Post Medieval copper alloy coin	Post Medieval
AH0103	MKE58100	MKE58100	Post Medieval copper alloy coin	Post Medieval
AH0104	MKE76700	TQ 57 SE 1068	Anglo-Norman silver penny, Darenth	Medieval

Table 11.9: Gazetteer of Archaeological Events

Event ID (as per Kent Historic Environment Record)	Type	Description
EKE10365	DESK BASED ASSESSMENT	Assessment for proposed reservoir at Darenth
EKE10382	WATCHING BRIEF	Watching brief at Thames Water Mains Replacement Works, Dartford District
EKE10383	DESK BASED ASSESSMENT	M25 Junction 1B to 3 Widening, Kent - Archaeological Desk Based Assessment
EKE10414	EXCAVATION	The Clactonian Elephant Butchery Site at Southfleet Road, Ebbsfleet
EKE10672	DESK BASED ASSESSMENT	Desk-based assessment of the impact of the CTRL
EKE10971	DESK BASED ASSESSMENT	Desk based assessment at Northfleet School for Girls
EKE10995	WATCHING BRIEF	Watching brief at Northfleet East substation, Gravesend

Event ID (as per Kent Historic Environment Record)	Type	Description
EKE11189	WATCHING BRIEF	Watching brief at Pepperhill Household Waste Recycling Centre, Station Road, Southfleet
EKE11611		Surface collection survey for the Channel Tunnel Rail Link: Supplementary Fieldwork
EKE11613	BOREHOLE SURVEY	Boreholing for the Channel Tunnel Rail Link: Supplementary Fieldwork
EKE12045	EVALUATION	Evaluation at the Sainsbury's Pepperhill site, Gravesend
EKE12167	EXCAVATION	Excavation on the A2 Pepperhill to Cobham widening scheme, Site L
EKE12173	STRIP MAP AND SAMPLE	Phase one of strip, map and sample excavation at Site K on the A2 Pepperhill to Cobham widening scheme
EKE12174	STRIP MAP AND SAMPLE	Phase two of strip, map and sample excavation at Site K on the A2 Pepperhill to Cobham widening scheme
EKE12184	GEOTECHNICAL SURVEY	Geotechnical survey at Hall Road, Northfleet
EKE12221	GEOPHYSICAL SURVEY	Geophysical survey at Temple East of Springhead
EKE12269	EXCAVATION	Excavation at Temple East of Springhead
EKE12369	EXCAVATION	Excavation of three areas at Springhead Quarter (Phase II), Northfleet
EKE12370	STRIP MAP AND SAMPLE	Strip, map and sample of two areas at Springhead Quarter (Phase II), Northfleet
EKE12371	EVALUATION	Evaluation at Springhead Quarter (Phase II), Northfleet
EKE12381	EVALUATION	Evaluation at Springhead Quarter, Phase 2 and Phase 3 areas
EKE12479	EVALUATION	Evaluation at Waterstone Park, Phase II, (Southern Parcel), Stone Castle
EKE12480	EXCAVATION	Excavation at Waterstone Park, Phase II, (Southern Parcel), Stone Castle
EKE12481	EVALUATION	Second phase of evaluation at Waterstone Park, Phase II, (Southern Parcel), Stone Castle
EKE12604	STRIP MAP AND SAMPLE	Strip, map and sample excavation on the North Kent Community Church site, Springhead

Event ID (as per Kent Historic Environment Record)	Type	Description
EKE12988	STRIP MAP AND SAMPLE	Excavation of land at Wingfield Bank, Northfleet
EKE13133	FIELD SURVEY	Survey of a dene hole, Northfleet
EKE13199	WATCHING BRIEF	Watching brief at Millbrook Garden Centre, Southfleet
EKE13221	DESK BASED ASSESSMENT	Desk based assessment of the Palaeolithic archaeological potential of the Southfleet Road improvement scheme
EKE13311	EXCAVATION	Excavation at Pepper Hill, Southfleet
EKE13385	EVALUATION	An Archaeological Evaluation at St. Clements Valley, Greenhithe, Kent.
EKE14059	DESK BASED ASSESSMENT	Ebbsfleet Green, Ebbsfleet, Kent: archaeological desk-based assessment
EKE14061	TRIAL TRENCH	Archaeological evaluation (trial trenching element) at Ebbsfleet Green (formerly Northfleet West Sub-Station), 2014
EKE14062	STRIP MAP AND SAMPLE	Archaeological evaluation (strip, map & sample) at Ebbsfleet Green (formerly Northfleet West Sub-Station), 2014
EKE14063	TEST PIT	Archaeological evaluation (Palaeolithic test-pitting element) at Ebbsfleet Green (formerly Northfleet West Sub-Station), 2014
EKE14064	TRIAL TRENCH	Geoarchaeological evaluation at Northfleet West substation (trial trenching, phase 3), 2010
EKE14065	TEST PIT	Geoarchaeological evaluation at Northfleet West substation (test-pitting, phase 3), 2010
EKE14066	TEST PIT, BOREHOLE SURVEY	Phase 1 of an evaluation at Northfleet West substation, 2009-2010
EKE14067	GEOTECHNICAL TEST PIT	Phase 2 of an evaluation at Northfleet West substation, 2009-2010
EKE14070	TEST PIT, BOREHOLE SURVEY	Springhead Quarter, Ebbsfleet Development: Palaeolithic/Pleistocene observations during geotechnical site investigation
EKE14071	TEST PIT, BOREHOLE SURVEY	Springhead Quarter, Ebbsfleet Development: Palaeolithic/Pleistocene observations during geotechnical site investigation (phase 2)

Event ID (as per Kent Historic Environment Record)	Type	Description
EKE14072	OPEN AREA EXCAVATION	Springhead Quarter Phase 1, Ebbsfleet, Kent. Archaeological Excavation Results Summary
EKE14073	TEST PIT	Springhead Quarter: Surface Water Culvert and Storage/Treatment Works, Ebbsfleet, Kent
EKE14074	STRIP MAP AND SAMPLE	Springhead Quarter: T.W.U.L Water Main, Station Quarter, South Springhead Quarter, Ebbsfleet, Kent
EKE14075	WATCHING BRIEF	Springhead Quarter: Storm Water Culvert and Cascade, Ebbsfleet, Kent
EKE14076	TEST PIT	Springhead Quarter: Phase 3, Ebbsfleet, Kent
EKE14300	WATCHING BRIEF	Eastern Quarry, Swanscombe, Kent, DA10 0EB: Archaeological watching brief report
EKE14301	WATCHING BRIEF	Northfleet west substation remediation works, Southfleet Road, Swanscombe, Kent: Archaeological watching brief
EKE14305	DESK BASED ASSESSMENT	Marbledon Hospital, Darenth, Heritage Statement
EKE14673	WALKOVER SURVEY, DESK BASED ASSESSMENT	A supplementary archaeological assessment. Northfleet West Substation Site, Southfleet Road, Swanscombe
EKE14676	EVALUATION	Archaeological Evaluation. Eastern Quarry: Pan Handle (West) Swanscombe, Kent
EKE14682	DESK BASED ASSESSMENT	Palaeolithic Integrated Deposit Model and Research Framework
EKE14685	DESK BASED ASSESSMENT	Proposed Archaeological Mitigation Strategy. Northfleet Rise, Ebbsfleet, Kent
EKE14686	DESK BASED ASSESSMENT	Proposed Archaeological Mitigation Strategy. Station Quarter North, Ebbsfleet, Kent
EKE14689	DESK BASED ASSESSMENT	Southfleet Road Improvements. Palaeolithic Desk-Based Assessment
EKE14724	GEOTECHNICAL SURVEY	A Geoarchaeological Evaluation of the Thames/Medway Alluvial Corridor of the Channel Tunnel Rail Link
EKE14757	WATCHING BRIEF	Thames Water ALF pipeline, River Darenth: An Archaeological Post-Excavation Assessment
EKE15423	DESK BASED ASSESSMENT	Sainsburys Pepper Hill Northfleet desk-based assessment, 2009

Event ID (as per Kent Historic Environment Record)	Type	Description
EKE16146	EXCAVATION	Ebbsfleet Green housing development (formerly Northfleet West Sub-station), excavation of Clactonian palaeo-landsurface.
EKE16147	EXCAVATION	Ebbsfleet Green housing development (formerly Northfleet West Sub-station), excavation of Final Upper Pal (Long Blade) knapping scatter.
EKE16152	WATCHING BRIEF	Eastern Quarry, Area B, watching brief on excavation of drainage basin and associated drainage pipes
EKE16153	EXCAVATION	Eastern Quarry, Area B, excavation of trenches in advance of enlargement of drainage basin and subsequent Watching Brief
EKE16155	TEST PIT	Eastern Quarry, further targeted evaluation trial pits to south of Area B
EKE16156	TEST PIT	Ebbsfleet, Station Quarter South, targeted evaluation trial pits
EKE16204	WATCHING BRIEF	Excavation at Springhead Nursery, Southfleet
EKE16205	STRIP MAP AND SAMPLE	Excavation at Springhead Nursery, Southfleet
EKE16206	WATCHING BRIEF	Archaeological recording of pipe works at the Roman walled cemetery, Ebbsfleet Valley
EKE16207	BOREHOLE SURVEY	Ebbsfleet River Crossing: Programme of boreholes carried out during CTRL works in 2001
EKE16208	EXCAVATION	Ebbsfleet River Crossing: excavation carried out during CTRL works in 2001
EKE3931	EXCAVATION	EBBSFLEET SITE 2
EKE4425	GEOPHYSICAL SURVEY	SWANSCOMBE MANOR HOUSE
EKE4426	EXCAVATION	SWANSCOMBE MANOR HOUSE
EKE4706	EXCAVATION	EBBSFLEET SITE 2
EKE5405	WATCHING BRIEF	Watching brief on A2 widening eastbound at Vagniacae Roman Settlement
EKE8143	EVALUATION	Evaluation at Millbrook Garden Centre, Springhead

Event ID (as per Kent Historic Environment Record)	Type	Description
EKE8243	SYSTEMATIC FIELDWALKING SURVEY	Springhead, Northfleet, Kent
EKE8245	GEOPHYSICAL SURVEY	Geophysical Survey at Springhead, Northfleet
EKE8256	BUILDING SURVEY	Southern Convalescent Hospital Survey
EKE8258	FIELD OBSERVATION (VISUAL ASSESSMENT)	Aggregates Levy Survey: Industrial Sites
EKE8261	GEOPHYSICAL SURVEY	Geophysical Surveys at Eastern Quarry, Swanscombe
EKE8296	GEOTECHNICAL SURVEY	Ground Investigation at Painters Ash County Primary School, Northfleet for Kent County Council
EKE8323	GEOTECHNICAL SURVEY	Boreholes at Bluewater
EKE8329	GEOTECHNICAL SURVEY	Boreholes for A2 Trunk Road Improvements Bean Road Junction & Carriageway
EKE8338	EVALUATION	Evaluation at Bluewater Park, Stone
EKE8345	EVALUATION	Evaluation at Pepper Hill
EKE8389	WATCHING BRIEF	Watching Brief at Bluewater, Stone, Dartford
EKE8394	WATCHING BRIEF	Watching Brief at Land off Landseer Avenue, Northfleet
EKE8396	WATCHING BRIEF	Watching brief on cable trenching, East of Springhead
EKE8398	WATCHING BRIEF	Watching Brief at Springhead Service Station A2, Southfleet
EKE8461	EXCAVATION	Excavation across the Roman town of Springhead
EKE8521	EVALUATION	Evaluation at Northfleet East GIS Substation, Springhead, Gravesend
EKE8525	WATCHING BRIEF	Watching brief at Darenth Village Park (Area 7)
EKE8527	EVALUATION	Evaluation at Springhead Nursery Southfleet
EKE8528	EVALUATION	Interim report on the evaluation work at Springhead, Gravesend, Kent.

Event ID (as per Kent Historic Environment Record)	Type	Description
EKE8529	EVALUATION	Evaluation at Springhead, Gravesend
EKE8535	EXCAVATION	Excavation at the Pepper Hill Lane Electricity Substation, Northfleet
EKE8554	EVALUATION	Evaluation on land at Residential Phase II, Waterstone Park, Stone Castle
EKE8568	EVALUATION	Evaluation South and North of the A2 (Park Corner), Springhead, Southfleet, carried out during CTRL works
EKE8569	EVALUATION	Evaluation at Pepperhill Tunnel, Near Springhead (CTRL)
EKE8570	EVALUATION	Evaluation at Pepperhill Café Roundabout, Near Springhead
EKE8572	EVALUATION	Evaluation South of the A2, Near Springhead
EKE8573	EVALUATION	Evaluation West of Springhead Nursery
EKE8575	STRIP MAP AND SAMPLE, EXCAVATION	Strip, map and sample / excavation work at Springhead Roman Town, carried out during CTRL works.
EKE8576	WATCHING BRIEF	Watching Brief at Springhead Roman Town, carried out during CTRL works
EKE8578	TEST PIT, EVALUATION	Evaluation at Springhead Quarter, Northfleet
EKE8581	WATCHING BRIEF	Springhead Nursery, Southfleet
EKE8582	EXCAVATION	Excavation at Springhead Nursery, Southfleet
EKE8619	WATCHING BRIEF	Watching brief at Pepper Hill, Southfleet
EKE8770	EVALUATION	Evaluation at Ebbsfleet Management Centre, Eastern Quarry, Swanscombe
EKE8906	EXCAVATION	Excavation of a cable trench to the south of Springhead, Dartford
EKE8907	EVALUATION	Evaluation at Pepper Hill, Springhead, Northfleet
EKE8908	EVALUATION	The Roman road at Springhead Nurseries, Southfleet, Dartford
EKE8910	EXCAVATION	Excavations at the garden centre, Springhead
EKE8914	EVALUATION	Evaluation at Temple East of Springhead, Southfleet, Dartford

Event ID (as per Kent Historic Environment Record)	Type	Description
EKE8916	GEOPHYSICAL SURVEY	Geophysical survey at the Roman walled cemetery, Springhead
EKE8919	EXCAVATION	Excavations at Springhead Roman town, Southfleet, Dartford
EKE8920	STRIP MAP AND SAMPLE	Strip, map and sample excavation at Pepper Hill, Southfleet
EKE8929	WATCHING BRIEF	Watching brief at Springhead Nurseries, Southfleet
EKE9058	WATCHING BRIEF	Package 330 Targeted Watching Brief
EKE9059	WATCHING BRIEF	Package 330 General Watching Brief
EKE9785	TRIAL TRENCH, EVALUATION	Evaluation of land at Wingfield Bank, Northfleet, Gravesend
EWX9126	EVALUATION	Evaluation at Station Quarter South, Ebbsfleet
EWX9132	FIELD SURVEY	Survey of a site at Northfleet, Gravesend
EWX9153	EVALUATION	Evaluation at Pepperhill Household Waste recycling centre, Station Road, Southfleet
EWX9165	DESK BASED ASSESSMENT	Desk based assessment at Waterstone Park Phase II, Stone
EWX9177	EXCAVATION	Channel Tunnel Rail Link excavation at Pepper Hill, Southfleet

12. Appendix K. Materials and Waste

12.1 Planning and policy context

12.1.1 All European directives applicable to the Scheme have been transposed into national legislation. However, a number of legislative proposals on waste have been adopted as part of the Circular Economy Package (as supported by the Circular Action Plan), which focuses on *'closing the loop of product lifecycles through greater recycling and re-use, and bring benefits for both the environment and the economy'*. Regarding the Scheme, the relevant legislative proposals include:

- Proposed directive on waste;
- Proposed directive on packaging waste;
- Proposed directive on landfill; and
- Proposed directive on electrical and electronic waste, on end-of-life vehicles, and batteries and accumulators and waste batteries and accumulators.

National legislation and policy

12.1.2 It should be noted that The National Planning Policy Framework does not contain specific waste policies, as such it is not included below. Section 1.1.24 summarises the Waste Management Plan for England 2013 which it is considered as the most relevant to the Scheme.

Environmental Protection Act 1990 (c. 43)

12.1.3 The Environmental Protection Act 1990 (c. 43) as amended in 1996 and 1999 implements integrated pollution control for the disposal of waste to air, land and water, including solid waste disposal.

12.1.4 As part of this, under Section 34, the Act imposes Duty of Care on anyone who produces, imports, keeps, stores, transports, treats or disposes of waste.

12.1.5 This will mean that Highways England and all contractors must take all reasonably practical steps to ensure that:

- Waste is consigned only to a registered waste carrier, licensed waste contractor, local authority waste collector or person dealing with waste in ways that are exempt from licensing;
- Waste that is disposed of is accompanied by a detailed written description of the waste to ensure its safe handling, treatment and disposal (waste transfer notes are to be kept for a minimum of two years and hazardous waste consignment notes are to be kept for a minimum of three years);
- Waste is securely contained to prevent it escaping to the environment;
- Appropriate measures are taken to ensure that others involved in the handling and disposal of waste do so in accordance with the all applicable Regulations;
- Copies of registration certificates should be obtained for all waste contractors and waste carriers used as part of the Scheme and it should be ensured that

they are on the Environment Agency's 'Public Register of Waste Carriers, Brokers and Dealers'; and

- Checks should be made on the final destination of each waste, ensuring that each waste disposal facility is licensed to accept the waste. Duty of Care audits of carriers and waste disposal facilities are advisable.

12.1.6 The generation of waste from the Scheme shall be managed in accordance with all applicable legislation and policy and in accordance with good practice.

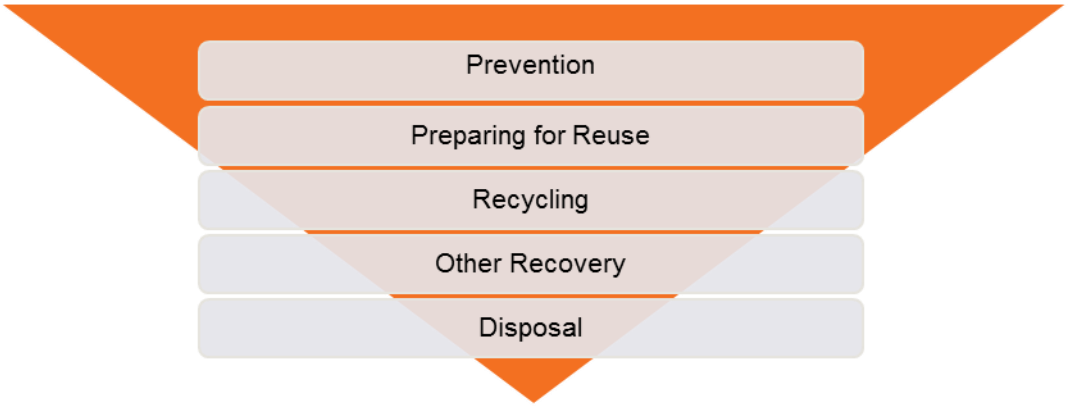
Clean Neighbourhoods and Environment Act 2005 (c. 16)

12.1.7 Chapter 16 of the Clean Neighbourhoods and Environment Act 2005 (c. 16) prescribes the correct transportation, collection, disposal and management of waste and prohibits fly tipping.

Waste (England and Wales) Regulations 2011 (SI 2011/988)

12.1.8 The Regulations 2011 (SI 2011/988), as amended in 2012 (SI 2012/1889) and in 2014 (SI 2014/656), transpose the Revised EU Waste Framework Directive (2008/98/EC) into English law and require organisations to manage waste in accordance with the waste hierarchy, as shown below in Figure 12.1, in order to prevent waste going to landfill.

Figure 12.1: Waste hierarchy



12.1.9 Waste management contractors working on the Scheme will be required to provide evidence that the waste hierarchy has been applied. This evidence can be in the form of waste transfer notes and hazardous waste consignment notes, which themselves must be kept for two and three years, respectively.

The Hazardous Waste (England and Wales) Regulations 2005 (SI 2005/894)

12.1.10 The Regulations, as amended in 2009 (SI 2009/507), 2015 (SI 2015/1360) and 2016 (SI 2016/336) apply to all wastes listed as hazardous in the European Waste Catalogue (2000/532/EC) and the CLP (Classification, Labelling and Packaging) Regulation (EC 1272/2008). Hazardous waste will be produced throughout all lifecycle stages of the Scheme. Hazardous waste should be disposed of in accordance with the Regulations including the production of a hazardous waste consignment note.

Waste Electrical and Electronic Equipment (WEEE) Regulations 2013 (SI 2013/3113)

12.1.11 The Regulations revoke the previous WEEE Regulations (2006 (SI 2006/3289), 2007 (SI 2007/3454), 2009 (SI 2009/2957) and 2010 (SI 2010/1155) and have a key objective to reduce the amount of WEEE that goes to landfill. This is to be achieved by making producers responsible for the collection, treatment and recovery of WEEE, including the associated costs.

12.1.12 For the Scheme being considered, all WEEE produced in the Construction Demolition and Excavation (CD&E) and operational phases must be segregated and managed separately from other wastes, with relevant paperwork provided as described above.

The Waste Batteries and Accumulators Regulations 2009 (SI 2009/890)

12.1.13 The Regulations, as amended in 2015 (SI 2015/1935), main requirements are that producers of batteries and accumulators must either take back waste batteries and accumulators, or fund the collection and recycling of them. The 2015 amendment removed several additional requirements, inclusive of the provision of operational plans and independent audit reports.

12.1.14 For the Scheme being considered, all batteries produced in the CD&E and operational phases must be segregated and managed separately from other wastes.

The CLP (Classification, Labelling and Packaging) Regulation (EC 1272/2008)

12.1.15 The CLP Regulation (within the UK and EU) was introduced in a staggered manner between 1999 and 2015. It should be noted that within the UK and EU, the CLP Regulation, has replaced the Dangerous Substances Directive (67/548/EEC) and the Dangerous Preparations Directive (1999/45/EC). To summarise, the Regulation provides guidance on the application of the CLP criteria for hazards (physical, health and environmental). With specific reference to the Scheme, the Regulation should be used to support the classification of both waste and materials. All waste should be classified by a six-digit code, which must be recorded on all waste transfer notes and hazardous waste consignment notes for the movement of waste from the CD&E and operational phases of the Scheme.

Environmental Protection (Disposal of Polychlorinated Biphenyls and other Dangerous Substances) (England and Wales) Regulations 2000 (SI 2000/1043)

12.1.16 The Regulations, as amended in 2000 (SI 2000/3359), require the safe disposal or decontamination of all equipment that contains polychlorinated biphenyls (PCBs). Contaminated equipment is covered by the Regulations if they contain over 5 litres or more of PCB substances or mixtures. PCBs are often present in areas of historical industrial use.

The Environmental Permitting (England and Wales) Regulations 2016 (SI 2016/1154)

12.1.17 The Environmental Permitting Regulations 2016 (SI 2016/1154) replace the 2010 Regulations (SI 2010/675) (as amended in 2011 (SI 2011/2043), 2012 (SI 2012/630) and 2014 (SI 2014/255)). The Regulations put in place requirements to ensure that sites that produce certain materials and undertake certain activities (such as the storage, use or treatment of waste) have a permit or exemption from the regulator (i.e. the Environment Agency).

Environmental Damage (Prevention and Remediation) Regulations 2009 (SI 2009/153)

12.1.18 The Regulations, as amended in 2010 (SI 2010/587), introduce obligations to ensure the polluter pays for any environmental damage caused. The Regulations are applicable to all economic activities and therefore cover businesses. The Regulations require caution to be taken when managing sites in order to prevent damage to water, land and biodiversity. Such damage could be caused by poor waste management practices and as such the generation of waste from the Scheme must be managed in accordance with all applicable legislation and policies and in accordance with good practice.

The Control of Asbestos Regulations 2012 (SI 2012/632)

12.1.19 The Regulations require notification to the appropriate authority of all notifiable asbestos works (as specified in the Regulations), the medical surveillance (from April 2015) and health records for employers dealing with asbestos, the provision of the correct equipment and training for working with asbestos; and the documentation of the method, storage and disposal of asbestos waste. Any waste containing asbestos (e.g. insulation or lagging) must be stored and disposed of, in suitable packaging to prevent fibre release, in line with the Regulations. All asbestos must be removed by a licensed contractor who has undergone the appropriate training for the removal of asbestos and must wear the appropriate Personal Protective Equipment (PPE). Written records must be kept of the workers and the likely level of exposure. The asbestos must only be disposed of at an appropriately permitted disposal site.

12.1.20 These regulations will be adhered to during the construction of the Scheme to minimise harm to human health due to asbestos exposure. Information relating to asbestos contaminated soils (ACS) is provided in Chapter 10 Geology and Soils.

Waste Management Plan for England 2013

12.1.21 DEFRA drew on issues from the previous Waste Strategy for England (WS2000), the Waste Strategy for England (WS2007), European Directives and Legislation to create the Waste Management Plan for England 2013. The Plan continues to focus on the importance of driving waste management up the waste hierarchy and states the importance of considering the Government's ambition of achieving a zero-waste economy. The Plan puts a strong emphasis on waste prevention through making products using fewer natural resources. The targets outlined in WS2007 remain relevant, including the target to recover 70% of construction and demolition waste by 2020. This target shall be considered a minimum requirement the Scheme.

National Planning Policy for Waste 2014

12.1.22 The National Planning Policy for Waste is the formal replacement for Planning Policy Statement 10 (PPS10). It follows the principles set out in PPS10, which states that waste should be managed in line with the principles of the waste hierarchy. It is important to ensure that, where possible, waste production is minimised to reduce environmental impacts and to ensure an assessment is made of the local waste infrastructure type and capacities, to include, but not be limited to, an assessment of the local policies.

Waste Planning Practice Guidance 2015

12.1.23 The Planning Practice Guidance website details how to adhere to the National Planning Policy for Waste 2014. The guidance should be followed in order to satisfy the local planning authority that impacts introduced by a proposed development on the existing waste management facilities are acceptable and do not prejudice the implementation of the waste hierarchy (see Figure 12.1).

National Policy Statement for National Networks (NN NPS) 2014

12.1.24 The NPS outlines of the importance of managing resources and wastes in order to prevent and minimise environmental impacts. The material resources and waste management measures outlined in the 'Waste Management' chapter should be adhered to and considered throughout all stages of the Scheme. Management measures are inclusive of, but not limited to, the implementation of the waste hierarchy (see Figure 12.1), the correct management of waste both on-site and off-site and the identification of appropriate waste infrastructure for waste treatment and disposal.

Regional policy

12.1.25 The Scheme sits within a development area covered by the Kent Minerals and Waste Local Plan 2013-30 (2016). The Kent Minerals and Waste Local Plan 2013-30 describes:

- *'The overarching strategy and planning policies for minerals extraction, importation and recycling, and the waste management of all waste streams that are generated or managed within Kent; and*
- *The spatial implications of economic, social and environmental change in relation to strategic minerals and waste planning'*.

12.2 Study area

12.2.1 The Scheme comprises improvements at both the A2 Bean and A2 Ebbsfleet Junctions. The Junctions are adjacent, grade-separated junctions located on the A2 trunk road in Dartford, within the County of Kent.

12.2.2 With regards to material resources and waste, the study area extends outside of the Scheme area. For material resources, the study area includes the demand for key construction materials nationally. For material resources, it is acknowledged that the impacts may occur outside of the national study area, however, as per IAN 153/11, this is considered outside of the assessment scope. For waste, the study area includes the waste arisings and waste infrastructure capacity within the county of Kent (with the exception of hazardous waste which

is considered at a national level). It is acknowledged that both Greater London and the unitary authority of Medway are situated within the vicinity of the Scheme, however, as there is typically a net importation of waste into Kent from Greater London and Medway, only waste infrastructure within Kent has been considered.

12.3 Methodology

12.3.1 A Detailed Assessment, as defined in IAN 153/11, is considered necessary to assess the impacts of material resources and waste arisings from the Scheme.

12.3.2 For the purposes of the assessment, material resources are defined as per the IAN 153/11 as 'the materials and construction products required for the construction, improvement and maintenance of the trunk road network. Material resources include primary raw materials such as aggregates and minerals, and manufactured construction products. Many material resources will originate off-site, purchased as construction products, and some will arise on-site such as excavated soils or recycled road planings'.

12.3.3 Whilst waste is defined in line with the Waste Framework Directive (2008/98/EC) as 'any substance or object which the holder discards or intends or is required to discard'.

12.3.4 As aforementioned, there is insufficient design detail to carry out an assessment at this stage and as such the assessment will be carried out during the production of the Environmental Statement. The section below describes the process that will be followed to undertake the assessment.

12.3.5 The following tasks are proposed to determine the impact of material resources and waste from the Scheme:

- Ongoing review of the relevant waste legislation, national, regional and local planning policies and guidance (as summarised previously in Sections 1.1.5 to 1.1.28);
- Review the proposed construction materials and materials quantities, and estimate the quantities and types wastes to be generated during CD&E. Operational wastes will be limited to ad hoc waste arisings and/ or scheduled maintenance which cannot be quantified;
- Identify and evaluate the impacts of the Scheme against the national demand for key construction materials, the regional CD&E waste arisings, the national hazardous CD&E waste arisings, the regional CD&E waste infrastructure capacity and the national hazardous CD&E waste infrastructure capacity; and
- Identify opportunities to reduce, re-use, recover and/ or recycle materials and wastes through a review of the proposed development (including proposed building materials, construction methods and design, where available) and in accordance with industry best practice.

12.3.6 Whilst not mandatory, it is best practice to produce a Site Waste Management Plan (SWMP) and a CEMP during each stage of the design.

12.3.7 The SWMP should be updated throughout the Scheme development and include the anticipated types and quantities of waste generated on-site, and actions undertaken to minimise waste generated on-site.

12.3.8 A CEMP is an overarching environmental management document. Its purpose is to identify stakeholder requirements, ensure compliance with legislation, and minimise potential adverse environmental impacts during construction via mitigation measures. It is proposed that both a SWMP and a CEMP will be produced and cross referenced within the ES.

12.3.9 Table 12.1 contains a summary of what is scoped in and out for material resources and waste assessment.

Table 12.1: Material resources and waste topics scoped in and out of further assessment

Effects	Scoped In/Out	Comment/ Justification
Change in demand for key construction materials during the CD&E phases.	✓	Assessment required to identify and evaluate the impacts of the Scheme against the national demand for key construction materials during the CD&E phases.
Change in demand for key construction materials associated planned/unplanned maintenance with during the operational phase.	×	Minimal impact is envisaged during the operational stage of the Scheme due to minimal material resource use (associated with planned/ unplanned maintenance). Data related to operational material resource use by highway schemes is not readily available and as such will not be assessed.
Change in baseline waste arisings during the CD&E phases.	✓	Assessment required to identify and evaluate the impacts of waste arisings from the Scheme against the waste arisings baseline during the CD&E phases. The baseline for CD&E waste will be on a regional level and the baseline for hazardous CD&E will be on a national level.
Change in baseline regional waste arisings during the operational phase.	×	Minimal impact is envisaged during the operational stage of the Scheme due to minimal waste generation (through littering and planned/ unplanned maintenance). Most of these wastes would likely be non-hazardous municipal type wastes during normal operation, and non-hazardous/ inert and hazardous wastes from planned/ unplanned maintenance. Data related to waste generated by highway schemes is not readily available and as such will not be assessed.
Change in capacity of waste infrastructure during the CD&E phase.	✓	Assessment required to identify and evaluate the impacts of waste arisings from the Scheme against the regional waste infrastructure baseline during the CD&E phases. The baseline for CD&E waste will be on a regional level and the baseline for hazardous CD&E will be on a national level.
Change in capacity of regional waste infrastructure during the operational phase.	×	Operational waste arisings from the Scheme will not be assessed as it is envisaged that this will be minimal and no data related to waste generated by highway schemes is readily available. Therefore, an assessment will not be made of the potential effect of the operational waste arisings on operational waste infrastructure.

12.3.10 The general methodology and criteria described below will be applied during the EIA process to determine the significance of the effects associated with material resources and wastes during the construction phase of the Scheme.

12.3.11 There are several assumptions and limitations that will be applicable to the proposed assessment methodology which are outlined below:

- Should a detailed construction programme not be available, it will be assumed that material resource use and waste generation will be spread equally across the construction period;
- Any new/ unused equipment will be fed back into the supply chain for use on alternative Schemes and as such will be excluded;
- All material quantities will be converted into tonnes using industry standard conversion rates;
- All material resources will be grouped according to main material types, as shown in Table 12.3;
- Wastage rates, published by the Construction Resources and Waste Platform, will be applied to all material resource tonnages to determine the likely waste arisings (offcuts, damaged and surplus materials);
- An additional 1% will be added to the total waste arisings (excluding soil, aggregate and granular fill) to account for packaging waste, based on experience from previous schemes. It will be assumed that 0.01% of all packaging waste arisings will be hazardous in nature (e.g. associated with sealants, paints and solvents);
- Hazardous waste arisings will comprise of oils, sealants, paints, solvents and contaminated soil. Contaminated soil will be considered separately;
- The availability of data within the timeframes of the ES submission (i.e. the availability of Bill of Quantities or equivalent); and
- The issue of waste infrastructure capacity data by Kent County Council in advance of the ES submission.

12.3.12 The results of the assessment will be tabulated and presented in the ES, as design data was not available within the timeframes of this PEIR submission. The tables will show:

- The total estimated material resource use and the estimated material resource use per annum; and
- The total estimate waste arisings and the estimated waste arisings per annum.

12.3.13 Additional detail will be provided in the SWMP which will be prepared and cross referenced in the ES, and will contain a more detailed breakdown of waste types.

12.3.14 The magnitude of the anticipated material resources used and waste arisings generated by the Scheme option will be determined by assessing the Bill of Quantities (or equivalent). The Bill of Quantities (or equivalent) will include (but will not be limited to) information on the removal of excavated materials, and materials/ equipment to be installed by sub-contractors.

12.3.15 The magnitude and sensitivity of the receptors will be assessed for the Scheme based on sensitivity (waste infrastructure capacity) and magnitude (national demand for key construction materials and waste arisings). As aforementioned, operational material resource use and waste arisings cannot be estimated and as such a quantitative assessment will not be undertaken. Table 12.2 and Table 12.3 below summarises how magnitude and sensitivity effects have been defined with regards to material resources, waste arisings and infrastructure capacity. The criteria are based on Atkins' prior experience, given there is no specific industry assessment standard. Sensitivity of key construction materials cannot be assessed due to a lack of publicly available data. As baseline data relating to operational material resource use and waste generated by highway schemes is not readily available, it will not be assessed for significance as part of the EIA process.

Table 12.2: Criteria for classifying the sensitivity of environmental effects

Level	Sensitivity criteria
Very high	The Scheme meets one of more of the following criteria: Very high volumes of waste generated such that it may have a very high impact on estimated CD&E waste infrastructure within the regional study area (greater than 100% of the regional baseline); and Very high volumes of hazardous waste generated such that it may have a very high impact on estimated hazardous waste infrastructure within the national study area (greater than 5% of the national baseline).
High	The Scheme meets one of more of the following criteria: High volumes of waste generated such that it may have a high impact on estimated CD&E waste infrastructure within the regional study area (greater than 10% of the regional baseline); and High volumes of hazardous waste generated such that it may have a high impact on estimated hazardous waste infrastructure within the national study area (greater than 1% of the national baseline).
Medium	The Scheme meets one of more of the following criteria: Moderate volumes of waste generated such that it may have a moderate impact on estimated CD&E waste infrastructure within the regional study area (greater than or equal to 5% but less than 10% of the regional baseline); and Moderate volumes of hazardous waste generated such that it may have a moderate impact on estimated hazardous waste infrastructure within the national study area (greater than or equal to 0.5% but less than 1% of the national baseline).
Low	The Scheme meets one of more of the following criteria: Low volumes of waste generated such that it may have a low impact on estimated CD&E waste infrastructure within the regional study area (greater than or equal to 1% but less than 5% of the regional baseline); and Low volumes of hazardous waste generated such that it may have a low impact on estimated hazardous waste infrastructure within the national study area (greater than or equal to 0.1% but less than 0.5% of the national baseline).
Negligible	The Scheme meets one of more of the following criteria: Negligible volumes of waste generated such that it may have a negligible impact on estimated CD&E waste infrastructure within the regional study area (less than 1% of the regional baseline); and

Level	Sensitivity criteria
	Negligible volumes of hazardous waste generated such that it may have a negligible impact on estimated hazardous waste infrastructure within the national study area (less than 0.1% of the national baseline).

Table 12.3: Criteria for classifying the magnitude of environmental effects

Level	Magnitude criteria
Major	The Scheme meets one of more of the following criteria: Significant volumes of key construction materials required such that it has a high impact on current market demand, greater than 10% of the national baseline (for any one material); Generation of large volumes of CD&E waste, greater than 10% of the regional baseline; and Generation of large volumes of hazardous waste, greater than 1% of the national baseline.
Moderate	The Scheme meets one of more of the following criteria: Moderate volumes of key construction materials required such that it has a moderate impact on current market demand, greater than or equal to 5% but less than 10% of the national baseline (for any one material); Generation of medium volumes of CD&E waste, greater than or equal to 5% but less than 10% of the regional baseline; and Generation of moderate volumes of hazardous waste, greater than or equal to 0.5% but less than 1% of the national baseline.
Minor	The Scheme meets one of more of the following criteria: Low amounts of key construction materials required such that it has a moderate impact on current market demand, greater than or equal to 1% but less than 5% of the national baseline (for any one material); Generation of low volumes of CD&E waste, greater than or equal to 1% but less than 5% of the regional baseline; and Generation of low volumes of hazardous waste, greater than or equal to 0.1% but less than 0.5% of the national baseline.
Negligible	The Scheme meets one of more of the following criteria: Negligible amounts of key construction materials required such that it has a negligible impact on current market demand, less than 1% of the national baseline (for any one material); Generation of negligible volumes of CD&E waste, less than 1% of the regional baseline; and Generation of negligible volumes of hazardous waste, less than 0.1% of the national baseline.
No change	The Scheme meets one of more of the following criteria: No key construction materials are required or waste generated either due to design, construction technique or 100% utilisation of site won materials; and No generation of hazardous waste

12.3.16 The assessment of significance combines the magnitude and sensitivity of the environmental effects to determine whether the effects are very large, large, moderate, slight or neutral, as shown in Table 4.2 in the PEIR Volume 1 Chapter 4 Environmental Impact Assessment Process .

12.3.17 Very large to moderate effects are considered to have the potential to be significant, while slight and neutral effects are not considered significant.

12.3.18 The results of the significance assessment will be tabulated and presented in the ES. The tables will show:

- The estimated percentage change in material resource use against the baseline;
- The estimated percentage change in waste airings against the waste arisings baseline;
- The estimated percentage change in waste airings against the waste infrastructure capacity baseline; and
- The potential significant material resource and waste effects (i.e. sensitivity, magnitude and overall significance).

12.4 Baseline conditions – Tables

Table 12.4: Estimated national demand for key construction materials

Construction Material	National Baseline
	Tonnes per Annum (tpa)
Aggregate	225,000,000
Asphalt	24,000,000
Cement	13,000,000
Concrete*	81,000,000
Steel	10,448,200
Timber**	3,225,920

Table Source: Mineral Products Association, UK Steel and the Forestry Commission. *Sum of concrete and other related products. ** Converted from cubic meters (9,488,000m^3) using a conversion rate of 1m^3 to 0.34 tonnes.

Table 12.5: Waste arisings baseline

Waste Stream	Tonnes per Annum (tpa)
CD&E (regional)	2,520,000
Hazardous CD&E (national)	197,710

Table 12.6: National waste infrastructure baseline

Waste Stream	Tonnes per Annum (tpa)
CD&E (regional)	22,073,247 *
Hazardous	9,271,631**

*Sum of data for Inert Recycled Aggregate, Non Inert Separated for recycling, Permanent Deposit to Land (Inert CD&E), Non Inert (EfW) and Non Inert Landfill. Composting was subtracted from this figure as it is shown as a shortfall in capacity.
** Hazardous landfill capacity has been interpreted from the stated total landfill capacity on the EA permitted list (available on request). The total landfill capacity is considered to be reflective of the tonnes per annum capacity based on a review of hazardous landfill permits which showed that the stated total capacity on the EA list to be below the permitted annual capacities.

13. Appendix L. People and Communities

13.1 Planning and policy context

13.1.1 There is no specific legislation or planning policy relating to 'people and communities' assessment, however national and local policy provides direction on relevant issues, particularly transport and land use. Table 13.1 below identifies the legislation, regulatory and policy framework for people and communities.

Table 13.1: Legislation, regulatory and policy framework for people and communities

Scale	Legislation/ Regulation	Summary of requirements
National	National Planning Policy Framework (NPPF) 2012	To support a prosperous rural economy, planning should promote the sustainable growth and expansion of businesses and enterprise in rural areas, the diversification of agricultural and land-based rural businesses, and the retention and development of local services and community facilities (Paragraph 28). The NPPF states that the system needs to be balanced in favour of sustainable transport modes to give people 'a real choice about how they travel' (Paragraph 29). Encouragement should also be given to solutions which reduce congestion (Paragraph 30). Paragraph 75 includes a requirement that planning policies should protect and enhance Public Rights of Way (PRoWs) and access. The NPPF emphasises the need to manage patterns of growth by making the fullest possible use of sustainable transport modes including public transport, walking and cycling. Chapter 4 of the NPPF sets out how transport should be considered within the context of planning decisions and sustainable development. This policy encourages solutions that seek to reduce congestion, greenhouse gas emissions and serve to facilitate the use of sustainable transport. Furthermore, local planning authorities (LPAs) are required to identify and protect, where there is robust evidence, sites and routes which could be critical in developing infrastructure to widen transport choice. Chapter 8 'Promoting Healthy Communities' describes how access to high quality open spaces and opportunities for sport and recreation can make an important contribution to the health and wellbeing of communities. Social interaction, health and inclusivity are priorities for communities. Planning should thus promote safe, accessible environments and use of public areas and shared space, and protect valued facilities and services including open space, sports venues, public houses and local shops (Paragraphs 69-70). Paragraph 75 states policies should protect and enhance public rights of way (PRoW) and access. Local authorities should seek opportunities to provide better facilities for users, for example by adding links to existing rights of way networks including National Trails.

Scale	Legislation/ Regulation	Summary of requirements
		NPPF requires that '…local planning authorities should take into account the economic and other benefits of the best and most versatile [BMV] agricultural land. Where significant development of agricultural land is demonstrated to be necessary, local planning authorities should seek to use areas of poorer quality land in preference to that of a higher quality ...' In December 2012 Natural England published Technical Information Note 049 (TIN049), 'Agricultural Land Classification: protecting the best and most versatile agricultural land'. This states that for planning applications, specific consultations with Natural England are required under the Development Management Procedure Order in relation to BMV agricultural land. These are for non-agricultural development proposals that are not consistent with an adopted local plan and involve the loss of 20 ha or more of BMV land.
	National Networks National Policy Statement (NN NPS)	The Government's vision and strategic objectives for the national networks include improving overall quality of life, journey quality, reliability and safety and linking up communities. Junction improvement is cited as a measure which will be used to enhance the existing national road network towards this vision (Paragraph 2.23). The NPSNN establishes the expectation that delivery of new schemes will improve quality of life and avoid and mitigate environmental and social impacts in line with the principles set out in the NPPF and the Government's planning guidance (Paragraph 3.3). Schemes will also be expected to improve accessibility and inclusivity and reduce community severance, to contribute to a network that provides a range of opportunities and choices for people to connect with jobs, services and friends and family (Paragraph 3.19). Although it does not provide specific guidance for people and communities impacts, the NPSNN outlines the approach to land use which is of relevance to this assessment. Applicants should identify existing and proposed land uses, including best and most versatile agricultural land, near the Scheme and the likely effects on these (Paragraphs 5.165 and 5.168).
	Countryside and Rights of Way Act 2000	The Countryside and Rights of Way Act 2000 (CRoW) regulates all Public Rights of Way (PRoW) and ensures access to them. It requires local highway authorities to publish a Rights of Way Improvement Plan (RoWIP), which should be reviewed every 10 years. The Act also obliges the highway authority to recognise the needs of the mobility impaired when undertaking improvements.
	Road Investment Strategy (RIS) and Strategic Business Plan 2015	The RIS aims to improve connectivity, safety, air quality and road user satisfaction, boost the economy whilst reducing noise and negative environmental impacts all of which will have an impact on local communities and people.
Regional	Kent County Council	Kent County Council Countryside and Coastal Access Improvement Plan 2013 – 2017 is the constituent plan/ document for the CRoW Act 2000. Rights of Way Improvement Plan - Information Gathering; pre-consultation information gathering survey. Kent County

Scale	Legislation/ Regulation	Summary of requirements
		Council's Public Rights of Way and Access Service is reviewing its Rights of Way Improvement Plan that finished consultation in late 2017. The RoWIP plans set out the councils aims. Guidance is provided on a dedicated Kent County Council PRoW website (https://www.kent.gov.uk/waste-planning-and-land/public-rights-of-way) sets out how PRoW meet the present and likely needs of the public; the opportunities provided by local rights of way for exercise and other forms of recreation and enjoyment. KCC's Kent and Medway Growth and Infrastructure Framework examines the projected future growth for the area and implications on transport, including the links with the LTP. The current GIF was published in 2015, and a GIF update is currently being prepared for publication in the new year.
	Ebbsfleet Development Corporation	The Ebbsfleet Development Corporation (EDC) DC is the Local Planning Authority for Ebbsfleet Garden City. The EDC area extends to the northern boundary of the A2. There is no formal Local Plan for this area but the EDC has signed up to the commitments of the Kent Planning Protocol which has been jointly prepared by the Kent Planning Officers Group and the Kent Developers Group. The leaders of all the Kent councils along with the chairs of the Kent Planning Officers, Kent Developers and Kent Housing groups have signed up to these commitments that promote collaborative working between the development community and local planning authorities.
Local	Dartford Borough Council Core Strategy (2011) and Proposals Map (2017)	Policy CS7: Employment Land and Jobs Policy CS8: Economic Change – This policy states the Council will seek a transformation of the economy by focussing on the key growth sectors in particular: Office uses; High technology; Logistics transport and distribution; Environmental technologies; Creative industries; and Built environment and construction. Policy CS10: Housing provision Policy CS21: Community Services Policy CS22: Sports, Recreation and Culture Facilities (relevant to PRoW and walking activities) Policy DP4: Transport Access and Design – Development should be of a design and layout to promote walking, cycling and public transport uses Policy DP5: Environmental and Amenity Protection Policy DP6: Sustainable Residential Locations. Policy CS 13: Green Belt.
	Dartford Borough Council Development	

Scale	Legislation/ Regulation	Summary of requirements
	Policies Plan (2017)	
	Gravesham Borough Council Local Plan Core Strategy (2014) and Local Plan First Review (1994) Saved Policies	Policy CS06: Ebbsfleet (Gravesham) Opportunity Area; Policy CS07: Economy, Employment and Skills; Policy CS08: Retail, Leisure and the Hierarchy of Centres; Policy CS09: Culture and Tourism; Policy CS10: Physical and Social Infrastructure; Policy CS13: Green Space, Sport and Recreation (relevant to PRoW and walking activities).

Table source: Various National and Local Planning Guidance

13.2 Study area

13.2.1 The People and Communities Chapter will assess the Scheme's likely impact upon:

- Private dwellings;
- Community assets;
- Local businesses;
- Agricultural land;
- Development land;
- Non-motorised users (NMU) - pedestrians, cyclists and equestrians; and
- Vehicle travellers (VT) - drivers and passengers of both public and private vehicles.

13.2.2 In the absence of prescriptive guidance for People and Communities assessments, it is proposed to assess likely effects within a study area comprising land within the Scheme's Red Line Boundary plus a 500 m buffer extending beyond this boundary. Using professional judgement and knowledge of the Scheme, this threshold is considered likely to capture all relevant effects resulting from the Scheme. The thresholds proposed are appropriate to most topics in the EIA, however the traffic model will also be considered to take account of the operational effects of major developments in the area and the wider surrounding region.

13.2.3 The extent of this study area may be increased during the assessment process subject to its findings and the findings of other environmental assessment topics which may inform the People and Communities assessment, such as landscape and visual impact, transport, noise and vibration and air quality.

13.3 Methodology

13.3.1 The people and communities impact assessment will assess a range of potential impacts. The method of assessment for these potential impacts will vary according to the nature of each impact and receptor type. Assessment criteria is presented below for the assessment of the following receptors:

- Private dwellings;

- Community assets;
- Local businesses;
- Agricultural land;
- Development land;
- Non-motorised users (NMU); and
- Vehicle travellers (VT).

13.3.2 In each case, the proposed methodology makes use of guidance provided in DMRB Volume 11 where applicable.

13.3.3 Due to the preliminary nature of the PEIR and the lack of available design information, including construction, it is not possible in all circumstances to apply in full the methodology that will be used in the main ES at this stage, in particular identifying significance of effects. The assessment within this PEIR follows the methodology proposed for the ES where possible and sets out preliminary findings and expectations for each sub topic area and it not considered to represent a full assessment which will be undertaken for the full EIA, and reported in the ES.

13.3.4 It is acknowledged in the NN NPS that new or enhanced national networks infrastructure can have direct (paragraph 4.79) and indirect impacts (paragraph 4.80) on health, well-being and the quality of life of the population. The ES, in suitably agreed chapter, will develop and include significance criteria for assessing the effects of the Scheme on health, well-being and quality of life. In compliance with NN NPS paragraphs 4.81 and 4.82, the relevant ES chapter will identify any likely significant adverse impacts and identify measures to reduce or compensate for adverse impacts and consider cumulative impacts.

Private dwellings: Land take and severance

13.3.5 Advice on assessing impacts from the demolition of private property and associated land-take is provided in DMRB Section 3, Part 6 (Land Use), however this does not include sufficient detail upon which to base assessment criteria beyond approximate number of units that may be lost.

13.3.6 Subject to Scheme design, the Scheme may result in loss of land, or impairment of access to one or more private dwellings.

13.3.7 All dwellings, including their access and curtilage, are assessed as receptors of high sensitivity. Demolition, loss of land, and alterations to access will be considered as a Land Take effect. Land take effects may either result in temporary impacts during construction, or permanent impacts occurring during construction. Impact will be assessed according to the criteria set out in Table 13.2.

Table 13.2: Impact to private dwellings assessment criteria

Impact description	Magnitude	Significance
Loss of land and / or access or substantially poorer replacement access to 5+ dwellings.	Major (adverse)	Large (adverse): Significant at a community level

Impact description	Magnitude	Significance
Loss of land and / or access or substantially poorer replacement access to 1-4 dwellings; small loss of curtilage for 5+ dwellings or large loss of curtilage for 1-4 dwellings.	Moderate (adverse)	Moderate (adverse): Locally significant
Re-provided access but less advantageous access for 1-4 dwellings or small loss of curtilage for 1-4 dwellings.	Minor (adverse)	Minor (adverse): Not significant
Negligible loss of curtilage or broadly comparable re-provided access for 1-4 dwellings.	Negligible (adverse)	Neutral adverse: Not significant

Private dwellings: Amenity

13.3.8 Construction of the Scheme has the potential to adversely affect amenity for residents of properties near the Scheme. Amenity effects will be assessed elsewhere in the ES namely in the air quality, noise and landscape and visual assessments; however, where a property or properties are likely to receive a combination of two or more significant traffic or amenity effects, the People and Communities chapter will consider the likely impact of these effects on residents and the local community. Impact will be assessed according to the criteria set out in Table 13.3. All dwellings, including their access and curtilage, are considered to be receptors of high sensitivity.

Table 13.3: In-combination amenity effect impact assessment criteria

Impact description	Magnitude	Significance
Adverse or beneficial alteration in amenity (including two or more significant amenity effects) for 5+ dwellings.	Major (adverse or beneficial)	Large (adverse or beneficial): Locally significant
Adverse or beneficial alteration in amenity (including two or more significant amenity effects) for 1-4 dwellings.	Minor (adverse or beneficial)	Slight (adverse or beneficial): Not significant

Community assets: Land take and severance

13.3.9 Advice on assessing impacts from the loss land used by members of the public is included in Section 3 (Environmental Assessment Techniques), Part 6 (Land Use). DMRB guidance requires assessment of the impact of loss of land used by the community. It requires the undertaking of sufficient assessment to identify the location, status and importance of land used by the public.

13.3.10 To asses this, guidance requires assessors to obtain information about the number of users. It is suggested that in many cases it will be necessary to visit the site and, depending on its importance, either make an estimate of usage or undertake a formal count. The site visit should take place on one or more 'typical' days (for example, a weekday during the school term or at the weekend).

13.3.11 The sensitivity or value of land used by the community will be classified as either High, Medium, Low or Negligible. The value is determined by professional judgement and the criteria for assessing receptor value is set out in Table 13.4.

Table 13.4: Criteria for assessing receptor sensitivity / value

Sensitivity / Value	Criteria
High	Community facility or recreational asset that provides a valuable service to the community, a community group, or individual or is otherwise considered to be of high value to the community. Frequent or continuous use of a resource, no suitable equivalent alternative resources used by the receptor are reasonably available.
Medium	Community facility or recreational asset which is one of several facilities providing the same of similar service to the community, community group, or individual, or is otherwise considered to be of medium value to the community. Moderate or occasional use of a resource, limited equivalent alternative resources used by the receptor are reasonably available.
Low	Community facility or recreational asset which is one of many providing the same of similar service to the community, community group, or individual, or is otherwise considered to be of low value to the community. Low or infrequent use of a resource, suitable alternative resources are readily available.
Negligible	Community facility or recreational asset which does not provide an essential service to the community, community group, or individual, or is otherwise considered to be of negligible value to the community. Very infrequent use of resource, multiple equivalent or better alternatives are freely and easily available.

13.3.12 The magnitude of impact will be assessed based upon professional judgement, considering any agreed mitigation. The criteria used to determine the magnitude of any change in baseline conditions is presented in Table 13.5 below. The magnitude of change is primarily derived from the following:

- Geographical scale of impact;
- Duration of impact; and
- Whether the impact is reversible or irreversible.

Table 13.5: Criteria for assessing magnitude of impact

Magnitude	Criteria
Major	A substantial part of the receptor will be lost. Loss is long term or irreversible.
Moderate	A substantial part of the receptor will be lost. Loss is short term. Or Some of the receptor will be lost. Loss is long term or irreversible.
Minor	A small part of the receptor will be lost. Loss is long term. Or A very small part of the receptor will be lost. Loss is irreversible.
Negligible	A small part of the receptor will be lost.

Magnitude	Criteria
	Loss is short term. Or A very small part of the receptor will be lost. Loss is long term but reversible.

13.3.13 Significance is the product of and the sensitivity of receptors magnitude of impact. The significance of effects within this assessment is measured according to Table 13.6 below. Of the effects described, moderate and major effects will be considered 'significant'.

Table 13.6: Significance of effects matrix

Significance (sensitivity of receptor)	Impact magnitude		
	Major	Moderate	Minor
High	Large adverse/ beneficial - significant	Large adverse/ beneficial - significant	Moderate adverse/ beneficial - significant
Medium	Large adverse/ beneficial - significant	Moderate adverse/ beneficial - significant	Slight adverse/beneficial - not significant
Low	Moderate adverse/ beneficial - significant	Slight adverse/ beneficial - not significant	Negligible - not significant

Table Source: DMRB Volume 11, Section 2, Part 5, HA 205/08

Community assets: Amenity

13.3.14 The Scheme may result in changes in amenity experienced at community facilities or land used by the community. Amenity and traffic effects (including air quality, noise, vibration, and visual impact caused either directly by the Scheme itself or by changes in traffic flows brought about by the Scheme) will be considered individually in detail elsewhere in the ES namely the air quality and noise assessments. The People and Communities chapter will consider instances where users of a community facility or land used by the community may experience a combination of such effects, leading to a cumulative deterioration in amenity.

13.3.15 A qualitative assessment of the potential impact of the Scheme on the amenity of community facilities and land used by the community during construction and operation is proposed. This assessment will draw upon the conclusions of the traffic, air quality, noise, vibration and visual impact assessments.

13.3.16 The sensitivity or value of land used by the community will be classified as either High, Medium, Low or Negligible. The value is determined by professional judgement and the criteria for assessing receptor value is set out in Table 13.4 above.

13.3.17 The method for the assessment of magnitude is based on a bespoke set of assessment criteria, which have been developed using professional judgement to assign a level of significance to effects arising from the impacts, based on the criteria set out in Table 13.7.

Table 13.7: Community facilities assessment criteria

Impact description	Magnitude
Substantial and permanent changes in environmental amenity for a large number of people.	Major (adverse or beneficial)
A substantial change to a modest number of people's environmental amenity or a moderate change in many people's environmental amenity. Impacts can be temporary or permanent but do not significantly affect the overall functioning of the land use in the longer term.	Moderate (adverse or beneficial)
A detectable but non-material change to environmental amenity for a small or large number of people. Changes might be noticeable, but the beneficial or adverse impacts fall within the range of normal variation.	Minor (adverse or beneficial)
Changes that are unlikely to be noticeable (i.e. well within the scope of natural variation).	Negligible (adverse or beneficial)

13.3.18 Of the effects described in Table 13.7, moderate and major effects will be considered 'significant'. The significance matrix in Table 13.6 above will be used.

Local businesses

13.3.19 The Scheme has potential to effect existing local businesses. Possible impacts include isolation or disruption to access and changes in local amenity, which may diminish trading conditions. In order to assess possible effects on local businesses, a schedule of properties that could reasonably be affected by the Scheme will be compiled based upon desktop research.

13.3.20 Having identified potential receptors, likely impact will be assessed according to a qualitative approach, evaluating the Scheme's potential impact (and the duration of any impact), during both construction and operation, on each receptor. The assessment will consider the likely effects arising from each impact the sensitivity of a receptor to each impact and the magnitude of any identified effect, to determine the significance of effects.

13.3.21 The relative sensitivity of local business receptors to potential impacts such as demolition, land take, and disruption to access is assessed in line with the definitions provided in Table 13.8 below.

Table 13.8: Sensitivity of local businesses

Receptor sensitivity	Definition
High	Business viability likely to be permanently jeopardised by a short disruption to access or worsening of trading conditions.
Medium	Business profitability may be harmed by a short or medium-term disruption to access or worsening of trading conditions.
Low	Business could continue to operate without substantial injury if affected by a disruption to access or worsening of trading conditions.

13.3.22 Magnitude of impacts on local businesses will be classified as Major, Moderate, Minor, or Negligible, in line with the definitions provided in Table 13.9 below.

Table 13.9: Magnitude of impact on local businesses

Impact magnitude	Definition
Major	The Scheme would have a very adverse/beneficial effect on the function or operation of the business for a prolonged period of time.
Moderate	The Scheme would have a very adverse/beneficial temporary effect on the function or operation of the business for a short period of time (e.g. <3 months during peak construction period); or The Scheme would have a modest adverse/beneficial effect on the function or operation of the business for a prolonged period of time.
Minor	The Scheme would have a modest adverse/beneficial temporary effect on the function or operation of the business for a short period of time (e.g. <3 months during peak construction period); or The Scheme would have a slight adverse/beneficial effect on the function or operation of the business for a prolonged period of time.
Negligible	The Scheme would have little or no adverse/beneficial effect on the function or operation of the business.

13.3.23 Significance is the product of the sensitivity of receptors and magnitude of impact. The significance of effects within this assessment is measured according to Table 13.6 above.

Agricultural land

Best and most versatile agricultural land (BMV)

13.3.24 The assessment follows the approach of the Design Manual for Road and Bridges (DMRB), Volume 11 'Environmental Assessment', Section 3 Part 6 'Land Use'. This identifies six main areas which need to be covered in any assessment of effects on agricultural land. These are agricultural land quality, designated agricultural areas, land take, type of husbandry, severance and major accommodation works for access, water supply and drainage.

13.3.25 No fieldwork was done at this stage and soils and the presence of BMV land were assessed using data from a published soil map. Land use information was obtained from Google Earth imagery.

13.3.26 Agricultural land in ALC Grades 1, 2 and 3a is considered to be of high sensitivity, agricultural land in ALC Subgrade 3b is considered to be of medium sensitivity and land in ALC Grades 4 and 5 is considered to be of low sensitivity.

13.3.27 Therefore, the soils affected by the Scheme are receptors of high sensitivity, except north of the Ebbsfleet Junction where the land is of low sensitivity.

13.3.28 The significance criteria address both magnitude of impact and sensitivity of the resource and consideration of the characteristics of the impact and the receptor, namely.

a. Type of impact - direct or indirect;

b. Nature of impact - beneficial, adverse or neutral;

c. Duration of impact - short or long term, reversible or not; and

d. Frequency of impact - continuous or intermittent, changing with time or constant.

13.3.29 There is no nationally recognised set of criteria for assessing the impact of infrastructure schemes on loss of BMV land and so a bespoke system has been developed to reflect the issues significant to this project.

13.3.30 All Scheme effects are considered to be adverse and are assessed on a scale of very large, large, moderate, slight and neutral.

13.3.31 The magnitude of impact of the junction improvements on agricultural land is assessed on the following scale (Table 13.10), based on likely loss of BMV land.

Table 13.10: Assessment of magnitude of impact on agricultural land

Magnitude	Criteria
Major	The identified impacts are predicted to result in a loss of >20 ha of BMV land
Moderate	The identified impacts are predicted to result in the loss of between 5 ha and 20 ha of BMV land
Minor	The identified impacts are predicted to result in a loss of between 1 ha and 5 ha of BMV land
Negligible	The identified impacts are predicted to result in the loss of <1 ha BMV land

13.3.32 All impacts are negligible. Any additional land occupied or disturbed temporarily during the construction phase would be returned to a condition equivalent to its original and so is excluded from this assessment.

13.3.33 The consideration of the relationship between the sensitivity and the magnitude of change defines the significance of effect of the Scheme on agriculture as shown in Table 13.6.

Agricultural land holdings

13.3.34 Impact on agricultural holdings will be assessed as follows. The sensitivity of agricultural holdings can be assessed as 'High', 'Medium', 'Low' or 'Negligible' are shown in Table 13.11.

13.3.35 The magnitude of the predicted impact on agricultural holdings may be assessed as 'Major', 'Moderate', 'Minor' or 'Negligible' following the criteria given in Table 13.12 below. These criteria were used successfully in the EIA of HS2 Phase 1 (HS2 Ltd, 2013).

13.3.36 In general terms, larger farm holdings have a greater capacity to absorb impacts and are less sensitive. However, the scale of the land holding is reflected in the magnitude of impact and the percentage land-take from the farm. For example, the loss of 100 hectares from a 400-hectare (1,000 acre) farm would be a high impact (25%), whereas the same land-take from a 1,000-hectare farm would be low (10%).

Table 13.11: Sensitivity of receptors - Agricultural holdings

Value	Receptors
High	Farm types in which the operation of the enterprise is dependent on the spatial relationship of land to key infrastructure, and where there is a requirement for frequent and regular access between the two, or dependent on the existence of the infrastructure itself, e.g.: – Dairying, in which milking cows must travel between fields and the parlour at least twice a day; – Irrigated arable cropping and field-scale horticulture, which are dependent on irrigation water supplies; – Intensive livestock or horticultural production which is undertaken primarily within buildings, often in controlled environments; – Marginal agricultural holdings; – Horses; – Fruit crops; – Land in agri-environmental schemes (Higher Level Stewardship); – Land in agri-environmental schemes (Organic Entry Level Stewardship); – Land with organic/organic conversion status; – Land with Notifiable Weeds; – Land with Notifiable Scheduled Diseases; – Land in woodland/forestry grant schemes; and – Statutory rural land designations, e.g. Nitrate Vulnerable Zones (re EU Nitrate Directive (91/676/EC)).
Medium	Farm types in which there is a degree of flexibility in the normal course of operations, e.g.: – Combinable arable farms; – Grazing livestock farms (other than dairying); – Unimproved pasture; – High value crops; and – Land in agri-environmental schemes (Entry Level Stewardship).
Low	Large agricultural holdings. Farm types and land uses undertaken on a non-commercial basis. Land farmed on an annual grazing licence or other short-term agreement, i.e. where the long term-tenure of the affected land is not secure.
Negligible	Non-agricultural land, including woodland, access tracks and hard-standing.

Table 13.12: Magnitude of impact - Agricultural holdings

Impact magnitude	Key agricultural issues			
	Land-take	Severance	Infrastructure	Nuisance (e.g. noise/dust)
Major	>20% of all land farmed.	No access available to severed land.	Direct loss of farm dwelling, building or structure.	Nuisance discontinues land use or enterprise.
Moderate	>10% to 20% of all land farmed.	Access available to severed land via the public highway.	Loss of or damage to infrastructure affecting land use.	Nuisance necessitates change to scale or nature of land use or enterprise.
Minor	> 5% to 10% of all land farmed.	Access available to severed land via private way.	Infrastructure loss/damage does not affect land use.	Nuisance does not affect land use or enterprise.
Negligible	5% or less of all land farmed.	No new severance.	No impact on farm infrastructure.	No nuisance on land use or enterprise.

13.3.37 Significance is the product of the sensitivity of receptors and magnitude of impact. The significance of effects within this assessment is measured according to Table 13.6 above.

Development land

13.3.38 The Scheme is likely to result in effects on development land. Assessment of the effects of the Scheme on development land will be based upon guidance set out in DMRB, Volume 11, Section 3, Part 6, Chapter 5: Effects on Development Land.

13.3.39 This guidance suggests that the environmental assessment should take account of, as far as is practicable, future changes in land use due to new development which would be likely to occur in the absence of a scheme. This should be done by considering the impact of a scheme's land-take on any sites covered by local planning authorities' land use planning designations.

13.3.40 In addition, future changes in land use, for which planning permission has been granted may also be relevant to the assessment of a scheme. For example, where a proposed scheme would run close to an area reserved for housing development it should be recognised that more residences would be affected by noise, visual intrusion, etc. than the current assessment suggests. Alternatively, planned development could reduce the landscape quality of an area, for example.

13.3.41 In order to assess potential effects of the Scheme on development land, a desk based review of local planning policy and associated mapping and a search of planning consents will be undertaken in order to identify potential 'receptors'. The impact of the Scheme will then be assessed using a descriptive approach that considers potential 'land-take' from allocated or consented sites and the effect the Scheme may have on allocated or consented sites nearby. This assessment will consider the extent to which the Scheme would support, depart from, or

hinder planning policy aims. The significance of impact on development land will be assessed according to Table 13.13 below.

Table 13.13: Assessment of magnitude of impact on agricultural land

Assessment Score	Contribution to Achievement of Policy Objectives
Significant Beneficial	The Scheme substantially contributes to the achievement of, or is consistent with, the intended use of identified development land.
Beneficial	The Scheme partially contributes to the achievement of, or is consistent with, the intended use of identified development land.
Neutral	The Scheme does not affect the intended use of identified development land or equally benefits and hinders achievement of the intended use.
Adverse	The Scheme partially hinders or is inconsistent with the intended use of identified development land.
Significant Adverse	The Scheme substantially hinders or is inconsistent with the intended use of identified development land.

Non-motorised users (NMU): Journey length and local travel patterns

13.3.42 The assessment for NMU impact will be undertaken in accordance with the guidance in the Pedestrians, Cyclists and Equestrians component of DMRB Volume 11, Section 3, Part 8.

13.3.43 Existing and proposed routes and Rights of Way used by NMUs that may be affected by the Scheme will be identified through a desk based assessment, supported where applicable by the findings of user surveys already undertaken and are being undertaken for the NMU Audit.

13.3.44 The way in which the Scheme might affect the duration or distance of pedestrians' and others' journeys, existing local travel patterns will be established.

13.3.45 The routes likely to be affected and the number of NMUs likely to experience changes in journey times on these routes will be reported. Particular attention will be given to impacts on vulnerable groups.

13.3.46 It is considered likely that the majority of NMU trips in the study area are associated with recreation. Recreational trips are generally considered less sensitive to changes in journey length in that users are not necessarily seeking the fastest or most direct route from their location to a specific destination.

13.3.47 A schedule will be produced showing changes in typical journey lengths and likely changes in travel patterns, with an estimate of the number of people affected in each case and a descriptive commentary of impacts.

Non-motorised users: Changes in amenity

13.3.48 Amenity is defined as the relative pleasantness of a journey. In assessing amenity for the routes used by pedestrians and others, a descriptive approach will be employed which gives an overall indication of the change in amenity and the number of journeys affected. Reasoning behind this judgement will be provided.

13.3.49 Other factors will also be considered where applicable, such as footpath width and distance from traffic, barriers between pedestrians and traffic, and the quality of street furniture and planting. For ramblers, changes in the quality of landscape or townscape will also be relevant. For cyclists, they include positive factors, such as the clear signage of alternative routes for cyclists, and subways or cycle crossings, and negative factors such as junctions where cyclists and vehicles are not separated. For equestrians, landscape quality will generally be an important factor, as may some of those affecting cyclists, depending on the existing and proposed provision for riders. Safety for equestrians crossing a route is a particularly important consideration.

Non-motorised users: Severance

13.3.50 Changes in journey length and journey times and amenity for pedestrians and others may be such that they affect, adversely or beneficially, the degree to which a locality is subject to 'community severance'.

13.3.51 Community severance is defined here as the separation of residents travelling by non-motorised means from facilities and services they use within their community caused by new or improved roads or by changes in traffic flows. In addition to changes in community severance caused by changes in pedestrians' and others' ability to travel in the locality of a scheme, severance may sometimes be caused by the demolition of a community facility or the loss of land used by members of the public.

13.3.52 In accordance with DMRB Volume 11 Section 3 Part 8, new severance will be described using a three-point scale, viz, Slight, Moderate or Severe severance.

- Slight: Generally, in cases of slight severance current journey pattern is likely to be maintained, but there will probably be some hindrance to movement.
- Moderate: In cases of moderate severance some residents, particularly children and elderly people, are likely to be dissuaded from making trips. Other trips will be made longer or less attractive.
- Severe: In cases of severe severance, People are likely to be deterred from making trips to an extent sufficient to induce a re-organisation of their habits. This would lead to a change in the location of centres of activity or in some cases to a permanent loss of a particular community. Alternatively, considerable hindrance will be caused to people trying to make their existing journeys.

13.3.53 These descriptions will be coupled with an estimate of the numbers of people affected, their location and the community facilities from which they are severed. On this basis, no prescriptive tables for sensitivity, magnitude, or significance are proposed.

Vehicle travellers: Views from the road

13.3.54 The assessment of travellers' views will be based on the guidance in DMRB 11.3.9 and TAG Unit 4.1 Social Impact Appraisal (November 2014) in the Department of Transport's TAG Guidance.

13.3.55 'View from the road' is taken to be the extent to which travellers, including drivers, are exposed to the different types of scenery through which a route passes. Aspects to be considered are:

- The types of scenery or the landscape character;
- The quality of the landscape;
- Features of particular interest or prominence in the view; and
- The extent to which travellers may be able to view the scene.

13.3.56 The extent to which travellers may be able to view landscape shall be considered according to the following categories in defining sensitivity:

- No View: road in steep cutting or contained by earth bunds, environmental barriers or adjacent structures;
- Restricted View: frequent cuttings or structures blocking the view;
- Intermittent View: road generally at ground level with shallow cuttings or barriers at intervals; and
- Open View: view extending over many miles or only restricted by existing landscape features.

13.3.57 The effects of the Scheme on traveller's views from existing routes and from the carriageway of the Scheme itself will be assessed according to the TAG Social Impact Appraisal guidance. The effect on traveller's views shall be categorised in one of the following three ways:

- Neutral: little or no effect for most views from the road or improvements on some views are generally balanced by deterioration in others;
- Beneficial: views from the road would be, on balance, a change for the better; and
- Adverse: views from the road would be, on balance, a change for the worse.

13.3.58 The significance of effects upon traveller's views will also be assessed according to the TAG Social Impact Appraisal guidance:

- *'the assessment is likely to be slight (beneficial or adverse) where the numbers of travellers affected is low (less than 500 a day, say);*
- *the assessment is likely to be large (beneficial or adverse) where the numbers of travellers affected is high (more than 10,000, say);*
- *the assessment is likely to be moderate (beneficial or adverse) in all other cases.'*

Vehicle travellers: Driver stress

13.3.59 Driver stress is defined in the DMRB as the adverse mental and psychological effects experienced by a driver traversing a road network. The level of stress experienced by a driver may be affected by several factors including; road layout and geometry, surface riding characteristics, junction frequency and speed and flow per lane. Reduction in achievable vehicle speeds resulting from congestion may result in substantially increased journey times, introducing a degree of severance and increasing driver stress.

13.3.60 There are three main components of driver stress: frustration; fear of potential accidents; and uncertainty relating to the route being followed:

- Driver frustration - caused by an inability to drive at a speed consistent with the standard of the road, and increases as speed falls in relation to expectations;
- Driver fear - the main factors are the presence of other vehicles, inadequate sight distances and the likelihood of pedestrians, particularly children, stepping into the road. Fear is highest when speeds, flows and the proportion of heavy vehicles are all high, becoming more important in adverse weather conditions; and
- Driver uncertainty - caused primarily by signing that is inadequate for the individual's purposes.

13.3.61 The measurable aspect of driver stress is associated with frustration due to delays. The level of driver stress has been determined through a qualitative assessment of the above factors, under a three-point descriptive scale, as recommended under DMRB guidance, as Low, Moderate or High.

13.3.62 As per the DMRB guidance, the following tables will be used to guide the assessment of stress in the ES.

Table 13.14: Driver stress - Dual-carriageway roads

Average peak hourly flow per lane, in flow Units/1 hour	Average Journey Speed Km/hr		
	Under 60	60-80	Over 80
Under 1200	High*	Moderate	Low
1200-1600	High	Moderate	Moderate
Over 1600	High	High	High

* “Moderate in urban areas”

Table 13.15: Driver stress – Single carriageway roads

Average peak hourly flow per lane, in flow Units/1 hour	Average Journey Speed Km/hr		
	Under 50	50-70	Over 70
Under 1200	High*	Moderate	Low
1200-1600	High	Moderate	Moderate
Over 1600	High	High	High

* “Moderate in urban areas”

13.4 Baseline conditions – Tables

Table 13.16: Bean and Ebbsfleet Junctions – potential residential and private property receptors

Bean Junction	Ebbsfleet Junction
Ightham Cottages	The Cottage
Hope Cottages	Springhead House
Bean House	
Bean Farm	

Bean Junction	Ebbsfleet Junction
Thrift Cottage	
Woodbine Cottage	
Brickfield Nurseries	
The Bungalow	
Merry Chest Cottage	
Oakwood	
Watling House	

Table 13.17: Bean and Ebbsfleet Junctions – potential business receptors

Bean Junction	Ebbsfleet Junction
Bluewater 330+ retail stores and services	Sainsburys
A2 Car Breakers	Springhead Nurseries;
Albus Environmental	Millbrook Garden Centre;
Shine Time Car Wash	Springhead Nurseries;
Forestrall Ltd Timber Merchant	Pepper Hill Waste and Recycling Centre
Merry Chest Café and Bar	
Sprint Wholesale	

Table 13.18: Development land

Development	Distance from site (closest point)	App No.	Description
Dartford and Gravesham Borough Councils			
Ebbsfleet	Immediately adjacent to red line boundary	96/00047/OUT (Dartford) and 96/00035/OUT (Gravesham) 20150155 (Ebbsfleet)	Development of up to 789,550 m^2 gross floorspace comprising employment, residential, hotel and leisure uses supporting retail & community facilities & provision of car parking, open space, roads & infrastructure.
Dartford Borough Council			
Hedge Place Road	Approximately 450 m from red line boundary	12/01150/FUL	Erection of 56 dwellings comprising 33 x 3 bedrooms and 11 x 4-bedroom houses and 12 x 2-bedroom flats together with associated landscaping works, parking and infrastructure works
Eastern Quarry	Immediately adjacent to red line boundary	12/01451/EQVAR	Mixed use up to 6250 dwellings & in addition up to 231,000 square metres of built floorspace (in total) for: business premises (B1 (a), (b) and (c)) education community & social facilities (D1 & D2) (schools, libraries, health centres, places of worship, sports leisure centres, community centres, care facilities for the young, old and/or infirm); hotels (C1); theatre (D2);

Development	Distance from site (closest point)	App No.	Description
			supporting retail (A1, A2, A3, A4 & A5) & leisure (D2) facilities; miscellaneous sui generis uses, ancillary & support facilities.
Land at St Clements Way	Approximately 250 m from red line boundary	12/01404/FUL	Erection of 187 dwellings extending to between 2 and 3 storeys in height, including 132 houses and 55 flats, together with the provision of associated public realm and landscaping, parking and infrastructure works
Land at St Clements Way Phase 2	Approximately 250 m from red line boundary	14/01344/FUL	Erection of 156 dwellings comprising 47 houses and 109 flats and 160 sqm of flexible commercial space, class A1, A2 and B1 uses together with the provision of associated public realm and landscaping, parking and infrastructure works
Land at St Clements Way Phase 2	Approximately 250 m from red line boundary	16/01913/FUL	Erection of 17 flats (comprising 14 x 2 bed and 3 x 1 bed flats) and 7 x 3 bed houses together with the provision of associated public realm and landscaping, parking and infrastructure works
Bluewater	Adjacent to red line boundary	16/01207/OUT (Dartford)	Outline application for extensions and alterations to the shopping centre through part demolition, alteration and refurbishment of existing buildings/structures and erection of new buildings/structures to provide retail and related uses (Use classes A1-A5), reconfiguration of existing car and coach parking areas, reconfiguration of existing lake, open space and public realm, alteration of existing pedestrian links within the site, infrastructure and associated facilities. Submission of reserved matters (17/01202/REM)
Ebbsfleet Green	Immediately adjacent to red line boundary	05/00308/OUT	Mixed use redevelopment of site comprising a mixed use of up to 950 dwellings & non-residential floorspace for: shopping, food & drink, hotel use; community, health, education & cultural uses; assembly & leisure facilities & associated works to provide the development
	Approximately 160 m from red line boundary	16/01271/EDCCON	Use Class B1a Floor Space and up to 50 car parking spaces with associated landscaping and public realm enhancements.

13.5 Potential impacts – Tables

Table 13.19: Agricultural land

Location	Agric land take
A2 Bean gyratory: arable land	100 m^2
West of A296/A2 merge: pasture	200 m^2
North of Ebbsfleet Junction: scrub and rough grassland	1.2 ha

Table 13.20: Agricultural land

Receptor	Sensitivity of receptor	Magnitude of impact	Significance of effect
Agricultural BMV soils	High	Negligible	Neutral to slight
Ungrazed non-BMV rough grass and scrub	Low	Negligible	Neutral

14. Appendix M. Climate

14.1 Planning and policy context

14.1.1 Planning and policy requirements regarding the climate impact associated with a Scheme are driven by international agreements established by the United Nations Framework Convention on Climate Change (UNFCCC) as the main forum for international action on climate change and include the Kyoto Protocol and Paris Agreement.

14.1.2 The Kyoto Protocol was established in 1997 and commits the Parties to setting internationally binding emission reduction targets, which the UK has implemented through the Climate Change Act (2008).

14.1.3 The Paris Agreement has set a long-term goal to keep global temperature rise this century below 2 degrees Celsius above pre-industrial levels and, if possible, to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius. The UK have ratified this agreement.

National planning policy

National Planning Policy Framework (NPPF)

14.1.4 The NPPF was published on the 27th of March 2012 and replaces the majority of the Planning Policy Statements and Planning Policy Guidance. The Climate Change Act (2008) strengthened the institutional framework in respect of planning policy and managing the impact of climate change. In line with the objectives and provisions of the Climate Change Act (2008), the NPPF states that local authorities should adopt proactive strategies to mitigate and adapt to climate change.

National Networks National Policy Statement (NN NPS)

14.1.5 With relevance to this Chapter, the NN NPS (2014) highlights that the impact of road improvements on aggregate emission levels is likely to be small.

14.1.6 However, it requires that applicants should both provide evidence of the carbon impacts of a Scheme and undertake an assessment of the Scheme against the Government's carbon budgets. This will be implemented through the methodology presented below.

Climate Change Act

14.1.7 The Climate Change Act (2008) creates a new approach to managing and responding to climate change in the UK. The Government has established legally binding carbon reduction targets through the Climate Change Act (2008) to drive the reduction requirements required by the Kyoto Protocol, as set out in Table 14.1. The overall objective is to reduce emissions by at least 80% of the 1990 base level year by 2050.

Table 14.1: UK carbon reduction targets

Carbon Budget	Carbon Budget Level	Reduction Below 1990 Levels
3rd carbon budget (2018 to 2022)	2,544 MtCO2e	37% by 2020
4th carbon budget (2023 to 2027)	1,950 MtCO2e	51% by 2025
5th carbon budget (2028 to 2032)	1,725 MtCO2e	57% by 2030

Table Source: Committee on Climate Change (2017).

HM Government: The Carbon Plan: Delivering our Low Carbon Future

14.1.8 The Carbon Plan (2011) sets out how the UK will achieve the emissions reduction commitment of 80% by 2050, made in the Climate Change Act (2008). It sets out how the UK will make the transition to a low carbon economy, maintain energy security and minimise costs to consumers.

14.1.9 The Plan does not relate directly to road improvement schemes, but the Scheme should support implementation of the plan by prioritising low carbon materials and construction and operational energy efficiency, where practicable.

HM Government: Construction 2025

14.1.10 Construction 2025 (2013) sets out how efficiency improvements will be created in construction covering sustainability and carbon, and includes a target to reduce emissions by 50%.

14.1.11 The emissions reduction target of 50% is not scheme specific, and the efficiency improvements are broad. In terms of the Scheme and emissions reduction, the reduction target should be taken into account when developing Scheme specific mitigation measures, where relevant.

HM Treasury: Infrastructure Carbon Review

14.1.12 HM Treasury produced the Infrastructure Carbon Review (2013) to set out carbon reduction actions required by infrastructure organisations.

14.1.13 In terms of the Scheme and emissions reduction, the reduction actions should be taken into account when developing Scheme specific mitigation measures, where relevant.

Department for Transport: Road Investment Strategy: for the 2015/16 – 2019/20 Road Period

14.1.14 The Road Investment Strategy (2015), as amended in 2016, published by the Department for Transport, sets out the strategy for the transformation of the strategic road network (SRN) by 2040 to create a modern SRN that supports a modern Britain. The Strategy also specifies objectives to significantly reduces emissions across the SRN, including emissions reductions from SRN construction activities.

14.1.15 The Scheme should support implementation of the strategy delivering carbon requirements specified as relevant to it.

14.1.16 The Scheme should support the implementation of the strategies, frameworks and tools by delivering mitigation measures of relevance to the Scheme.

Regional policy

Kent County Council: Environment Policy and Targets

14.1.17 Kent County Council's Environment Policy includes a commitment to:

- Reduce carbon dioxide emissions related to its corporate estate, and its corporate target up to 2021 is to reduce greenhouse gas emissions by 32% by 2021. With particular reference to this chapter, it specifically refers to street lighting; and
- Make sure its estate and services are adapted to the future impacts and opportunities of climate change.

Kent County Council: Environment Strategy

14.1.18 The purpose of the Environment Strategy (2016) is to set out the high-level priorities for Kent in terms of environment and related health and economic outcomes. It recognises the major role of transport infrastructure, and specifically includes identification of the significant negative impact of carbon dioxide emissions from transport in Kent. The Environment Strategy includes priorities to address carbon dioxide emissions from transport and the issue of severe weather, heat and flooding.

Kent County Council: Environment Strategy Implementation Plan

14.1.19 The Environment Strategy Implementation Plan (2017) sets out the specific activities to implement the Strategy summarised above. The Scheme should take into account the principles and requirements of the Plan when specifying mitigation measures of relevance to the Scheme.

Local plans and policies

14.1.20 In addition to the aforementioned Kent policy, strategy and implementation plan, the associated borough councils, either support the Kent strategy, or have equivalent plans that detail how they will seek to reduce their direct emissions and ensure that outputs of the Kent Climate Change Risk Assessment are integrated into policy and planning.

14.1.21 The Scheme should support the implementation of the policies and plans by delivering mitigation measures of relevance to the Scheme.

Amendment to the EIA Directive (2014/52)

14.1.22 The requirement to consider a project's vulnerability to climate change has resulted from the 2014 amendment to the EIA Directive (2014/52). The Directive has been fully transposed into UK law in the Town and Country Planning (Environmental Impact Assessment) Regulations and came into force in the UK on the 16th May 2017. The Directive requires: *'A description of the likely significant effects of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change.'*

14.1.23 Climate resilience and climate change adaptation is fast becoming an established issue in EIA policy, practice and organisational and planning policies. This is in response to legislative and regulatory drivers, but also in response to

the nature of the risks and associated costs presented to projects and programmes. The consideration of climate resilience issues for the Project is therefore not only important to demonstrate compliance with these legislative and regulatory requirements, but to also demonstrate and respond to the project's long-term resilience for planning and effective and efficient operation.

14.2 Study area

Effect of the Scheme on climate

14.2.1 In general terms, the study area will cover the emissions of GHGs (herein referred to as 'emissions') throughout the Scheme's lifecycle, including its supply chain, i.e. emissions from:

- The extraction of raw materials;
- Manufacturing;
- Fuel refining;
- Operation of construction plant; and
- Operational/ maintenance/ in-use activities.

14.2.2 In addition, the study area will also cover the emissions from the wider associated road network.

14.2.3 For the purposes of the Scheme specific assessment the study area, and lifecycle stages are defined, as below, according to Section 7 of the PAS 2080:2016 Carbon Management in Infrastructure technical standard. PAS 2080:2016 is considered appropriate to define the study area, until specific guidance for highways schemes is available.

14.2.4 In summary, as per section 7 of PAS 2080:2016 it is anticipated that the Scheme specific study area will cover:

- Products and materials (A1-3), i.e. use of materials for temporary and permanent construction activities;
- Transport to works site (A4), i.e. transportation of construction materials to site;
- Construction/ installation processes (A5), i.e. construction plant use, construction use of mains water, construction waste transportation and construction waste off-site processing;
- Maintenance, repair, replacement and refurbishment (B2-5), i.e. replacement cycles;
- Operational energy use (B6), i.e. operational energy and fuel use; and
- User utilisation of infrastructure (B9), i.e. in use traffic; and
- Benefits and loads beyond the system boundary (D), i.e. predicted effects on traffic on the surrounding road network.

14.2.5 It is anticipated that the following PAS 2080:2016 lifecycle stages will be excluded from the above study area, on the basis that either the associated

emissions are likely to be minimal/ negligible, or the lifecycle stage is not applicable to the Scheme:

- A0. Preliminary studies and consultations;
- B1. Use (e.g. direct operational emissions);
- B7. Operational water use;
- B8. Other operational processes; and
- C1-4. End of life stages (e.g. deconstruction, transport, waste processing for recovery and disposal).

14.2.6 Table 14.2 below further details the lifecycle stages, the anticipated Scheme specific study area and the emissions scope that will be included within the Scheme specific assessment. The scope of the assessment of the Scheme, as set out by the study area, is dependent upon the availability of design, construction and operational data. If such data is not available, part or all of the affected lifecycles stages will be quantified using appropriate assumptions and estimations. The responsibility for such assumptions will be the responsibility of the project design team/ the appointed contractors. All information will be taken at face value and the scope of the assessment will be determined based on this.

Table 14.2: Effect on climate study area

Lifestyle scope	Study area		Emissions scope
A1-3. Products and materials.	The study area will cover the use of temporary and permanent construction materials within the construction site boundary and the supply chains associated with these. Consumables are excluded as they are small, and plant is excluded on the basis of shared use across schemes. Where suitable the quantifications undertaken as part of the materials assessment will be used (Chapter 12).		The emissions scope will account for primary raw material extraction, manufacturing, and intra-manufacturing transportation, as captured in the relevant emissions factor values.
A4. Transport to works site.	The study area will cover transportation of the temporary and permanent construction materials and the distances travelled from the primary site of manufacturing, not the supply depot, including international freight transportation, where relevant. The primary site of manufacturing is used because transportation from a local supply depot does not represent the realistic transportation emissions, so can lead to significant under reporting.		The emissions scope will consider both the direct vehicle/ freight emission and fuel supply chain (well-to-tank) emissions.
A5. Construction/ installation process.	Construction plant use.	The study area for quantification of emissions for construction plant will consider the same plant quantities, sizes and operating hours as that to be used for the noise assessment (Chapter 6).	The emissions scope will consider only the direct plant emission, where only plant specification data is available. If direct fuel consumption data is available, the emissions scope will consider direct plant emissions, but also the fuel supply chain emissions (well-to-tank).

Lifestyle scope	Study area		Emissions scope
	Construction water use.	This study area cover will cover mains water use only within the construction site boundary.	The emissions scope will consider emissions from all activities for the supply of water.
	Construction waste transportation.	The study area will cover transportation of bulk construction waste and the distances travelled from the construction site to the primary processing site.	The emissions scope will consider both the direct vehicle/ freight emission, but also the fuel supply chain (well-to-tank) emissions.
	Construction waste off-site processing.	The study area will cover primary processing of bulk construction waste as available and quantified and in the waste assessment (Chapter 12).	The emissions scope will consider emissions from all activities for waste processing.
B2-5. Maintenance, repair, replacement and refurbishment.	The study area will include the inspection works and planned replacement cycles of bulk items (e.g. road surface replacement) over the planned operational life-time of the project, within the red line boundary for the Scheme.		The emissions scope will consider materials use, transportation, and construction works, as defined by A1-5 above.
B6. Operational energy use.	The study area for operational energy will include the electricity and direct fossil fuel consumption for operation of the infrastructure within the red line boundary for the Scheme, over the planned operational life-time of the Scheme.		The emissions scope will cover direct emissions from consumption of fossil fuels, and supply chain emissions from primary electricity generation, fuel and electricity supply chain (well-to-tank), and transmission and distribution losses for electricity and fuels.
B9. Users utilisation of infrastructure.	The study area will include traffic use of the infrastructure within the red line boundary for the Scheme.		The emission scope will cover direct exhaust emissions from vehicles.
D. Benefits and loads beyond the system boundary.	The study area will include traffic use of the wider road network as determined by the traffic reliability area, as outlined in the air quality assessment (Chapter 5).		The emission scope will cover direct exhaust emissions from vehicles.

Table Source: Interpreted from PAS 2018:2016.

Vulnerability of the Scheme to climate

14.2.7 The Scheme is described in the PEIR Volume 1 Chapter 2 The Project. Figure 14.1 below shows the location of the Scheme alongside the Met Office UK Climate Projections 25 km gridded data, which is the source of climate change information used in this chapter. Figure 14.2 below shows the location of the Scheme within the broader context of the Thames river basin as the site may be at risk of localised fluvial flooding.

Figure 14.1: Location of 25km grid box (ID: 1668)

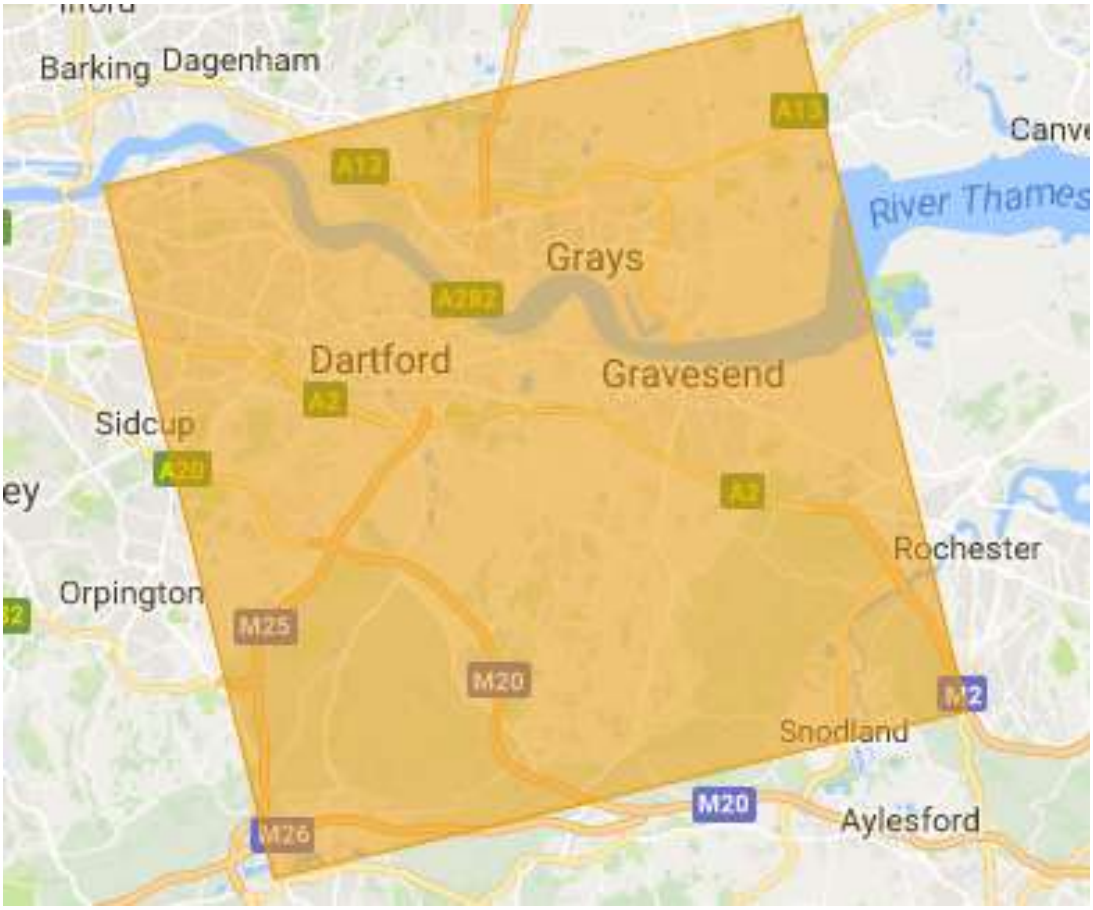


Figure 14.2: Location of Thames river basin

14.3 Methodology

Effect of the Scheme on climate

14.3.1 As aforementioned, there is insufficient design detail to carry out a Scheme specific assessment at this stage, as such the necessary assessment will be undertaken as part of the ES. This methodology section describes the process that will be followed to undertake the assessment. A proxy assessment has been carried out for the purposes of this chapter, which is explained in Table 14.3.

14.3.2 Using DMRB terminology, a 'simple' assessment of the Scheme's emissions will be undertaken using a desk based assessment, to quantify the magnitude and determine the significance of the emissions. The level of detail of the Scheme specific assessment will be determined by the data available within the timeframes of the ES.

14.3.3 The scope of assessment comprises the study area as defined in Section 14.2.

14.3.4 The emissions will be quantified according to the methodologies included within PAS 2080:2016 Chapter 7 (as directed by Highways England (2016) Major Projects' Instructions: Environmental Impact Assessment: Implementing the Requirements of 2011/92/EU as amended by 2014/52/EU (EIA Directive)).

14.3.5 It is acknowledged that guidance is currently being developed by Highways England regarding the assessments of effects of the Scheme on climate. Subject to availability of the guidance within the timeframe of the assessment this will be considered as appropriate.

14.3.6 The key tasks that PAS 2080 specifies are to:

- Define the overall objective of the assessment;
- Define the scope of emissions assessment (e.g. the activities included, the geographical boundary and the timeframes);
- Decide upon assessment methodology, i.e. how the specific calculation will be undertaken and what data will be used;
- Collect the necessary calculation data; and
- Calculate/ determine the emission associated with the Scheme.

14.3.7 Further details on each of the above are provided in the following sections.

Objective

14.3.8 The objective of the proposed assessment is to quantify the emissions from the scheme, the associated supply chain, and the surrounding road network in order to assess the Scheme's significance, and to identify appropriate mitigation measures.

Scope

14.3.9 The scope covers the direct and supply chain emissions resulting from the construction and operational activities of the Scheme, as appropriate. It also includes emissions from vehicles within the red line boundary for the Scheme and the surrounding road network.

Calculation methodology

14.3.10 It is proposed that emissions calculations will be undertaken in the Carbon Knowledgebase (CKB) for all lifecycle stages, with the exception of vehicle use of the scheme (B9) and surrounding road network (D). The CKB contains a detailed library of emissions factors including sources such as the Inventory of Carbon and Energy (ICE) (versions 1.6(a) and 2.0), published by Bath University, the DEFRA Greenhouse Gas Reporting Conversion Factors, and the EMEP/ CORINAIR Emission Inventory Guidebook. These factors will be used with the relevant Scheme data to carry out the calculations, using the automated calculation functionality in the CKB. The emissions for B9 and D will be calculated, as specified in the air quality assessment (Chapter 5) and will cover the first year of operation and then 15 years hence. The emission for B9 and D will be included directly in the CKB. The emissions for D will also be geographically mapped using GIS.

14.3.11 The output of the calculations in the CKB is a tabular model/ footprint, which presents the quantified emissions as total carbon dioxide equivalents (CO2e). The output of the emissions calculations for B9 and D also includes a geographical carbon model specifically highlighting the difference in traffic emissions, as a consequence of the Scheme.

14.3.12 The CKB model will be structured in accordance with the study area as defined in Section 14.2. Table 14.3 provides information on the data that will be gathered and the associated emissions factors which are likely to be used for the Scheme specific assessment.

14.3.13 The outputs of the CKB model/ footprint will be succinctly presented in tabular format in the ES. In addition, the geographical mapping will be included as a figure/ series of figures in the ES.

Table 14.3: Emissions assessment methodology

Scheme specific lifecycles	Methodology		Emissions factors
A1-3. Temporary and permanent construction materials.	Temporary and permanent construction materials data will be sourced and defined, where suitable, in alignment with the materials assessment (Chapter 12) If data is not suitable for use proxy engineering data from previous projects and engineering judgement will be used.		Bath Inventory of Carbon and Energy (2.0) emissions factor values will be used to convert the materials data into CO_2e.
A4. Materials transport to works site.	The materials quantities calculated for A1-3 will be used to determine quantities to be transported. Transportation distances will be estimated based on either the data presented in the Transport Assessment or an anticipated average distance to/ from supplier locations. Together this data will be used to define kilometre and/ or tonne kilometre values.		The kilometre and/ or tonne kilometre values will be converted into CO_2e using the Defra 2017 vehicle/ freight emissions factors.
A5. Construction/	Construction plant use.	Plant quantities, sizes and operating hours will be used as presented in the noise assessment (Chapter 6). This will	The plant hours of operation will be converted into CO_2e

Scheme specific lifecycles	Methodology		Emissions factors
installation process.		be used to estimate total hours of operation per plant type during the construction phase.	using CORINAR emissions factors.
	Construction water use.	Total water use during construction will be estimated based on either data provided by the design team/ the contractor or industry recognised indices.	Water quantities will be converted into CO_2e quantities using the Defra 2017 water supply emissions factor.
	Construction waste transportation.	The waste quantities which will be calculated as part of the waste assessment (Chapter 12) will be used in combination with the transportation distances presented in the Transport Assessment or an anticipated average distance to/ from waste treatment/ disposal facilities. Together these will be used to define tonne kilometre values.	The tonne kilometre values will be converted into CO_2e using the Defra 2017 vehicle/ freight emissions factors.
	Construction waste off-site processing.	The waste treatment/ disposal options, which will be estimated as part of the waste assessment (Chapter 12) will be used to establish the likely waste treatment/ disposal route and the associated treatment/ disposal quantities.	The data will be converted into CO_2e using the Defra 2017 waste treatment/ disposal emissions factors.
B2-5. Replacement	Maintenance, repair, replacement and refurbishment cycles and the information regarding the planned operational life span will be obtained from the design team, and will be simply and collectively defined as replacement. Unitised emissions factor values for the relevant materials/ activities will used as per A1-A5 above.		See methodology and emissions factors for A1-A5 above.
B6. Operational energy use.	Energy consumption and estimated operational hours (e.g. associated with lighting and gantries) will be collected. This will be combined using a total energy use value (kilowatts).		Kilowatts will be converted into CO_2e using the Defra 2017 electricity emissions factors.
B9. In-use traffic on the Scheme.	The CO_2e data quantified using the air quality assessment methodology (Chapter 5) for operational traffic use will be directly used.		CO_2e emission values will be directly displayed in the CKB.
D. In use traffic on wider network.	The CO_2e data quantified using the air quality assessment for the wider road network as determined from the traffic reliability area will be directly used, and will also be geographically mapped using GIS.		CO_2e emission values will be directly displayed in the CKB.

Table Source: Interpreted from PAS 2080:2016.

Data collection

14.3.14 The specific data necessary to undertake the Scheme specific assessment will be collected directly from the appropriate personnel (e.g. the design team, the contractor(s) and the environmental assessment team).

14.3.15 As aforementioned, the assessment will be dependent upon the availability of design, construction and operational information, in advance of the preparation of the ES, and all information will be taken at face-value. Furthermore, if the required information is not available within the timeframes of the assessment assumptions and estimations will be used to quantify relevant emissions.

Calculation and determination of emissions

14.3.16 The emissions for the specified lifecycle stages will be calculated by entering the Scheme data into the CKB using the appropriate formulas and emissions factors, as detailed in Table 14.3. The emissions for B9 and D will be calculated using the methodology specified in the air quality assessment (Chapter 5). These will then be entered into the CKB directly. The road network emissions for B9 and D will also be geographically mapped using the shape file(s) in GIS.

14.3.17 The Scheme emissions and the emissions changes to the surrounding roads network will be analysed by comparison of the do-minimum and do-something scenarios of the Scheme against:

- Each other;
- Background emissions;
- Emissions reduction targets; and
- Emissions changes to the surrounding road network.

14.3.18 The first year of operation and the projected operational year will be considered in the analysis.

14.3.19 The only guidance currently available for EIA assessment of emissions is Chapter 4 of the Department for Transport's TAG Unit A3 Environmental Impact Appraisal.

14.3.20 Whilst TAG can be used for in-use traffic assessments and is commonly applied in that regard through the air quality assessment, it does not apply to the full scope of emissions related to the Scheme. Therefore, in the absence of suitable guidance, the assessment will be based on the application of professional technical judgement and expertise, as summarised above.

14.3.21 This will be used to determine whether the effects are positive or negative and major, moderate, minor, negligible or no change, as shown in the matrix Table 4.1 and defined in Table 4.2 in the PEIR Volume 1 Chapter 4 Environmental Impact Assessment Process.

14.3.22 Following the determination of emissions mitigation measures will be identified.

Vulnerability of the Scheme to climate

14.3.23 The proposed approach for integrating the consideration of climate change into the EIA process aligns with the following guidance:

- European Commission (2013) Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment.

Scoping phase

Step one: Identify receptors and analysis of legal requirements

14.3.24 During this stage, we have identified relevant receptors which may be affected by climate change with consideration for:

- The impact of extreme weather and changes in climate on the project over its lifetime;
- The impact of the project on the climate resilience of wider (social, environmental and economic) systems over time (reflecting on the climate change issues associated with other relevant assessment areas of the EIA); and
- These receptors are likely to comprise both known (for example, receptors affected by historical flooding gleaned from literature review) and unknown (new) receptors.

14.3.25 This stage also includes the assessment and definition of the policy context.

Stage two: Climate vulnerability assessment

14.3.26 A climate vulnerably assessment has been undertaken to clearly identify the primary receptors that are vulnerable and the nature of this vulnerability over the life of the project. These vulnerabilities will then inform the detailed assessment phase.

14.3.27 The vulnerability of a project to extreme weather and climate change depends on:

- The typical sensitivity of the type of the project to climate variables and hazards; and
- The geographic exposure of the project to climate variables and hazards.

14.3.28 The climate vulnerability assessment was informed by a qualitative sensitivity analysis and an assessment of exposure from an evolving baseline. The sensitivity analysis focused on identifying the typical climate sensitivities for receptors to relevant climate variables and climate-related hazards, such as those outlined in Table 14.4. The level of exposure of the primary receptors was then determined based on an expert understanding of observed climate, scenarios for projected future climate and a literature review of climate hazards associated with the prescribed changes.

Table 14.4: Typical climate variables and related hazards

Climate variable	Climate-related hazard
Average (air) temperature change (annual, seasonal, monthly)	Sea level rise (plus local land movements), storm surge/tide
Extreme (air temperature (frequency and magnitude)	Water availability/drought

Climate variable	Climate-related hazard
Average precipitation (annual, seasonal, monthly)	Flood (coastal and fluvial)
Extreme rainfall (frequency and magnitude)	Subsidence and ground stability
Average wind speed change (annual, seasonal, monthly)	Fog
Gales and extreme winds (frequency and magnitude)	Storms (tracks and intensity), including storm surge
Humidity	Snow, ice and hail
Solar radiation	Storms and lightning

14.3.29 A categorisation was then assigned to each climate variable/hazards in relation to each receptor based on the following scale:

- **High:** High climate sensitivity/exposure;
- **Moderate:** Moderate climate sensitivity/exposure; and
- **Low:** No significant climate sensitivity/exposure.

14.3.30 This was a qualitative assessment informed by expert opinion and a supporting literature review. The vulnerability of primary receptors to relevant climate variables and hazards was then determined using the vulnerability matrix below (Table 14.5). High and selected Moderate vulnerabilities will then be taken forward to the detailed assessment stage.

Table 14.5: Vulnerability Rating Matrix

Sensitivity	Exposure		
	Low	Moderate	High
Low	Low	Low	Low
Moderate	Low	Moderate	Moderate
High	Low	Moderate	High

Detailed assessment phase

Step three: Baseline conditions

14.3.31 In support of the climate risk assessment an evolving climate baseline will produce a profile of key climate variables and hazards and how they are expected to change over the life of the project. The evolving baseline will be based on local/regional Met Office observed extreme weather and climate data, UKCP09 climate projections (with consideration for the associated uncertainty) and other relevant sources of climate risks data and information (Highways England, 2016). Note, this methodology will adopt UKCP18 climate projections once they are made available next year.

Step four: Impact assessment

14.3.32 A detailed impact assessment will be undertaken, as required, for selected Moderate and High climate vulnerabilities identified. The foundation for this

assessment will be a qualitative assessment based on expert judgment, engagement with project stakeholders and a review of relevant literature. This process will however be supplemented with quantitative data and information where available.

14.3.33 The assessment will focus on identifying and appraising the specific impact of relevant climate variables and hazards on primary project receptors over the life of the project. Taking account of the contribution of incorporated measures to climate resilience, this assessment will outline the level of climate resilience of each receptor to significant climate variable/hazards based on the following rankings:

- **High** - A strong degree of climate resilience, remedial action or adaptation may be required but is not a priority;
- **Moderate** - A moderate degree of climate resilience, remedial action or adaptation is suggested; and
- **Low** - A low level of climate resilience, remedial action or adaptation is required as a priority.

Step five: Avoidance, minimisation, adaptation and compensation measures

14.3.34 Recommendations for supplementary climate change adaptation measures for all Low and selected Moderate level of climate resilience will be identified. The identification of possible measures will focus on:

14.3.35 Adaptation actions:

- Design;
- Operational and maintenance;
- Planning; and
- Financial.

14.3.36 Adaptive capacity building:

- Information;
- Supportive social structures; and
- Supportive governance.

14.4 Baseline conditions – Tables

Effect of the Scheme on climate

Table 14.6: UK emissions baseline

Sector (by final user)	GHG emissions (Million tonnes of CO_2e)	Percentage of total
Business	147	29.66%
Transport	134.9	27.21%
Public	14.6	2.95%
Residential	112.1	22.61%
Agriculture	51.1	10.31%
Industrial processes	13.3	2.68%
Land use, land use change and forestry	-7.4	-1.49%
Waste management	18.2	3.67%
Exports	12.1	2.44%
Grand Total	495.7	100.04%

Table Source: Final UK greenhouse gas emissions national statistics: 1990-2015 (2017).

Table 14.7: Highways scheme emissions baseline

Carbon footprint lifecycle stages	Project/length and width component							
	M4CaN	A14	A465	HA project A	HA project B	HA project C	HA project D	HA Project E
	23 km New relief road	37 km Improvement scheme	7.8 km Embankment section	26.6 km widening of A road	6.5 km Single to 2 lane dual carriageway	4 km Upgrade of existing junction	0.7 km Refurbished existing viaduct	22.1 km Upgrade from dual to 3 lanes
CapCO_2e (tCO_2e)								
Material	436,600	740,100	44,300	74,500	77,300	36,100	5,800	213,700
Labour + Plant	42,800	243,800	5,800	38,500	27,500	8,200	4,000	20,900
Earthworks	43,200	n/a	2,500	n/a	n/a	n/a	n/a	n/a
Construction tCO2e/km	21,800	26,600	6,700	4,300	16,100	11,100	13,900	10,600
OpCO_2e (tCO_2e)								
Operation + Maintenance/ annum	1,600	2,400	2,600	n/a	n/a	n/a	n/a	n/a
UseCO_2e (tCO_2e)								
Use/annum	2,268,700	4,386,400	882,000	n/a	n/a	n/a	n/a	n/a

Table Source: Welsh Government (2016). M4 Corridor around Newport, Environmental Statement: Volume 3, Appendix 2.4 Carbon Report

Vulnerability of the Scheme to climate

Table 14.8: Stanford-le-Hope climate (1981 to 2010)

	Average Maximum Temperature (°C)	Average Minimum Temperature (°C)	Days of air frost (days)	Sunshine (hours)	Seasonal Rainfall (mm)	Days of rainfall >= 1 mm (days)	Monthly mean wind speed at 10m (knots)
Winter	7.6	1.4	32.0	181.5	144.7	29.6	7.6
Spring	13.8	4.4	12.9	474.7	130.5	27.1	13.8
Summer	21.9	11.2	0.0	612.1	145.9	23.5	21.9
Autumn	14.9	6.9	7.8	330.0	170.7	27.8	14.9
Annual	14.6	6	52.7	1598.2	591.8	108.1	14.6

Table Source: https://www.metoffice.gov.uk/public/weather/climate. Winter is defined as December to February, Spring is March to May, Summer is June to August and Winter is September to November.

Table 14.9: Weather extreme records: South-East and Central Southern England

Variable	Value	Date	Location
Highest daily maximum temperature (°C)	38.5	10 August 2003 Faversham	10 August 2003 Faversham
Lowest daily maximum temperature (°C)	-19.5	14 January 1982	Lacock (Wiltshire)
Highest 155-minute total rainfall (UK)	169mm	14 August 1975	Hampstead (Greater London)
Highest gust speed records	100 knots / 115 mph	16 October 1987	Shoreham-by-Sea (West Sussex)

Table Source: https://www.metoffice.gov.uk/public/weather/climate-extremes/#?tab=climateExtremes

14.5 Potential impacts – Tables

Vulnerability of the Scheme to climate

Table 14.10: Typical climate impacts on road infrastructure

Aspect	Impact: Precipitation (high and increasing)	Impact: Precipitation (low and decreasing)	Impact: Temperature (high and increasing)	Impact: Wind
Roads	Flooding Loss of strength of layer materials Damage to structure and surfaces Erosion of unpaved shoulders	Damage to thin surfaces and asphalt More rapid binder deterioration	Ageing of bituminous binders Softening, deformation and damage to bitumen in asphalt Expansion and buckling of	Accumulation of debris Wind-loading of structures

Aspect	Impact: Precipitation (high and increasing)	Impact: Precipitation (low and decreasing)	Impact: Temperature (high and increasing)	Impact: Wind
	Traffic disruption and congestion		concrete roads and structures Reduced visibility and operational disruption (fires)	
Bridges and culverts	Increased river scour		Expansion and buckling of concrete roads and structures	Wind-loading of structures
Earthworks	Increased slope instability Soil saturation Erosion of surface Undercutting Excessive vegetation growth	Earthworks failure due to desiccation Damage to vegetation and more difficult to establish erosion protection measure		Erosion
Subgrade soils	Soil softening, erosion collapse and settlement Deformation of rigid structures	Shrinkage and cracking		
Drainage	Blockages Water accumulation Erosion and scour of structures and surfaces Softening of subsurface materials	Erosion, silting and sedimentation	Expansion, cracking and erosion Loss of vegetation	
Construction	Difficult working conditions Excessive moisture in materials Reduced working periods and increased delays Water damage	More dust Evaporation of construction water	Enhanced reactions when cement Stabilising and drying of concrete Difficult working conditions Damage and disruption (fires)	Difficult working conditions More dust Evaporation of construction water
Operation and maintenance	Additional damage and maintenance requirement Reduced opportunities maintenance Operational disruption			

Table 14.11: Climate vulnerability assessment: Road infrastructure, London

Climate variable/hazard	Regional exposure	Sector sensitivity	Climate vulnerability
Average (air) temperature change (annual, seasonal, monthly)	High	Low	Low
Extreme (air) temperature (frequency and magnitude)	High	Moderate	Moderate
Average precipitation (annual, seasonal, monthly)	High	Low	Low
Extreme rainfall (frequency and magnitude)	High	High	High
Average wind speed change (annual, seasonal, monthly)	Moderate	Low	Low
Gales and extreme winds (frequency and magnitude)	Moderate	High	Moderate
Humidity	Moderate	Low	Low
Solar radiation	Moderate	Moderate	Moderate
Sea level rise (plus local land movements), storm surge/tide	Low	High	Low
Water availability/drought	High	Low	Low
Flood (coastal and fluvial)	High	High	High
Subsidence and ground stability	Moderate	High	Moderate
Fog	Moderate	Moderate	Moderate
Storms (tracks and intensity), including storm surge	Low	High	Low
Snow, ice and hail	Moderate	High	Moderate
Storms and lightning	Moderate	Moderate	Moderate

14.6 Potential mitigation measures – Tables

Effect of the Scheme on climate

Table 14.12: Emissions mitigation measures

Scheme specific lifecycle scope	Mitigation measures
A1-3. Temporary and permanent construction materials.	Reduction of materials consumption will be carried out in accordance with the mitigation measures outlined in the Waste and Materials Chapter (Chapter 12) In addition, consideration will be given to alternative low carbon materials.

Scheme specific lifecycle scope		Mitigation measures
A4. Materials transport to works site.		Materials transportation distances will be avoided by minimising the quantity of materials required, as per A1-3 above. Additionally, where possible designs will be specified to minimise the necessity to source materials from long distances.
A5. Construction/ installation process.	Construction plant use.	Construction plant emissions will be minimised by designing for efficient construction processes as part of design development. During construction plant emissions will be managed via the Construction Environmental Management Plan (CEMP), which should specify plant operator efficiency requirements.
	Construction water use.	Construction water consumption will be minimised by designing for efficient construction processes as part of design development. During construction mains water consumption will be managed via the CEMP, which should specify reduction and reuse measures, and rain water harvesting.
	Construction waste transportation.	Reduction of waste generation will be carried out in accordance with the mitigation measures outlined in the Waste and Materials Chapter (Chapter 12).
	Construction waste off-site processing.	Suitable/ appropriate waste treatment/ disposal will be carried out in accordance with the mitigation measures outlined in the Waste and Materials Chapter (Chapter 12).
B2-5. Replacement.		Replacement cycles will be mitigated through design by designing for long-life, ease of deconstruction and suitability for reuse/ recycling etc.
B6. Operational energy use.		Operational energy use will be minimised by designing for use of low energy lighting and traffic management systems, and specification of controls that minimise on-time, where practicable.
B9. In-use Traffic on the Scheme.		Mitigation of in-use emissions will be explored based on examination of traffic management scenarios over the network.
D. In-Use Traffic on wider network.		

Table Source: Interpreted from PAS 2080:2016.

Vulnerability of the Scheme to climate

Table 14.13: Selected impact mitigation measures for roads

Aspect	Proposed measure(s)
Roads and supporting infrastructure	Higher degree of compaction Appropriate structural designs, surfaces and construction Use different (harder) binders in asphalt Changes to concrete mixes and reinforcing Raise riding surface and appropriate drainage Accounting for climate risks in maintenance regimes Use of heat resistant surfacing materials Replacement of bridge expansion joints

Aspect	Proposed measure(s)
	Provide shade for roads, footpaths and cycleways
Earthworks	Higher degree of compaction Appropriate drainage Appropriate structural design Maintenance Slope stabilisation measures Green infrastructure (deep-rooted, drought resistant vegetation) Isolation of susceptible soils Construct at in-service moisture conditions
Drainage	Appropriate structural design and construction Strengthen embankments and cuttings Modify extreme rainfall return periods in design Maintenance Increase culvert and bridge openings Concrete and reinforcement Green/blue infrastructure
Construction	More night-time construction to avoid undue heat stress for construction workers Construct in dry season Greater use of unslaked lime Modified and innovative construction techniques Water efficiency measures Dust management plan
Operation and maintenance	Adequate resources and capacity in place Local community reporting of maintenance need More regular maintenance and preventative action Underpinning the efficiency and effectiveness of incorporated climate change adaptation measures Emergency planning for climate impacts Early warning systems and evacuation routes Monitoring and evaluation of asset resilience to inform climate change adaptation decision-making The incorporation of adaptation measures to existing assets during planned maintenance and repairs Water efficiency measures

Table Source: Various

15. Appendix N. Assessment of Cumulative Effects

15.1 Study area

Combined effects

15.1.1 The study area for the assessment of combined effects reflects the Zones of Influence (ZoI) which are proposed for each of the environmental topic areas and are identified in topic chapters 5 to 14 and in Table 15.1 below. These are subject to change and will be confirmed in the ES.

Table 15.1: Zones of influence

Environmental topic	Zone of influence
Air quality	Within 200 m of the red line boundary
Noise and Vibration	Within 600 m of any affected route that is within 1 km of the Scheme.
Ecology and Nature Conservation	2 kilometres (km) for statutory designated sites of nature conservation importance: Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Wetlands of International Importance (Ramsar sites), Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs) and Local Nature Reserves (LNRs); 2 km for non-statutory designated sites of nature conservation importance known locally as Local Wildlife Sites (LWSs) and Roadside Nature Reserves (RNRs); 30 km for SACs where bats are one of the qualifying species; 1 km for notable habitats, ancient woodland, and notable or legally protected species, which was extended to 5 km for bats and 3 km for reptiles and amphibians; 50 metres (m) for veteran trees; and 1 km for non-native invasive plant species
Road Drainage and the Water Environment	As a minimum, the catchment of any watercourses crossed by the Scheme. Groundwater – assessed on the underlying Water Framework groundwater body.
Landscape	Landscape effects within 1.5 km from the perimeter of the Scheme; and Visual effects within 1.5 km from the edge of the Scheme.
Geology and Soils	500m
Cultural Heritage	500m buffer from the red line boundary for the Scheme.
Materials and Waste	Material resources study area includes the demand for key construction materials nationally; and Waste study area includes the waste arisings and waste infrastructure capacity within the county of Kent.
People and Communities	Study area comprises land within the Scheme's red line boundary plus a 500m buffer extending beyond this boundary.
Climate Change	Effect on of the Scheme on climate change study area: Various -see topic chapter for specific areas. Vulnerability of the Scheme to climate change study area: 25km

Cumulative effects

15.1.2 The study area for the identification of 'other developments' for inclusion in the assessment of cumulative effects is based upon thresholds and spatial areas. These thresholds and spatial areas are considered to be appropriate, based upon professional judgement and taking into account the nature and location of the Scheme. They capture the topic ZoIs with the exception of the 30 km ZoI for SACs where bats are one of the qualifying species and the Materials and Waste ZoI which look nationally and within the county of Kent.

15.1.3 It is not considered appropriate to align with the Transport Model for the Scheme which includes data from across the whole country, selected significant major developments within the whole of Dartford and Gravesham Borough Council's and Ebbsfleet Development Corporation. This approach is in line with guidance provided within the Planning Inspectorate's Advice Note 17 Cumulative effects assessment.

15.1.4 The proposed thresholds and spatial area are as follows:

- Nationally Significant Infrastructure Projects - 10 km from the red line boundary;
- Regionally Significant Projects - 3 km from the red line boundary;
- Major development - within and 1.5 km from the red line boundary; and
- Minor development - within the red line boundary.

15.1.5 The definition of Major development and Minor development will be according to article 2 of the Town and Country Planning Development Management Procedure (England) Order 2015.

Interaction with other projects

15.1.6 Four NSIPs have been identified within the study area. These are the Lower Thames Crossing, Tilbury 2, Tilbury Energy Centre and the London Resort. The Lower Thames Crossing has inherently been assessed as part of the Air Quality and Noise and Vibration assessments, due to its inclusion in the traffic modelling undertaken and is shown in Figure 15.1 in the PEIR Volume 3.

15.1.7 Tilbury 2 and Tilbury Energy Centre will be considered for assessment in the ES. The London Resort will not be assessed due to critical interdependencies in delivery of the project.

15.1.8 The provisional list of proposed developments to be considered in the cumulative effects assessment is presented in Table 15.2 below. Due to the ongoing and iterative nature of producing the development schedule not all sites shown will have been considered in the high-level assessment provided in Table 15.5. A full assessment will be undertaken in the ES. The locations of the developments are shown in Figure 15.1 in the PEIR Volume 3.

15.1.9 Table 15.6 below sets out the full development schedule used for the PEIR, with Stage 1 assessment in accordance with Appendix 1 of Advice Note 17. This is to inform the inclusion of developments in the further stages of the Cumulative Effects Assessment (CEA).

Table 15.2: Provisional list of proposed developments for inclusion in CEA

	Development	Distance from site (closest point)	App No.
1	Ebbsfleet	Adjacent and within red line boundary	96/00047/OUT (Dartford/Gravesham) 20150155 (Ebbsfleet)
2	Croxton Garry Site (E of Ingress Park)	Approx. 1.4 km from red line boundary	EDC/17/0110 (Ebbsfleet)
3	Craylands Lane	Approx. 1.5 km from red line boundary	14/01689/OUT (Dartford)
4	Hedge Place Road	Approx. 450 m from red line boundary	12/01150/FUL (Dartford)
5	Knockhall Road	Approx. 1.4 km from red line boundary	13/01522/OUT (Dartford)
6	Eastern Quarry	Immediately adjacent to red line boundary	12/01451/EQVAR (Dartford)
7	St James Lane Pit	Approx. 1.1 km from red line boundary	05/00221/OUT (Dartford)
8	Land at St Clements Way	Approximately 250 m from red line boundary	12/01404/FUL (Dartford)
9	Ebbsfleet Green	Immediately adjacent to red line boundary	05/00308/OUT (Dartford)
10	Ebbsfleet Green	Approximately 160 m from red line boundary	16/01271/EDCCON (Dartford)
11	Former Empire Sports Ground, Knockhall	Approx. 900 m from red line boundary	15/01497/REM (Dartford)
12	Village Heights	Approx. 1.1 km from red line boundary	16/00016/OUT (Dartford)
13	Land to rear unit G1 Manor Way Bus Park	Approx. 1.7 m from red line boundary	14/00679/CPO (Dartford)
14	Ebbsfleet Northfleet Embankment East Crete Hall Road Northfleet Gravesend Kent	Approximately 2.3 km from red line boundary	EDC/17/0038 (Ebbsfleet)EDC/16/0004 (Ebbsfleet)
15	Land at Former Northfleet Cement Works, The Shore Northfleet Gravesend Kent DA11 9AN	Approx. 1.3 km from red line boundary	Pre-application PINS project
16	Lower Thames Crossing	Approx. 3.9 km from red line boundary	16/01207/OUT (Dartford)
17	Bluewater	Adjacent to red line boundary	14/01344/FUL(Dartford)
18	Land at St Clements Way Phase 2	Approx. 250 m away from red line boundary	16/01913/FUL (Dartford)
19	Land at St Clements Way Phase 2	Approx. 250 m away from red line boundary	20141214 & 20180041 (Gravesham)

	Development	Distance from site (closest point)	App No.
20	Land at Coldharbour Road	Approx. 1.8 km from red line boundary	20160670 (Gravesham)
21	M Block Former Gravesend & North Kent Hospital	Approx. 3 km from red line boundary	15/01497/REM (Dartford)

15.2 Methodology

Combined effects

15.2.1 The assessment methodology for combined effects requires the identification of impact interactions associated with the Scheme upon separate environmental receptors.

15.2.2 The significance of construction and operational environmental effects from the topic chapters will be reported in matrices to provide an overview of the potential effects on individual receptors and their significance. Professional judgement will also be used.

Cumulative effects

15.2.3 The assessment methodology for cumulative effects involves the identification of changes likely to be caused by 'other developments' together with the Scheme.

15.2.4 In order to carry out the assessment it is necessary to define the location and timing of nearby potential developments. This follows the methodology provided in the PINS Advice Note 17 which proposed four stages of assessment:

- Stage 1 - Establish the ZoI and a Long List of 'Other Development';
- Stage 2 - Identify a Short List of 'Other Development' for assessment;
- Stage 3 - Information Gathering; and
- Stage 4 – Assessment.

15.2.5 The following criteria is being used to identify and determine 'other development':

- Trunk road and motorway projects which have been confirmed (i.e. gone through the statutory processes);
- Development projects with valid planning permissions as granted by the Local Planning Authority, and for which formal EIA is a requirement or for which non-statutory environmental impact assessment has been undertaken;
- Applications for consent which have been made, but which have not yet been determined (see thresholds below);
- Allocated sites in emerging or adopted Local Plans; and
- Other types of application which could have implications for the project.

15.2.6 The delivery of development in the above categories is considered to be 'reasonably foreseeable' and 'committed', in line with the advice in the DMRB Volume 11, Section 2, Part 5 HA 205/08.

15.2.7 The PINS Advice Note 17 recommends grouping the 'other developments' into Tiers, reflecting the likely degree of certainty attached to each development, with Tier 1 being the most certain and Tier 3 being the least certain and most likely to have limited publicly available information to guide the assessment. The 'Other Development' Tiers are presented in Table 15.3 below.

Table 15.3: 'Other Development' for inclusion in CEA

Tier	Description	
1	a. Under construction*	Decreasing level of detail likely to be available.
	b. Permitted application(s), whether under the PA2008 or other regimes, but not yet implemented	
	c. Submitted application(s) whether under the PA2008 or other regimes but not yet determined	
2	a. Projects on the Planning Inspectorate's Programme of Projects where a scoping report has been submitted.	
	b. Projects on the Planning Inspectorate's Programme of Projects where a scoping report has not been submitted.	
3	Identified in the relevant Development Plan (and emerging Development Plans - with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited;	
	Identified in other plans and programmes (as appropriate) which set the framework for future development consents/approvals, where such development is reasonably likely to come forward	

*Where other projects are expected to be completed before construction of the proposed NSIP and the effects of these projects are fully determined, effects arising from them should be considered as part of the baseline and may be considered as part of the construction and operational assessment.

15.2.8 In line with DMRB HA 205/08, further liaison is currently taking place with the relevant Local Planning Authorities (LPAs), Dartford and Gravesham Borough Council's and Ebbsfleet Development Corporation who are providing their assistance to determine and agree whether any other developments in the vicinity of the Scheme should be taken into consideration and when they believe these to be likely to come forward, so Stage 1 can be completed. So far, we have received assistance from Dartford Borough Council (including on behalf of Dartford and Gravesham Borough Council's and Ebbsfleet Development Corporation). We are awaiting information from Gravesham Borough Council, to complete the development schedule.

15.2.9 The following categories in Table 15.4 below which are presented in the DMRB Volume 11, Section 2, Part 5 HA 205/08 will be used as a framework for determining the significance of cumulative effects.

Table 15.4: Determining significance of cumulative effects

Significance	Effect
Severe	Effects that the decision-maker must take into account as the receptor/resource is irretrievably compromised
Major	Effects that may become a key decision-making issue

Significance	Effect
Moderate	Effects that are unlikely to become issues on whether the project design should be selected, but where future work may be needed to improve on current performance
Minor	Effects that are locally significant
Not significant	Effects that are beyond the current forecasting ability or are within the ability to absorb such change

Table Source: DMRB, Volume 11, Section 2, Chapter 3 (DMRB Table 2.6)

15.3 Potential impacts

Table 15.5: Preliminary cumulative effects assessments from each topic chapter

Topic	Construction Cumulative Effects	Operational Cumulative Effects
Air Quality	During construction, four of these proposals: The Eastern Quarry (12/01451/EQVAR); Ebbsfleet (96/00047/OUT); and two proposals at Ebbsfleet Green (05/00308/OUT and 16/01271/EDCCON) could potentially affect receptors within the air quality study area for construction, if construction occurs over the same period. This will be revisited and assessed for the air quality assessment for the ES.	At Option Selection Stage, specific committed developments were taken into account within the traffic modelling outputs for the air quality assessment, meaning that the air quality assessment during operation already takes into consideration cumulative effects. This will be revisited and assessed for the air quality assessment for the ES.
Noise and Vibration	A CEMP should be created and implemented by the contractor and be approved by the Local Authorities prior to the commencement of construction works. Even with appropriate mitigation in place, it may not be possible to eliminate all noise impacts. However, best practice, considerate working hours as well as frequent and open communications with stakeholders will help to reduce the residual impact of construction noise and vibration. The potential for cumulative effects will be considered in the ES.	The traffic model used as the basis of the noise assessment, takes into account the effects of major residential and employment developments proposed in the wider area, as these will affect traffic volumes. The impact of these developments is therefore considered in the operation phase assessment. This cumulative operational noise assessment has only taken into account road traffic noise from these developments. Given that the traffic model takes into account all permitted development, any noise mitigation measures proposed for the scheme will inherently mitigate the noise from traffic using the scheme roads The potential for cumulative effects will be considered in the ES.
Biodiversity	The main cumulative impacts on biodiversity is likely to be habitat loss. In particular, there may be loss of Ancient Woodland, as well as habitats with bat, reptile and amphibian populations. However, it is assumed that mitigation and compensation measures will be incorporated into detailed design phases of the developments with the end result of minimising loss and including habitat creation where needed. Habitats supporting dormice adjacent to A2 will be largely unaffected by cumulative and combined effects of surrounding developments and the A2BE improvements. Despite the close proximity of Ebbsfleet Marsh LWS to the Ebbsfleet Development (96/00047/OUT), no cumulative effect is expected as the designated features of the LWS would not be affected by the Scheme. The development could add to habitat loss within the local area. However, habitat creation and landscape planting within and around Ebbsfleet Junction could have an overall positive impact on reptiles, amphibians and hazel dormice by strengthening habitat connectivity around the local road network.	
Road Drainage and the Water Environment	Interactions between developments may occur where developments are located within the catchment of the River Ebbsfleet or within the same SPZ1 as the Scheme. However, each development will be subject to compliance with relevant planning policies, for example the NPPF with regard to development and flood risk, and regulatory regimes preventing pollution and safeguarding water quality. To satisfy these policy and regulatory requirements development would be designed to ensure flood risk resilience and appropriate management of surface water	

Topic	Construction Cumulative Effects	Operational Cumulative Effects
	drainage, including climate change allowance. Cumulatively therefore, the developments would be expected to have neutral (operation) to minor beneficial (construction) effects. Below ground structures in new developments may also have increased risk of groundwater flooding on the A2 by creating barriers to flow and increasing the potential for water level rise. It is assumed that the development will be subject to standard groundwater protection planning conditions, best practice construction methods and any contaminated land or groundwater would be remediated as part of development. Cumulatively therefore, the developments would be expected to have a neutral effect.	
Landscape	Vegetation screening along Watling Street and along the A2 would be largely unaffected by the development with roadside planting retained to shield the development from the A2 and other roads. Poor lighting design for the junction improvements and Eastern Quarry (12/01451/EQVAR) could have a combined negative impact on light spill and lighting pollution.	
Geology and Soils	The developments listed for the CEA (Table 15.2) are subject to the planning process, with some receiving consent, and have been / will be required to ensure that the planned scheme is suitable for its intended use and that mitigation and control measures will be adopted during the construction phase to reduce impacts to the environment. Therefore, a low potential for cumulative impacts is predicted during the construction phase.	It is assumed that the developments will be operated in accordance with granted consents and the relevant regulations and best practice guidance in applying Best Available Techniques and pollution prevention. Therefore, a low potential for cumulative impacts is predicted during operation.
Cultural Heritage	The preliminary assessment shows there is likely to be significant adverse cumulative effect arising from the construction of the Scheme in conjunction with other proposed development in the area, particularly in regard to important as yet determined archaeological and palaeoenvironmental remains. The scale and extent of these impacts will need to be assessed in detail in the ES and following further planning application information.	The potential cumulative effects during operation will be considered in the ES.
Materials and Waste	Eastern Quarry (12/01451/EQVAR); Ebbsfleet Green (05/00308/OUT); and Former Northfleet Cement Works (EDC/16/0004) are identified as having potential cumulative impacts with the Scheme were producing waste at the same time the combined total would be 7,850 tpa. This would be 0.3% of the regional CD&E baseline (2,520,000 tpa) and 0.04% of the regional CD&E capacity (22,073,247). Therefore, it would have a negligible, short term impact.	
People and Communities	The potential for cumulative effects will be considered in the ES.	
Climate Change	Effect of the Scheme on climate change:	

Topic	Construction Cumulative Effects	Operational Cumulative Effects
	Cumulative effects are considered applicable when considering the impacts of in-use traffic on the wider network, and the overall Scheme on total UK emissions. As such, emissions assessment considered in the EIA will inherently consider the cumulative impacts of other proposals, and the wider UK emissions. Vulnerability of the Scheme to climate change: The Scheme may have an impact on the climate resilience of other projects and stakeholders. Also, climate change adaptation measures create wider cumulative impacts on other projects and stakeholders. These impacts may be positive or negative. The ES will consider the cumulative impacts for other projects and stakeholders in a climate change adaptation context. The potential for cumulative effects will be considered in the ES.	

15.4 Other Development' Schedule for A2 Bean to Ebbsfleet Improvement

Table 15.6: 'Other Development' Schedule for A2 Bean to Ebbsfleet

	Development	Distance from site (closest point)	App No.	Description	Tier (based on 'current' status)[43]	Year specific assumptions - implementation					Additional Relevant Information	Stage 1	
						From March 2018	2019	2020	2021	2022		Within ZOI?	Progress to Stage 2?
1	Ebbsfleet	Adjacent and within red line boundary	96/00047/OUT (Dartford/ Gravesham) 20150155 (Ebbsfleet)	Development of up to 789,550sq.m gross floorspace comprising employment, residential, hotel and leisure uses supporting retail & community facilities & provision of car parking, open space, roads & infrastructure.	1 B			200	300	300	5-year supply. Up to 50,000 m^2 B1.	All topic areas (or significant enough to trigger assessment)	Yes
2	Croxton Garry Site (E of Ingress Park)	Approx. 1.4 km from red line boundary	EDC/17/0110 (Ebbsfleet)	Outline planning application for residential development of up to 220 dwellings including new vehicular access to Tiltman Avenue, creation of a development platform and associated works.	1 C		50	85	85			Biodiversity, Landscape; Materials & Waste; and Climate.	Yes
3	Craylands Lane	Approx. 1.5 km from red line boundary	14/01689/OUT (Dartford)	Outline application for residential development for up to 110 mixed tenure units, including a new vehicular access to Craylands Lane, including emergency access and creation of a development platform and associated works including the demolition of existing buildings.	1 B	60						Biodiversity; Landscape; Materials & Waste; and Climate	Yes
4	Hedge Place Road	Approx. 450 m from red line boundary	12/01150/FUL (Dartford)	Erection of 56 dwellings comprising 33 x 3 bedrooms and 11 x 4 bedroom houses and 12 x 2 bedroom flats together with associated landscaping works, parking and infrastructure works.	1 B	20	36					Noise; Biodiversity; Geology; Cultural Heritage; Materials & Waste; P&C; and Climate.	Yes
5	Knockhall Road	Approx. 1.3 km from red line boundary	13/01522/OUT (Dartford)	Outline application for demolition of the existing dwellings and the erection of 66 flats incorporating 53 two-bedroom and 13 three-bedroom apartments with provision 110 car park spaces and an additional 6 spaces for the residents of Flint Cottage	1 B	30	20					Biodiversity; Landscape; Materials & Waste; and Climate	Yes
6	Eastern Quarry	Immediately adjacent to red line boundary	12/01451/EQVAR (Dartford)	Mixed use up to 6250 dwellings & in addition up to 231,000 square metres of built floorspace (in total) for: business premises (B1 (a), (b) and (c)) education community & social facilities (D1 & D2) (schools, libraries, health centres, places of worship, sports leisure centres, community centres, care facilities for the young, old and/or infirm); hotels (C1); theatre (D2); supporting retail (A1, A2, A3, A4 & A5) & leisure (D2) facilities; miscellaneous sui generis uses, ancillary & support facilities.	1 B	300	300	300	300	300		Yes for all topic areas (or significant enough to trigger assessment)	Yes
7	St James Lane Pit	Approx. 1.1 km from red line boundary	05/00221/OUT (Dartford)	Development comprising or to provide development of up to 870 dwellings and in addition up to 1,200 sq metres of built floorspace (in total) for: business premises (B1(a) (b) and (c)); community and social facilities (D1 and D2); provision of a primary school site and supporting retail (A1, A2, A3, A4 and A5).	1B		50	100	100	100		Biodiversity; Landscape; Materials & Waste; and Climate	Yes

[43] Categories based on Table 3: Other Development for inclusion in CEA Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2015/12/Advice-note-17V4.pdf

	Development	Distance from site (closest point)	App No.	Description	Tier (based on 'current' status)[43]	Year specific assumptions - implementation					Additional Relevant Information	Stage 1	
						From March 2018	2019	2020	2021	2022		Within ZOI?	Progress to Stage 2?
8	Land at St Clements Way	Approximately 250m from red line boundary	12/01404/FUL (Dartford)	Erection of 156 dwellings comprising 47 houses and 109 flats and 160 sqm of flexible commercial space, class A1, A2 and B1 uses together with the provision of associated public realm and landscaping, parking and infrastructure works	1A							Biodiversity; Landscape; Materials & Waste; and Climate	Yes
9	Ebbsfleet Green	Immediately adjacent to red line boundary	05/00308/OUT (Dartford)	Mixed use redevelopment of site comprising a mixed use of up to 950 dwellings & non-residential floorspace for: shopping, food & drink, hotel use; community, health, education & cultural uses; assembly & leisure facilities & associated works to provide the development	1B	100	150	150	150	150		Yes for all topic areas	Yes
10	Ebbsfleet Green	Approximately 160 m from red line boundary	16/01271/EDCCON (Dartford)	Use Class B1a Floor Space and up to 50 car parking spaces with associated landscaping and public realm enhancements.	1B						1100 m^2 B1a	Yes for all topic areas	Yes
11	Former Empire Sports Ground, Knockhall	Approx. 900 m from red line boundary	15/01497/REM (Dartford)	Erection of 40 residential dwellings (comprising 16 x 3 bed, 13 x 4 bed, 7 x 5 bed houses and 4 x 1 bed maisonettes) and provision of public open space	1B	11	29					Biodiversity; Landscape; Materials & Waste; and Climate	Yes
12	Village Heights	Approx. 1.1 km from red line boundary	16/00016/OUT (Dartford)	Erection of up to 33 residential units, comprising 3 x 3 bed houses and 4 x 2 bed houses, 15 x 2 and 11 x 1 bed apartments, together with medical centre and associated parking, landscaping and amenity space	1B			33				Biodiversity; Landscape; Materials & Waste; and Climate	Yes
13	Land to rear unit G1 Manor Way Bus Park	Approx. 1.7 m from red line boundary	14/00679/CPO (Dartford)	Construction of building to accommodate plant for the processing and transfer of construction, demolition and excavation wastes and commercial and industrial wastes	1B						2700 m^2 sui generis	Biodiversity; Materials & Waste; and Climate	Yes
14	Ebbsfleet Northfleet Embankment East Crete Hall Road Northfleet Gravesend Kent	Approx. 2.3 km from red line boundary	EDC/17/0038 (Ebbsfleet)	Hybrid planning application (part full and part outline) comprising: (1) full planning application for the erection of 598 residential dwellings including affordable housing; retail floorspace (Use Classes A1, A2 and/or A3); amendments to existing highway accesses and realignment of Crete Hall Road; demolition of rear of WT Henley Building; provision of open spaces, equipped areas of play and landscaping; and associated internal accesses/roads, parking, infrastructure, attenuation features and earthworks; and (2) outline planning application (with all matters except access reserved) for a two-form entry primary school and for the refurbishment, change of use (for Use Classes A1/A2/A3/B1(a)/C3/D1) and demolition of the boundary wall and rear portion of the WT Henley Building.	1C							Noise; Biodiversity; Landscape; Materials & Waste; and Climate	Yes
15	Land at Former Northfleet Cement Works The Shore Northfleet Gravesend Kent DA11 9AN	Approximately 1.3 km from red line boundary	EDC/16/0004 (Ebbsfleet)	Outline application for a mixed development and comprising: up to 532 Homes, related car parking and landscaping (C3) up to 46,000 sq. m Employment Floorspace, related car parking, servicing and landscaping (B1/B2/B8); Mixed Use Neighbourhood Centre comprising mix of: up to 850 sq. m retail/cafe/takeaway floor space (A1/A2/A3/A5); residential uses (C3); community centre (D1) and related car parking and landscaping; Riverside Food and Drink Uses comprising up to 500 sq m of pub or food	1B							Materials & Waste; and Climate	Yes

	Development	Distance from site (closest point)	App No.	Description	Tier (based on 'current' status)[43]	Year specific assumptions - implementation					Additional Relevant Information	Stage 1	
						From March 2018	2019	2020	2021	2022		Within ZOI?	Progress to Stage 2?
				and drink uses (A3/A4); Public Open Space including riverside promenade, public park with equipped play areas and playing field with shared public/school use, multi-use games area and wildlife corridors; Fastrack Link to provide a segregated link across the site along with Fastrack stops Street and Footpath Network to provide access to development and maintain and enhance existing public rights of way, including a bridge link between Hive Lane and Factory Road; Access Improvement to Grove Road/The Creek and The Shore/Crete Hall Road and associated highway improvements; Supporting Services and Infrastructure including new utilities, enhanced flood defences and providing for access to cliffs and tunnels; Ground re-grading to create efficient development and open space platforms and to raise land to address flood risk ; and Other Minor Works and development ancillary to the main proposals including the demolition of existing buildings and the retention of tunnels and facing walls adjacent to Lawn Road.								
16	Lower Thames Crossing	Approx. 3.9 km from red line boundary	Pre-application PINS project	"The Lower Thames Crossing will be a new road crossing connecting Essex and Kent. Located east of Gravesend and Tilbury, this new crossing will offer the improved journeys, new connections and network reliability, and economic benefits that only a new, alternative crossing, away from Dartford, can provide" - Highways England	2A							Materials & Waste; Climate Change	Yes
17	Bluewater	Adjacent to red line boundary	16/01207/OUT (Dartford)	Outline application for extensions and alterations to the shopping centre through part demolition, alteration and refurbishment of existing buildings/structures and erection of new buildings/structures to provide retail and related uses (Use classes A1-A5), reconfiguration of existing car and coach parking areas, reconfiguration of existing lake, open space and public realm, alteration of existing pedestrian links within the site, infrastructure and associated facilities. Submission of reserved matters (17/01202/REM)	1B							Materials & Waste; Climate Change	Yes
18	Land at St Clements Way Phase 2	Approx. 250m away from red line boundary	14/01344/FUL (Dartford)	Erection of 156 dwellings comprising 47 houses and 109 flats and 160 sqm of flexible commercial space, class A1, A2 and B1 uses together with the provision of associated public realm and landscaping, parking and infrastructure works | Phase 2	1A	42					Within this period up to 25000 m^2 C1	Biodiversity; Landscape; Materials & Waste; and Climate	Yes
19	Land at St Clements Way Phase 2	Approx. 250m away from red line boundary	16/01913/FUL (Dartford)	Erection of 17 flats (comprising 14 x 2 bed and 3 x 1 bed flats) and 7 x 3 bed houses together with the provision of associated public realm and landscaping, parking and infrastructure works	1A							Biodiversity; Landscape; Materials & Waste; and Climate	Yes
20	Land at Coldharbour Road	Approx. 1.8 km from red line boundary	20141214 & 20180041 (Gravesham)	Outline planning application for the development of up to 400 new homes and associated infrastructure including provision of open space, with access off Coldharbour Road. Reserved Matters Application for the approval of details of appearance, landscaping, layout and scale pursuant to outline planning permission reference number 20141214.	1C							Biodiversity; Materials & Waste; and Climate	Yes

	Development	Distance from site (closest point)	App No.	Description	Tier (based on 'current' status)[43]	Year specific assumptions - implementation					Additional Relevant Information	Stage 1	
						From March 2018	2019	2020	2021	2022		Within ZOI?	Progress to Stage 2?
21	M Block Former Gravesend & North Kent Hospital	Approx. 3 km from red line boundary	20160670 (Gravesham)	Outline application (with all matters other than access reserved), for the demolition of a former hospital block and erection of up to 80 residential units and flexible B1/D1/D2 ground floor unit, and associated works including construction of podium, car and cycle parking, refuse and cycle storage and landscaping.	1B							Materials & Waste; Climate Change	Yes

Key:
1 A. Under construction
1 B. Permitted but not yet implemented
1 C. Submitted but not yet determined
2 A. PINS Projects where a scoping report has been submitted
3 A. PINS Projects where a scoping report has not been submitted
3 B. Site allocation
3 C. Identified as reasonably likely to come forward

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