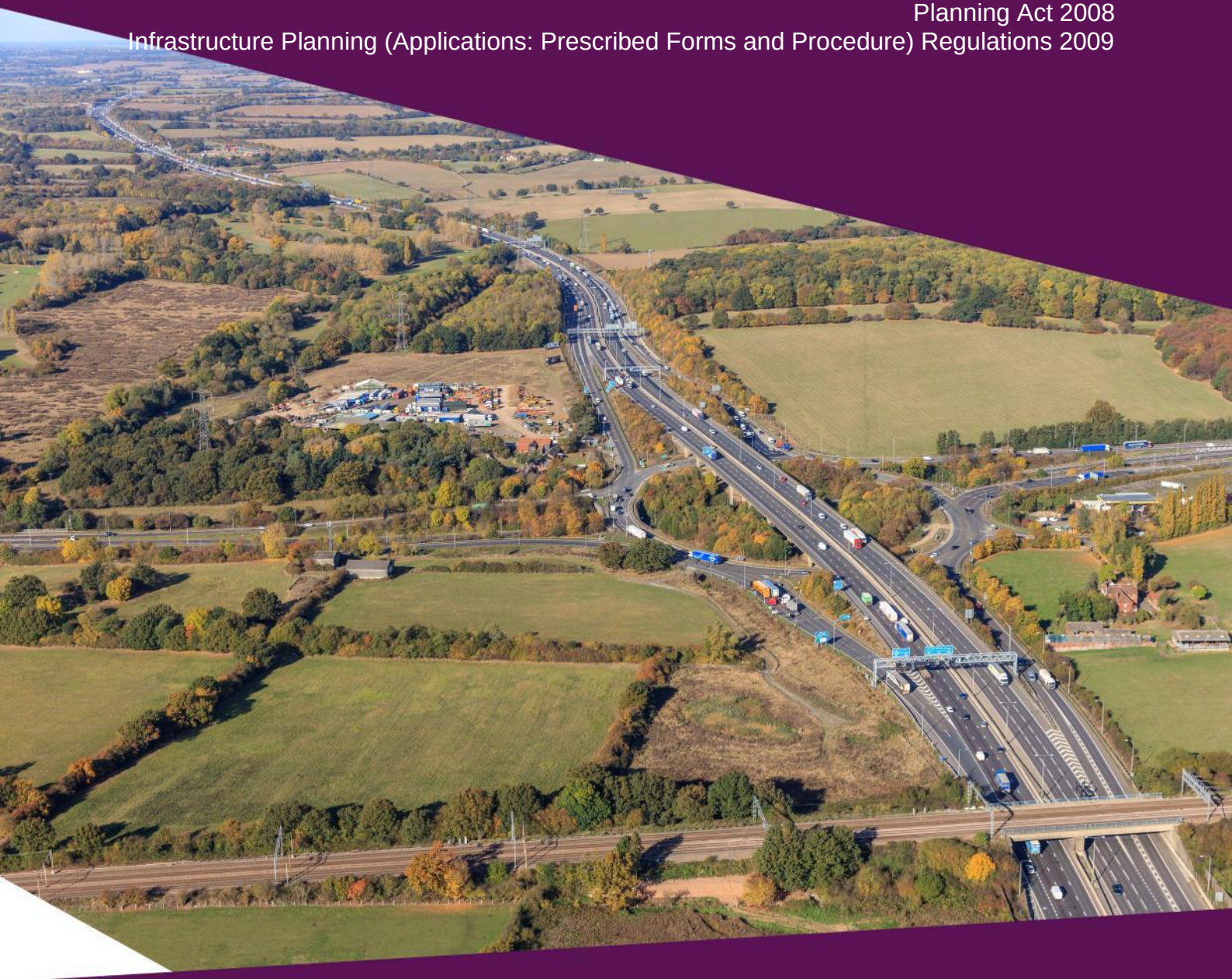
M25 junction 28 improvement scheme
TR010029
6.1 Environmental Statement
Chapters 1-4: Introductory chapters

APFP Regulation 5(2)(a)
Planning Act 2008
Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009



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Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

M25 junction 28 scheme
Development Consent Order 202[x]

6.1 ENVIRONMENTAL STATEMENT
CHAPTERS 1 - 4: INTRODUCTORY CHAPTERS

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List of contributors

Chapter	Topic	Organisation
Chapter 1	Introduction	Atkins/ Highways England
Chapter 2	The Scheme	Atkins/ Highways England
Chapter 3	Assessment of alternatives	Atkins/ Highways England
Chapter 4	Environmental assessment methodology	Atkins/ Highways England
Chapter 5	Air quality	Atkins/ Highways England
Chapter 6	Noise and vibration	Atkins/ Highways England
Chapter 7	Biodiversity	Atkins/ Highways England
Chapter 8	Road drainage and the water environment	Atkins/ Highways England
Chapter 9	Landscape and visual	Atkins/ Highways England
Chapter 10	Geology and soils	Atkins/ Highways England
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1. Introduction

1.1 Overview of the Scheme

1.1.1 This Environmental Statement (ES) has been prepared to support the application by Highways England for a development consent order (DCO) to authorise the construction of the M25 junction 28 highways improvement scheme (the "Scheme").

1.1.2 In December 2014, the Department for Transport (DfT) published its Road Investment Strategy (RIS) for the investment period 2015 and 2020, announcing £15 billion to invest in England's strategic road network. The RIS sets out a list of schemes that are to be delivered by Highways England over this investment period and identified M25 junction 28 as a key junction requiring improvement to address congestion and safety issues. In their second RIS (RIS2) for 2020 to 2025, published in March 2020, the DfT reiterate their support for improvements to M25 junction 28. The Scheme is described in RIS2 as an "*upgrade of the junction between the M25 and A12 in Essex, providing a free-flowing link from the northbound M25 to the eastbound A12"*.

1.1.3 The Scheme constitutes a Nationally Significant Infrastructure Project (NSIP) as defined by sections 14(1)(h) and 22(1)(b) and 22(3) of the Planning Act 2008. Further detail concerning the Scheme's qualification as an NSIP can be found in the prescribed form within the Application form (application document TR010029/APP/1.3) and in the Explanatory memorandum to the draft DCO (application document TR010029/APP/3.2). Accordingly, an application for a DCO has been submitted in line with section 37 of the Planning Act 2008 to seek authorisation for the construction, operation and maintenance of the Scheme.

1.1.4 As illustrated in Figure 1.1a below (and on Figure 1.1, application document TR010029/APP/6.2) the Scheme is located between Brentwood and Romford in Essex. The Scheme is one of the major improvement projects planned for the south east region and will provide better access towards Essex and London, as well as improved connectivity between Brentwood, Chelmsford, Colchester and Suffolk with London and other key destinations.

1.1.5 The Scheme involves an alteration of junction 28, which connects the M25 and the A12 in Essex. It includes the provision of a new dedicated loop road for traffic travelling on the M25 northbound carriageway and heading towards Essex on the A12 eastbound carriageway. The new loop will reduce the number of traffic movements through the junction and the majority of existing movements through the junction will see an improvement to travel times.

1.1.6 A full description of the works required to deliver the new dedicated loop road and the other key components of the Scheme considered to be necessary is provided in Chapter 2 below.

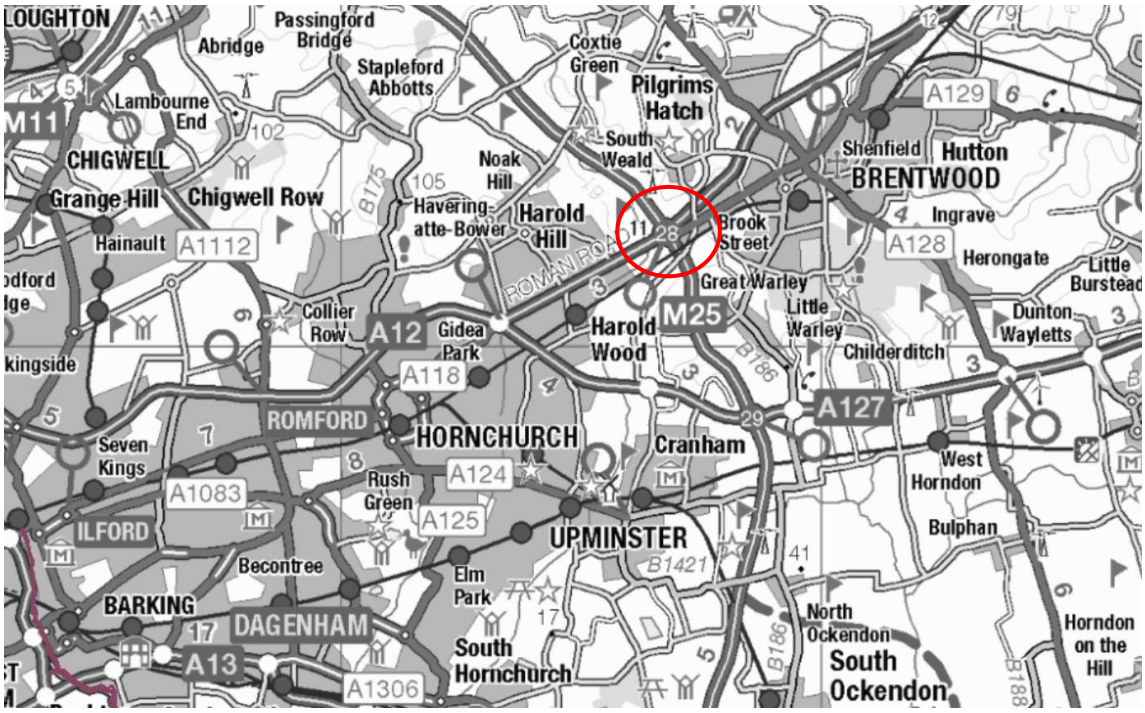

Figure 1.1a: Scheme location (Magic Maps 2019)

1.2 The Applicant

1.2.1 Highways England (the “Applicant”) is appointed and licensed by the Secretary of State for Transport as the strategic highways company for England. It is responsible for operating, maintaining and improving the Strategic Road Network (SRN) in England on behalf of the Secretary of State for Transport. The SRN is made up of England's motorways and all-purpose trunk roads (the major "A" roads). The Scheme will be part of the trunk road network for which the Applicant is responsible. Following construction of the Scheme, the Applicant will be responsible for operating, maintaining and improving (under its general statutory powers in respect of the latter) the Scheme.

1.3 The designer

1.3.1 Atkins Limited has been appointed as the designer under Highways England’s Collaborative Design Framework to undertake the Preliminary Design of the Scheme. This includes responsibility for the Environmental Impact Assessment (EIA) and the preparation of this ES.

1.4 Purpose of the Environmental Statement

1.4.1 This ES has been produced to support the DCO application by Highways England for the Scheme. The ES reports on the findings of the EIA. It identifies the likely significant environmental effects of the Scheme, the appropriate measures to avoid or reduce such effects and the alternatives considered. The ES has been produced in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the “IP (EIA) Regulations 2017”).

1.4.2 The IP (EIA) Regulations 2017 impose procedural requirements for carrying out EIA for NSIPs which are considered as ‘EIA development’. The ES complies with

Regulation 14(2) of, and Schedule 4 to, the IP (EIA) Regulations 2017. Advice[1] published by the Planning Inspectorate states that the ES should clearly explain the processes followed, the forecasting methods used and the measures envisaged to prevent, reduce and, where possible, offset any likely significant environmental effects.

1.5 Need for Environmental Impact Assessment

1.5.1 The requirement for certain projects to report their effects on the environment is derived from European Union (EU) legislation, initially in Council Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment. This legislation was amended in 1997, in 2003 and in 2009 with the amendments codified by Directive 2011/92/EU1 ("the EIA Directive 2011") of 13 December 2011. The 2011 Directive was then itself amended in 2014 by Directive 2014/52/EU2. The most recent changes were implemented into UK law through a series of regulations and, in the case of the consenting regime established for NSIPs under the Planning Act 2008, by the IP (EIA) Regulations 2017 which transpose changes made to EU Directive 2011/92/EU1 ("the EIA Directive 2011") by EU Directive 2014/52/EU2. The related Town and Country Planning (Environmental Impact Assessment) Regulations 2017 ("the TCP (EIA) Regulations 2017") govern development given planning consent under the Town and Country Planning Act 1990.

1.5.2 Under the IP (EIA) Regulations 2017, the Scheme is considered to be an EIA development which requires an ES to be prepared because of the likelihood that the Scheme will give rise to significant environmental effects. The Applicant notified the Planning Inspectorate on 14 November 2017 that it proposed to provide an ES in respect of the Scheme, in accordance with regulation 8(1)(b) of the IP (EIA) Regulations 2017.

1.5.3 The Scheme involves the alteration of the M25 motorway, which is located solely within highway infrastructure in England for which Highways England is the strategic highway authority and realignment of the existing A12 eastbound off-slip which is a Transport for London (TfL) asset. The Scheme would involve the creation of a new two lane loop road and the replacement of two existing slip roads. Overall, the area of development is approximately 43.15 hectares, which exceeds the 15 hectares threshold for a highway-related development to amount to an NSIP as prescribed in Section 22(4)(a) of the Planning Act 2008. Consent for the construction and operation of an NSIP and associated development is sought by a DCO application made to the Secretary of State under Section 37 of the Planning Act 2008. Further detail as regards to the Scheme's qualification as an NSIP can be found in the Explanatory memorandum (application document TR010029/APP/3.2).

1.5.4 The aim of EIA is to protect the environment by ensuring that the Examining Authority, when deciding whether to recommend consent for a project which is likely to have significant effects on the environment, does so in the full knowledge of the likely significant effects, and takes environmental information into account in the decision-making process. Further, EIA ensures that the public are given early and effective opportunities to participate in the decision-making process.

[1] Advice Note Seven: Environmental Impact Assessment: Process, Preliminary Environmental Information and Environmental Statements, The Planning Inspectorate, December 2017

1.6 Legislative and policy framework

Legislation framework

1.6.1 The overriding legislative framework requiring an EIA is described above in paragraphs 1.5.1 and 1.5.2.

1.6.2 All relevant legislation for each environmental topic is referenced in each topic chapter of the ES (Chapters 5 to 15).

Policy framework

1.6.3 Section 104(2)(a) of the Planning Act 2008, requires the Secretary of State to have regard to the relevant National Policy Statement (NPS), amongst other matters, when determining the DCO application. The relevant NPS for the Scheme is the National Policy Statement for National Networks (NPS NN). Chapters 5 to 15 of the ES includes the relevant assessment paragraphs of the NPS NN where relevant to the topic chapters and the overall assessment of the Scheme's accordance with the NPS NN can be found alongside the Case for the Scheme (application document TR010029/APP/7.1).

1.6.4 Table 1.1 below provides a summary of the key national, regional and local policies that support the need for the Scheme.

Table 1.1: Policy overview

Scale	Policy document	Key consideration for the Scheme
National	Road Investment Strategy 2015 to 2020 (2014)[2]	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.
	Highways England: Strategic Business Plan 2015 - 2020[3]	Support short-term targets as well as long-term aspirations and not significantly impact on network availability.
	Road Investment Strategy 2 2020 to 2025[4]	Promotes a safer network, more reliable, and more sensitive to the places through which it runs. Strong focus on the differing needs of road users and adoption of new working practices and technologies including network users experiencing smoother, more consistent journeys and use of green infrastructure and good design, so users and residents alongside the network experience less noise, light and air pollution.
	National Policy Statement on National Networks (NPS NN) (2014)[5]	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) (2019)[6]	Advises that local authorities should take account of the need for strategic infrastructure, including nationally significant infrastructure within their

[2] Road Investment Strategy: 2015 to 2020, Department for Transport and the former Highways Agency, December 2014
[3] Highways England: Strategic Business Plan 2015 to 2020. Department for Transport 2014
[4] https://www.gov.uk/government/publications/road-investment-strategy-2-ris2-2020-to-2025
[5] National Policy Statement for National Networks, Department for Transport, December 2014
[6] Department for Communities and Local Government (2019) National Planning Policy Framework. London: DCLG

Scale	Policy document	Key consideration for the Scheme
		areas. The NPPF sets out the Government's planning policies for England and requirements for the planning system. It provides a framework within which locally-prepared plans for housing and other development can be produced. The NPPF advises that local authorities should take account of the need for strategic infrastructure, including nationally significant infrastructure within their areas.
Regional	South East England Strategic Economic Plan (2014)[7]	Enable local housing and employment growth in Essex and the wider South East by supporting efficient movement along the A12 and M25.
	Adopted London Plan (January 2017)[8]	Recognises the importance of working collaboratively with a wide range of strategic partners to achieve good transport connectivity within London and also between London and the wider South East.
	Draft London Plan (July 2019)[9]	Recognises the importance of working collaboratively with a wide range of strategic partners to achieve good transport connectivity within London and also between London and the wider South East.
	Mayor's Transport Strategy (2018)[10]	Support the smooth and efficient movement of traffic along the A12 to the west of the M25.
Local	Essex Local Transport Plan (2011)[11]	Manage the impacts of traffic on the local community, support access to strategic locations in Essex along the A12 corridor and support multimodal access for Brentwood.
	Draft Brentwood Local Plan (2018)[12]	Ensure improvements are consistent with land use and environmental constraints and help to deliver local aspirations for housing and employment growth.

1.6.5 Other relevant policy documents for each environmental topic are referenced in each topic chapter of the ES (Chapters 5 to 15).

1.7 Competent experts

1.7.1 In accordance with the IP (EIA) Regulations, and Highways England guidance, the coordination of the environmental assessment process and specialist assessments has been undertaken by a team of competent and qualified consultants who are registered with the relevant institutions and/or chartered.

1.7.2 Atkins is EIA Quality Mark registered through the Institute of Environmental Management and Assessment (IEMA). Accreditation is based around compliance with a series of EIA commitments, which IEMA regularly independently monitors through an annual review process. The EIA Quality Mark

[7] Strategic Economic Plan (2014) South East Local Enterprise Partnership
[8] London Plan (January 2017) Mayor of London
[9] Draft New London Plan (July 2019) Mayor of London
[10] Mayor's Transport Strategy (2018) Mayor for London
[11] Essex Transport Strategy: The Local Transport Plan for Essex (2011) Essex County Council
[12] Draft Brentwood Local Plan (2018) Brentwood Borough Council

therefore provides registrants with a benchmark for their EIA activities and demonstrates a commitment to effective practice. Continued registration requires all of Atkins EIA coordinators and practitioners to be aware of the commitments and deliver EIA work to a high standard.

1.7.3 The environmental specialists work in close collaboration with designers and engineers through the various stages of a scheme's development. This process maximises the opportunity to avoid or reduce adverse environmental effects early in the design process and to identify mitigation measures to address those effects that cannot be avoided or reduced at source.

1.7.4 Each environmental topic chapter sets out the details of the competent experts leading the environmental assessments (Chapters 5-15). The overall lead on the ES is a Principal Environmental Consultant with over 17 years' experience in delivering major infrastructure schemes including assessments of highways schemes.

1.8 Consultation overview

1.8.1 A summary of the consultation undertaken on the Scheme to date is presented below. Full details of the consultation process that has been undertaken in respect of the Scheme is provided in the Consultation report (application document TR010029/APP/5.1).

Option selection stage (non-statutory) consultation

1.8.2 The option selection stage (non-statutory) consultation period ran from 14 November 2016 to 6 January 2017 - a period of 8 weeks to gather views on three options to address congestion and delays, safety, resilience to accidents and environmental concerns at junction 28. The three options consulted on were:

- Option 5B: single lane loop road, and widening of existing M25 bridge over junction 28.
- Option 5C: single lane loop road, and widening of short section of M25.
- Option 5F: two-lane loop road, widening of short section of M25, and reconfiguration of A12.

1.8.3 As part of this option selection stage consultation the following environmental bodies were consulted:

- Environment Agency
- English Heritage
- Natural England
- Forestry Commission
- Local planning authorities (London Borough of Havering, Brentwood Borough Council and Essex County Council)

1.8.4 There were three stakeholder responses to the consultation. The London Borough of Havering provided feedback during this stage and raised concerns about the proximity of the junction to Havering's Green Belt, and the Ingrebourne River being a Site of Metropolitan Importance to Nature. London Borough of Havering also noted that the Scheme was located within an Air Quality Management Area (AQMA) and requested that consideration be given to noise

mitigation measures. Essex County Council also provided feedback in response to this consultation, but no key environmental concerns were raised. The third was from a local MP and did not raise any environmental issues. No feedback was provided by the other environmental bodies listed above.

1.8.5 Overall the results of the option selection consultation showed that respondents were most concerned with congestion, limited capacity and road safety. This feedback supported the key Scheme objectives which are to deliver improvements in these areas.

1.8.6 Of the three options considered, Option 5F (the two-lane solution) had the most support and was considered to deliver the Scheme's core objectives. The three stakeholder responses as described at 1.8.4 all stated support for Option 5F.

1.8.7 Further details on the option selection stage consultation can be found in the Highways England Report on Public Consultation, published in May 2017[13] and Chapter 3 of this ES.

1.8.8 The Applicant issued a Preferred Route Announcement (PRA) in August 2017 explaining that Option 5F was the preferred option that it would be taking forward into preliminary design.

Preliminary design stage consultation

Scoping report consultation and scoping opinion

1.8.9 On 14 November 2017, the Planning Inspectorate received a scoping request from the Applicant and the Environmental Scoping Report which accompanied that request was published on the Planning Inspectorate website (application document TR010029/APP/6.10). This report set out how the environmental effects of the Scheme would be assessed during the EIA process. Consultation bodies were notified to reply within the statutory timeframe and were invited to make comments on the Scoping Report. The Planning Inspectorate coordinated the responses to the Scoping Report from statutory consultees and others.

1.8.10 A scoping opinion (application document TR010029/APP/6.10) was received from the Planning Inspectorate on behalf of the Secretary of State in respect of the Scoping Report on 20 December 2017. The Scoping Opinion took into account the requirements of the IP (EIA) Regulations 2017 as well as current best practice towards preparation of the ES. The Scoping Opinion recommended that a table be provided in the ES summarising the scoping responses from the consultation bodies and how they are or are not addressed in this ES. This summary table is provided in Appendix 1.1 (application document TR010029/APP/6.3).

Statutory consultation on design

1.8.11 Under Sections 42 and 47 of the Planning Act 2008, Highways England are required to consult with prescribed consultees, local authorities, the Greater London Authority and persons with an interest in land (PiL) along with the local community before submitting an application for a DCO.

1.8.12 Highways England undertook this consultation between 3 December 2018 and 28 January 2019 (an extension to the consultation deadline was made to 28 February 2019 to provide specific groups of consultees an opportunity to

[13] Highways England, 2017. Road Investment Strategy M25 Junction 28 Improvements, Stage 2 Report on Public Consultation.

respond).

1.8.13 As well as seeking consultees' views, preferences and ideas on the Scheme's design, feedback was also sought on the Preliminary Environmental Information Report (PEIR)[14].

1.8.14 Responses on environmental matters were received from Environment Agency, Essex County Council, Forestry Commission, Historic England, London Borough of Havering, Natural England, and Public Health England. The key comments from each environmental stakeholder are summarised below:

- Environment Agency:
  - Water Framework Directive (WFD) assessment – commented that this will need to outline mitigation and compensation for any degradation of watercourses, outlining improvements/gains.
  - Water quality - raised comments about water quality in terms of supporting the WFD and development of the Construction Environmental Management Plan (CEMP).
  - Bridge crossings – commented that clear span bridges would be supported as less obtrusive and that the Environment Agency would support the setting back of abutments no less than 8 m from the watercourses.
  - Flood risk, flood storage and climate change – requested that the Scheme design be informed by an appropriate Flood Risk Assessment (supported by detailed flood modelling) to ensure there is no increase in flood risk to third parties as a result of the Scheme, and a reduction in flood risk is achieved overall.
  - Contaminated land – advised that detailed information would be required for the soils present within the footprint of the Scheme to inform the baseline assessment and the remediation strategy.
- Essex County Council:
  - Biodiversity – outlined that there may be opportunities to enhance parts of the site through Priority Habitats and landscape connectivity. They commented that the CEMP and Landscape and Ecological Management and Monitoring Plan (LEMP) should consider residual loss of habitat and compensation and bat surveys must be undertaken at the correct times of year.
  - Historic environment and archaeology – consideration should be given to secondary impacts upon heritage assets and more extensive trial trenching may be needed dependent on survey results and scheme design.
  - Public health and wellbeing – outlined that a health element is required in the EIA and severance of walking and cycling connectivity should be addressed.
- Forestry Commission:

[14] https://highwaysengland.citizenspace.com/he/m25-junction-28-statutory-consultation/supporting_documents/Preliminary%20Environmental%20Information%20Report%20%20Volume%201%20Main%20Text.pdf

  - Outlined that there are several Ancient Woodlands adjacent to the DCO boundary and these areas must be considered appropriately to avoid adverse impacts to soil, flora, fungi, vegetation, water table, drainage or archaeology. They stated that loss of woodland should be included in compensation package and consideration and protection of woodland is needed for work within Root Protection Zones. Long term management of woodland should also be included.

- Historic England:
  - Outlined that an Iron age-Romano British transition site was excavated just to the south of the Scheme area and this discovery raises the potential for evidence from those periods to be present. They referred to the former Maylands Aerodrome west of the Weald Brook and that remains of the aerodrome's structures and buried features connected with the site likely to be present at the site and there is also scope for survival of wartime defence structures. Both these sites need to be assessed. They stated that mitigation measures should preserve significant remains.
- London Borough of Havering:
  - Biodiversity – exploration of all reasonable options to enhance the development for biodiversity including “Protected and Priority Habitats and Species” will be required as well as compensation for the loss of habitat.
  - Cultural heritage – noted that a deposit model of Weald Brook for defining potential prehistoric deposits may be required.
  - Air quality - a detailed assessment will be required for pollution during construction and mitigation measures agreed.
  - Geology and soils - ground investigation would need to be undertaken in order to assess and mitigate the risks posed by land contamination, through previous landfill uses.
  - Noise and vibration – noted support for the methodology proposed for the noise and vibration assessments as detailed in the PEIR.
- Natural England:
  - The EIA should include an assessment of the likely impacts on the wildlife and geodiversity interests of Local Sites and the wider context of the site. The assessment should include proposals for mitigation of any impacts and if appropriate, compensation measures. Surveys should always be carried out in optimal survey time periods and to current guidance by suitably qualified and where necessary, licensed, consultant.
  - A full assessment of the potential impacts of the development on local landscape character using landscape assessment methodologies should be included in the EIA.
- Public Health England:
  - Public health and wellbeing – recommended that health assessments should be undertaken, and equal merit should be given to physical and mental health and that they would expect to see consideration of noise levels due to construction and operation, including health outcomes. They would expect to see more detail about the cumulative impacts of the works

alongside other major road schemes. Stated that the ES should include monitoring relating to population and human health effects and consultation with key stakeholders.

- Air quality – stated that consideration is needed in construction management of air quality as a result of road closures, traffic management, transport of waste and materials. They queried whether the future assessment of air quality concentrations in the PEIR was sufficient as well as the monitoring points.
- Geology and soils – recommended that investigation should include extent nature and composition of existing landfill and that the assessment considers the impact of land contamination.
- Materials and waste – commented that consideration should be given to re-use of construction materials generated by the Scheme.

1.8.15 As a result of this consultation changes were made to the Scheme design, including considerations to avoid, reduce, mitigate and improve where possible the impact on the local environment.

1.8.16 Engagement continued with statutory environmental bodies after the statutory design consultation to seek to address the matters raised. For example, this has included sharing documents with the Environment Agency such as flood risk modelling data, the draft WFD compliance assessment report (application document TR010029/APP/6.7) and Outline LEMP (application document TR010029/APP/6.3, Appendix 7.16). These discussions have informed the assessment process and the approach to mitigation.

1.8.17 Following the statutory consultation, the Applicant also undertook further environmental assessments. These included additional river, ecological and tree survey works to support the development of the Scheme design, taking into account key infrastructure in the area and identifying further measures to mitigate the effects of the Scheme.

1.8.18 The proposed Scheme changes, along with additional environmental information on trees, were then the subject of a supplementary consultation.

Supplementary consultation

1.8.19 A further supplementary consultation was held between 4 November 2019 and 2 December 2019 seeking views on changes to the Scheme following the statutory consultation, the extent of the Scheme red line boundary and newly identified environmental impacts, including the loss of two veteran trees. These changes included additional mitigation proposals to minimise the impacts of the Scheme on watercourses and ecology receptors due to the high-pressure gas pipeline diversion, the proposed location of the construction compounds and the redesign of the A12 slip road.

Targeted consultation

1.8.20 A targeted consultation was undertaken from 31 January to 26 February 2020 with Luddington Golf Limited (who run Maylands Golf Club), London Borough of Havering and Glebelands estate. These consultees were identified as being directly affected by the proposed extension of the red line boundary and were invited to respond to this proposal.

Ongoing consultation

1.8.21 Discussions on the development of biodiversity mitigation proposals were held with Essex County Council, London Borough of Havering, Brentwood Borough Council, Environment Agency and Natural England to discuss mitigation and compensation for the permanent and temporary loss of habitat within the Ingrebourne Valley Site of Metropolitan Importance (SMI) for Nature Conservation and compensation for the loss of two veteran trees. The biodiversity mitigation proposed for the Scheme is outlined in the Outline CEMP (application document TR010029/APP/7.2) and Register of Environmental Actions and Commitments (REAC) (application document TR010029/APP/7.3). An outline plan for the long-term habitat management objectives, targets and prescriptions is set out in the Outline LEMP (application document TR010029/APP/6.3, Appendix 7.16).

1.8.22 Discussions with the Environment Agency were held to ensure the development of the design work affecting the water environment were taken into consideration and incorporates appropriate mitigation measures were secured through the developments part of the preliminary design stage. The mitigation measures proposed for the water environment are outlined in the Outline CEMP, REAC and WFD.

1.8.23 A summary of key meetings held during the preliminary design stage to discuss environmental issues with stakeholders and to obtain and provide information on the Scheme are outlined in Table 1.2 below.

Table 1.2: Consultation meetings

Date	Stakeholder	Team involved and issues discussed
30.10.17	Environment Agency (EA)	Project and environment team – Scheme overview following PRA with EA recommendations on flooding, WFD compliance, biodiversity, geomorphology and water quality.
20.11.17	Environment Agency	Project and environment team – historic landfill and approach to Ground Investigation (GI) Report.
06.11.18	Environment Agency	Project and environment team – project update following project pause. Update on GI progress and Scheme interaction with the water network.
05.12.18	Environment Agency	Environment team – groundwater matters and update on GI and proposed approach to the DCO application.
16.04.19	Environment Agency	Project and environment team – design development and environmental mitigation.
21.05.19	Environment Agency	Project and water team – site visit to familiarise EA staff with the site and the opportunities / constraints this presents to the design of the Scheme. Initial looks at potential for compensating the effect of Scheme on water environment by works on the Ingrebourne River upstream of junction 28.
11.06.19	Environment Agency	Environment team – site visit follow-up call and discussion on the feasibility of proposed mitigation measures north of the junction.
09.08.19	Essex County Council	Project and biodiversity team – additional bat

Date	Stakeholder	Team involved and issues discussed
	Ecologist	surveys.
12.08.19	Environment Agency	Project and environment team – environmental mitigation update, supplementary consultation update and GI and DCO progress.
19.09.19	Essex County Council Ecologist	Biodiversity team - proposed compensation for the permanent loss of land with the Ingrebourne Valley SMI.
20.09.19	Brentwood Borough Council and London Borough of Havering	Project and environment team – air quality methodology and assessment outcomes update.
24.09.19	Environment Agency	Project and water team – discussion on the outcome of the feasibility study on Ingrebourne River within French's Farm area.
22.10.19	Environment Agency	Project and water team – follow up meeting to discuss alternative mechanism for delivering the additional mitigation required for the Scheme.
20.11.19	Natural England	Biodiversity team – Scheme overview, proposed compensation for the permanent loss of land with the Ingrebourne Valley SMI.
06.12.19	Environment Agency	Water team – discussion on the flood risk model.
17.12.19	Environment Agency	Water team – discussion regarding the HAWRAT assessment and the proposal for setting out delivery mechanism for watercourse mitigation to be implemented under EA programme of works.
12.02.20	Environment Agency	Water team – discussion to explore opportunities for the EA to implementing mitigation measures solely within the Ingrebourne WFD water body.
02.03.2020	Brentwood Borough Council and London Borough of Havering Essex County Council	Briefing on the content of the Scheme DCO application, including Outline CEMP, Outline LEMP.
17.04.2020	Brentwood Borough Council and London Borough of Havering	Issue of draft Outline LEMP, draft Outline CEMP, preliminary environmental design plans
21.04.2020	Natural England	Issued by email draft ecological impact assessment, environmental design plans, etc
20.04.20	Environment Agency	Water and legal team – discussion on the Statement of Common Ground and delivery mechanism for watercourse mitigation within the Ingrebourne WFD water body.
22.04.2020	Forestry Commission	Issue of preliminary environmental design plans by email, information about veteran trees.
11.05.2020	London Borough of Havering / Essex County Council Ecologist	Biodiversity team – discussion regarding comments on the Outline LEMP provided to the local authorities and landscape/ecology design.
13.05.2020	Natural England	Biodiversity team – discussion regarding compensation for woodland loss and veteran trees following comments from Natural England.

2. The Scheme

2.1 Need for the Scheme

2.1.1 Junction 28 plays a key role connecting the M25 motorway with the A12 trunk road, as well as providing local access to Brentwood via the A1023 (Brook Street).

2.1.2 Currently junction 28 is a heavily used junction which features a roundabout controlled by traffic lights and it is used by up to 7,500 vehicles an hour during peak times. Traffic analysis of the existing movements through the junction has been set out within the Transport assessment (application document TR010029/APP/7.4). This analysis indicates that there are four dominant movements through junction 28, namely between the M25 northbound and southbound carriageways and the A12 eastbound (facing Essex) in both directions.

2.1.3 The junction is already operating at capacity, with motorists regularly experiencing congestion and delays. By 2037, traffic levels in the area are expected to increase by up to 22% by 2037, with more than 9,000 vehicles travelling through the roundabout every hour at peak times. Average delay due to congestion during peak travel times is predicted to increase by at least three times from over a minute per vehicle at present, to four minutes per vehicle in 2037 under 'Do Mimnimum' conditions (that is, without the Scheme).

2.1.4 Traffic modelling (further details are again provided in the Transport assessment (application document TR010029/APP/7.4) has been undertaken to replicate current traffic demand and conditions at junction 28, and to predict how these might change in the future. The traffic modelling shows that without intervention, there will be further deterioration in traffic conditions at junction 28:

- Delays will be at over three times greater than currently experienced
- Average speeds will be reduced by 25%

2.1.5 As stated above, the junction 28 roundabout also caters for traffic accessing Brentwood via the A1023 (Brook Street). While the roundabout is signalised, the Brook Street approach to the roundabout is the only approach not currently controlled by traffic lights. Brook Street is not part of the Applicant's SRN and it is owned and maintained by Essex Highways.

2.1.6 In recent years there have also been several traffic incidents at junction 28, which create delays and congestion along the M25, A12 and local roads. Without the Scheme, traffic conditions will deteriorate with queues from the M25 south off-slip blocking back to the mainline of the M25. This will bring significant safety and operational issues with queues on the main M25 carriageway.

2.1.7 Current accident records show that 27 injury accidents were reported (on the junction 28 roundabout and the adjoining slip roads over the five year period to December 2017). This figure does not include 'damage only' collisions which are often unreported. The 27 accidents have resulted in 36 casualties of which 33 were slight injuries (90%) and three serious. The number of killed and serious injury (KSIs) incidents is low with less than one KSI each year. As well as harm and injury, a key concern arising from the frequency of these incidents on junction 28, together with the unreported damage only events, relates to the traffic disruption they cause across the wider highway.

2.2 Scheme objectives

2.2.1 The objectives for the Scheme were developed with DfT and local authorities. The Scheme objectives are:

- To increase capacity and reduce congestion and delays by providing an improved link from M25 to A12.
- To reduce the incident rate and resulting disruption by increasing the capacity of the roundabout.
- To improve safety on the roundabout by reducing traffic levels and redesigning the existing layout.
- To cater for future traffic demands to enable development and economic growth.
- To minimise the impact on local air quality and noise by smoothing traffic flow.
- To protect access for non-motorised users (pedestrians and cyclists) and improve conditions wherever possible.

2.2.2 Alongside the objectives for the Scheme, Highways England aims to:

- Minimise environmental impact as measured in accordance with the Design Manual for Roads and Bridges (DMRB).
- Where possible improve air quality related to vehicle emissions, and specifically within declared Air Quality Management Areas (AQMA).

2.2.3 In addition, the Highways England Delivery Plan 2015-2020[15] sets out its own approach to meeting the key performance indicators identified within RIS of reducing net loss of biodiversity and more recently in RIS2 having a longer- term ambition of ensuring no net loss across Highways England's activities. The plan also sets targets to mitigate noise in at least 1,150 Noise Important Areas (NIAs) between 2015/2016 and 2019/2020. This plan also demonstrates the ability of the Scheme to meet the requirements within Highways England's licence, specifically in relation to the environment. Highways England published 'The Road to Good Design' in January 2018, which sets out design principles for delivering projects with the aspiration to 'deliver safer, better, beautiful roads which connect people and connect our country' which have been considered within the development of the Scheme design.

2.3 Scheme location and key environmental context

2.3.1 The location of junction 28 of the M25 is shown in Figure 1.1a above.

2.3.2 An overview of the key environmental constraints which have informed the development of the Scheme are outlined below with further detail in the specific environmental topic chapters 5 to 15. A plan showing the key environmental constraints is provided in Figure 2.1 (application document TR010029/APP/6.2).

2.3.3 The Scheme is located in a predominantly rural setting in a narrow strip of Green Belt between the edge of the settlement of Brentwood to the east and Romford to the west. The Scheme lies within the Northern Thames Basin National

[15] Highways England Delivery Plan 2015-2020, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/424467/DSP2036-184_Highways_England_Delivery_Plan_FINAL_low_res_280415.pdf

Character Area.

2.3.4 Brentwood Borough Council have declared three Air Quality Management Areas (AQMAs) within their administrative areas. The Scheme is partially located within AQMA No. 2 which comprises parts of Brook Street, Brentwood and the A12. The London Borough of Havering has also declared a Borough wide AQMA covering areas to the west of the Scheme.

2.3.5 Monitoring by the Department for Environment, Food and Rural Affairs (Defra) recorded elevated nitrogen dioxide (NO_2) concentrations on the A12. There are several noise important areas (NIAs) within the area (noise hotspots), with one centred on junction 28.

2.3.6 There are eight Grade II and II* Listed Buildings within the vicinity surrounding the Scheme. The Nags Head is a Grade II Listed Building located 600 m along Brook Street to the east of junction 28. The Golden Fleece Inn and the Moat House (Grade II*) are located 1 km to the east of junction 28. Weald Park is a Registered Park and Garden located 800 m to the north of the junction.

2.3.7 There are no designations for landscape quality but there are several Ancient Woodlands around junction 28. Lower Vicarage Wood and Vicarage Wood are both designated Ancient Woodland and located approximately 400 m and 800 m respectively to the north east from the junction. The Manor Local Nature Reserve (LNR) is located approximately 1 km to the north west of junction 28. The Ingrebourne Valley SMI[16] is located directly west of junction 28.

2.3.8 Fifteen veteran trees have been identified within the Scheme DCO boundary.

2.3.9 The area surrounding the junction is Grade 3 Agricultural Land Classification (ALC) and there is a former landfill site immediately to the north west of junction 28, situated within the landholding known as Grove Farm.

2.3.10 Two waterbodies cross the area, the Ingrebourne River which flows adjacent to A12 and the Weald Brook which flows north to south to the west of the M25 and both have associated fluvial flood plains.

2.3.11 Five ponds have been identified within the vicinity of the Scheme and Great Crested Newts (GCN) have been confirmed to be present in four of these ponds.

2.4 Scheme description

Scheme overview

2.4.1 The Scheme is illustrated on the Scheme layout plans (application document TR010029/APP/2.7). The Scheme comprises an alteration of junction 28 of the M25 between Romford and Brentwood in Essex. In summary it involves the provision of a new dedicated loop road between the M25 northbound carriageway and the eastbound carriageway of the A12. The provision of the new loop road will involve the realignment of the existing A12 eastbound off-slip and the M25 northbound on-slip. The Scheme includes other complementary improvements to the existing roundabout as described below.

2.4.2 The preferred route announcement (PRA) was made in August 2017. Since then the Scheme has been developed further based on consultation with stakeholders

[16] Non-statutory designated sites in Greater London are known as Sites of Importance for Nature Conservation (SINCs). These are categorised as Site of Metropolitan Importance (SMI), Sites of Borough Importance Grade I (SMI I), Sites of Borough Importance Grade II (SMI II) and Sites of Local Importance (SLI).

and members of the public, and more detailed assessments of traffic, engineering, buildability and environmental factors. The Scheme has been developed to a level of detail sufficient to determine the size and location of the key works elements and the land interests required to construct, maintain and operate it. The boundary of the works has been drawn with reference to the DCO limits of deviation (as shown in the Works plans (application document TR010029/APP/2.3) and draft DCO (application document TR010029/APP/3.1) and applied the 'Rochdale Envelope'[17] to allow for any further design refinement and development during the detailed design of the Scheme.

2.4.3 The Scheme comprises of the following key works elements:

Highways works

a. The creation of a new two-lane loop road with hard shoulder (Work No. 6), for traffic travelling from the M25 northbound carriageway onto the A12 eastbound carriageway towards Essex.

   The loop road would be approximately 1.4 km in length, inclusive of merge and diverge, commencing from an elevated position on the northern end of the M25 viaduct at junction 28. The loop road would then curve away from the M25 in a north-westerly direction before heading south beneath the realigned A12 eastbound off-slip (Work No. 2), to merge with the existing A12 eastbound carriageway (Work No. 1). There will be a vehicular access track (Work No. 20A) from the new loop road to allow for maintenance and access to drainage pond (Work No. 20B).

   The new two lane loop road would also include the provision of three new bridges and an underpass:

   - Alder Wood bridge which would carry the new loop road over the new M25 northbound on-slip (Work No. 8)
   - Grove Farm underpass to accommodate an access track under the loop road for areas to the north of the loop road (Work No. 14)
   - Duck Wood bridge which would carry the loop road over the realigned Weald Brook (Work No. 23C)
   - Grove bridge which would carry the loop road over the realigned Weald Brook (Work No. 23B) and Ingrebourne River (Work No. 23D)

   The loop road would include other engineering features such as embankments and retaining walls. For example, a retaining wall would be provided between Duck Wood bridge and Grove Farm underpass to protect a high value tree and other existing structures such as the electricity transmission tower.

b. Realignment of the existing A12 eastbound off-slip road (Work No. 2) over a length of approximately 760 m to accommodate the new loop road including the provision of a new bridge (Maylands bridge) and the extension of the existing Grove culvert (not exceeding 80 m in length).

[17] The approach known as the 'Rochdale Envelope' was developed during onshore planning applications to provide flexibility in design options where details of the whole project are not available when the application is submitted, while ensuring the impacts of the final development are fully assessed during the Environmental Impact Assessment (EIA). Consents granted on the basis of the Rochdale Envelope are conditional on providing the final details for agreement prior to construction.

The off-slip would include other engineering features such as an embankment and retaining walls. For example, retaining walls would be provided between Maylands bridge and Grove culvert extension to accommodate a new ecological mitigation area (Work No. 26) and limit the impact on Grove Wood.

The off-slip would include the provision of an improved widened footway, and a new egress from Grove Farm (Work No. 15).

c. Improvements to the existing A12 eastbound and westbound carriageways and A12 eastbound entry (on-slip) road (Work Nos. 1, 3 and 4).

d. Realignment of the existing M25 northbound on-slip (Work No. 8) over a length of approximately 1.2 km in length, inclusive of the merge.

e. Starting from the existing circulatory carriageway of the junction 28 roundabout, the slip road would be realigned to pass under the new loop road (at Alder Wood bridge (Work No. 6)) and continue to merge with the M25 northbound carriageway.

   The on-slip would include other engineering features such as earthwork, cutting and retaining walls. For example, a retaining wall would be provided at Alder Wood bridge to accommodate the new M25 gantry (Work No. 9).

   The on-slip would also include the extension of two existing culverts.

   A vehicular access track is proposed from this new on-slip (Work No. 14) to allow for maintenance and access to drainage features (Work Nos. 21A and 21B), land and utility infrastructure.

f. Improvements to the existing junction 28 roundabout, the existing M25 northbound carriageway and the M25 northbound off-slip (Work Nos. 5, 7 and 12).

   The Scheme includes the installation of new gantries and signage required on the M25 to provide information to motorists of the new junction alteration. The location of the new gantries would be:

   - Over the M25 just to the north of the M25 viaduct over junction 28 (Work No. 11)
   - Just after the start of the diverge from the M25 to the new loop road (Work No. 9)
   - Across the M25 after the merge of the new on-slip from the roundabout joining the M25 northbound carriageway (Work No. 10)

   Replacement advanced signage is also proposed along the northbound M25 carriageway, south of and on the approach to junction 28 from junction 29.

g. Alterations to existing private access and egresses and the provision of new private means of access to enable the Scheme (Work Nos. 13, 14, 15, 16, 19A, 20A and 21A).

   Private means of access will be created from the existing or new public highway onto the land within the Scheme to enable future maintenance and entry/exit, for example, to the attenuation ponds, environmental compensation areas, overhead electric lines and pylons. These include:

   - A private means of access approximately 600 m in length around the outer alignment of the loop road (Work No. 13).

- A private means of access from the M25 northbound on-slip approximately 519 m in length (Work No. 14), as described in d) above.
- Alteration to the existing egress from Grove Farm to enable the realignment of the A12 eastbound off-slip as described in b) above (Work No. 15) whilst maintaining egress for the landowners.
- A private means of access (Work No. 16) approximately 35 m in length from the proposed means of access (Work No. 19A) to replace the stopped up existing field access.
- A private means of access from the A12 eastbound carriageway (Work No. 19A) approximately 290 m in length to provide access to the drainage pond (Work No. 19B).
- A private means of access from the new loop road (Work No. 20A) approximately 65 m in length to provide access to the drainage pond (Work No. 20B).

Earthworks and drainage works

h. Surplus earthworks construction material would be deposited within the Scheme DCO boundary in two main areas; one to the west of the Weald Brook and north west of the new loop road (approximately 22,000 m^2) (Work No. 17), and another in the area to the north of the A12 and west of the new loop road (approximately 23,000 m^2) (Work No. 18).

i. The drainage works supporting the new highway proposals involves the creation of three new attenuation ponds (Works Nos. 19B, 20B, and 21B) and associated drainage facilities. These would be accessed for any maintenance activities from specific access tracks (Works Nos. 19A, 20A and 21A) included in the Scheme proposals. A new drainage outfall pipe (Work No. 22) is proposed between Work No. 21B and Weald Brook.

Realignment of watercourses

j. Realignment of two existing watercourses is required and proposals are included in the Scheme to achieve this, including:
   - The realignment of three sections of the Weald Brook, and the Ingrebourne River:
     - Weald Brook straightening - Realignment of sinuous section of natural channel to accommodate Duck Wood bridge (Work No. 23C);
     - Weald Brook realignment - Realignment of two sections of existing straight channel to new sinuous courses on the lower Weald Brook 85 m length (Work No. 23A), and 250 m in length (Work No. 23B); and
     - Ingrebourne River realignment - Realignment of approximately 200 m of existing straight channel to new sinuous course (Work No. 23D) between Grove culvert extension and beneath Grove Bridge.

Environmental mitigation and compensation

k. The Scheme will provide ecological compensation for the temporary and permanent loss of habitat within the Ingrebourne Valley SMI, and this includes the following:

- Two new flood compensation areas (Work Nos. 24A and 24B) and the provision of new ecological compensation and mitigation areas (Work No. 26).
- The creation of two new flood compensation areas, one approximately 2,100 m^2 in area (Work No. 24A), and another approximately 7,800 m^2 in area (Work No. 24B) on the western side of the Weald Brook to the north and south of the new loop road to compensate for loss of flood plain volume. This will create wet grassland habitat integrated with the riverine habitat. Floodplain lowering around the realigned Ingrebourne River (Work No. 26) to created wet grassland habitat to integrate with the new sinuous course of the river.
- New habitat creation including broad-leaved woodland, flower-abundant grasslands (for invertebrates), tussocky grassland, scrub and hedgerows, bird and bat boxes, and habitat for invertebrates requiring dead wood. These are incorporated into ecological compensation areas (Work No. 25) of approximately 90,000 m^2 in area, comprising planting and screening of the loop road, and two new environmental mitigation ponds (Work Nos. 27 and 28) both approximately 500 m^2 in area for great crested newts and other ecological features along the Weald Brook and Ingrebourne River.

2.4.4 Further details are provided in paragraphs 2.4.6, 24.7 and 2.4.8, as well as in section 2.5 below.

Utilities

l. The Scheme would require the diversion of utility apparatus as follows:

- Diversion of an existing underground high-pressure (33 bar) gas pipeline (Work No. 29) around the western side of the loop road and then under the realigned A12 eastbound off-slip and existing A12. The diversion continues into the Gardens of Peace burial ground development (formerly known as Land at Oak Farm). The approximate length of this diversion is 860 m. This diversion will not involve any above ground installations.
- Diversion and undergrounding of a section of the 11 kV overhead electricity line (Work No. 30) commencing north of Duck Wood bridge to a point between Grove Bridge and the A12. The approximate length of this diversion is 640 m.
- Diversion of other utilities infrastructure within the highway boundary, including water supply, telecommunications and a sewer, and protection work to an existing fuel pipeline.

Accommodation works

m. Accommodation works to provide replacement facilities for Maylands Golf Course (Work No. 32) on an area of land approximately 13,521 m^2 in area.

2.4.5 Temporary compounds (comprising welfare facilities) and associated haul roads will also be required to facilitate the construction of the above proposals (Figure 2.2 of the application document TR010029/APP/6.2). For further details on how the Scheme will be constructed, please see section 2.6 below.

Compensation and enhancement land proposals

2.4.6 The Scheme is located within an area designated as Ingrebourne Valley SMI. This is a non-statutory designated site designated for nature conservation given protection through policies in the Havering Local Plan[18] and London Plan.

2.4.7 Land take from the Ingrebourne Valley SMI is required to accommodate the Scheme. The Scheme will lead to the permanent loss of approximately 4.9 ha (1.9%) of SMI habitat, with additional areas subject to temporary loss during construction. To compensate for this loss, a parcel of land to the west of the Scheme, within the Ingrebourne Valley SMI, has been identified to be used for habitat enhancement and long-term management along with other areas of land which will be retained around the new loop road (see section 2.5 below for further details). Within this parcel of land, non-native plant species (goldenrod) would be controlled and habitat creation would include tussocky wildflower grassland, scrub and new ponds for great crested newt.

2.4.8 The compensation land will contribute to reducing the adverse effects of the Scheme on the SMI. This proposal is in line with the Draft New London Plan which states that where loss of land from these sites is unavoidable, plans should seek to 'minimise the spatial impact and mitigate it by improving the quality and management of the rest of the site'.

2.4.9 This compensation land will also secure mitigation required to address effects on protected and priority species; great crested newt, reptiles, invertebrates and bats.

Order limits

2.4.10 The Order limits have been established and include all works proposed by the Order and any of the associated development, including environmental and other mitigation works.

Land take

2.4.11 The Scheme's temporary and permanent land take requirements have been identified through the preliminary design, consultation and through engagement with landowners that would be affected by its progression. These are defined by the Order Limits within the DCO application and are illustrated on the Land plans (application document TR010029/APP/2.2).

2.4.12 The Scheme will require the acquisition of land outside of the Applicant's existing land ownership boundary to enable it to be built, operated and maintained. Land acquisition is split into three categories:

- Outright acquisition where the land taken will be retained in the ownership of the Applicant after the works are complete. Approximately 60 ha of land will be taken permanently to build and operate the Scheme. The Applicant is also seeking powers to use this land temporarily pending or in the absence of a need to acquire it permanently.
- Acquisition of rights where the land will be used to build the Scheme and returned to its original owners after construction is complete but where rights of access will remain over it for future maintenance operations. Approximately 10 ha of land will fall into this category. The Applicant is also seeking powers

[18] London Borough of Havering, March 2018. Havering Local Plan (2016 – 31).

to use this land temporarily pending or in the absence of a need to acquire it permanently.

- Temporary possession only where the land will be used to build the Scheme and the Applicant will vacate the land after construction is complete. Approximately 15 ha of land would be taken temporarily.

2.4.13 Although the Applicant is endeavouring to acquire land by agreement, the rights to acquire the land required to deliver the Scheme are being sought by the Applicant through the DCO application, to ensure that the Scheme can be delivered.

2.4.14 Land used temporarily will be restored to the reasonable satisfaction of the owners of the land once the Applicant has vacated it. However, the Applicant will not be required to:

- Restore land on which any permanent works under Schedule 1 to the draft DCO (TR010029/APP/3.1) have been constructed.
- Remove any ground strengthening works which have been placed on the land to facilitate construction of the authorised development.
- Remove any measures installed over or around statutory undertakers' apparatus to protect that apparatus from the authorised development.
- Remove or reposition any apparatus belonging to statutory undertakers or necessary mitigation works.

2.5 Environmental proposals

2.5.1 The Preliminary environmental design on Figure 2.2 (application document TR010029/APP/6.2) shows mitigation which has been embedded within the Scheme design, including areas of new landscape planting, habitat creation and watercourse enhancements. These mitigation measures have been developed through an iterative design process with a multidisciplinary team responding to a complex range of environmental and engineering constraints found within and adjacent to junction 28 and following feedback through consultation.

2.5.2 The full details of the mitigation measures proposed for the Scheme are also outlined in the relevant ES chapters (Chapters 5 to 14), the Outline CEMP (application document TR010029/APP/7.2) and the REAC (application document TR010029/APP/7.3).

2.5.3 The Scheme has been designed as far as possible to avoid key environmental features. This process will continue during the Scheme's detailed design development to ensure that any additional design opportunities are identified to avoid residual environmental impacts on key environmental features that are currently the result of the preliminary design.

2.5.4 Specific environmental works have been incorporated in the Scheme in various ways:

- Environmental proposals for the land used for construction
- Environmental proposals in highway land
- Environmental proposals for the long term management of habitats
- Environmental proposals for the Ingrebourne River and the Weald Brook

2.5.5 These proposals are indicated in broad terms on the Preliminary environmental design plans (Figure 2.2) and will be refined during detailed design and, if necessary, refined again during construction to accommodate site conditions.

Environmental proposals for the land used for construction

2.5.6 The current expectation is that construction of the Scheme will result in the loss of existing vegetation, where required, to facilitate construction. Detailed design and construction planning will aim to reduce the extents of land needed and vegetation clearance where practicable, particularly within Ingrebourne Valley SMI. Important features within the SMI will be retained and protected throughout construction.

2.5.7 Once the engineering construction works are complete, there will be substantial areas of the site that will have their soil conditions restored and become available for environmental reinstatement, subject to any applicable detailed approvals under DCO requirements. These areas will include compounds, soil and materials storage areas, haul roads, temporary slip roads and space for construction activities (including utilities diversions).

2.5.8 Maintaining and providing sufficient woodland screening vegetation along the western side of new loop road, sections to the south and north of Grove Farm will help to screen views from nearby residents at Grove Farm, Maylands Cottages and properties along the eastern edge of Harold Hill.

Environmental proposals in highways land

2.5.9 The Scheme will result in the loss of existing scrub and woodland planting located in the highway land along the A12 and M25 which currently screens views of the highway from Maylands Golf Club and Grove Farm. Where this vegetation is lost the proposals are to reinstate the areas on the new highway verges and earthworks with woodland planting and scrub to provide visual screening of the Scheme to nearby receptors. This will, in time, restore the character of the roadside vegetation.

Environmental proposals for the long term management of habitats

2.5.10 Permanent loss of habitat from Ingrebourne Valley SMI is unavoidable. To compensate for this loss, long-term management of newly planted and existing habitats adjacent to the new loop road will be carried out following completion of the authorised development. An Outline LEMP detailing the management objectives, targets and prescriptions, for these habitats is provided in Appendix 7.16 (application document TR010029/APP/6.3). A final version of the LEMP will be developed by the Principal Contractor in the next phase of the project lifecycle and this is secured through requirement 5 of the draft DCO (application document TR010029/APP/3.1). The LEMP will be substantially in accordance with the Outline LEMP. The habitats subject to long-term management are highlighted within the Outline LEMP (Figure 1).

2.5.11 The overall strategy to compensate for loss of land within the Ingrebourne Valley SMI, temporary and permanent loss of habitats and effect on protected species, includes a suite of measures within the areas of Ingrebourne Valley SMI affected by the Scheme as detailed on the Preliminary environmental design (Figure 2.2). This would be achieved through:

- Appropriate reinstatement and creation of habitats in temporary working

areas, on new earthworks, and around balancing ponds and flood compensation areas (including grassland, scrub and woodland habitats).

- Implementing specific mitigation protection measures for species including creation of ponds and refuges for great crested newts, creation of basking areas for reptiles, bird and bat boxes, maintaining connectivity at watercourse crossing points with widespan bridges.
- Control of non-native invasive plant species, including goldenrod and Himalayan balsam.
- Enhancement of the Ingrebourne River and Weald Brook including in-channel features, management of riparian trees, realignment of channel and lowering of floodplain to improve the river and floodplain integration and create wetland habitat (measures for the riverine habitat are discussed further below, section 2.5.13 and 2.5.14).

Environmental proposals for the Ingrebourne River and the Weald Brook

2.5.12 The construction of the new loop road and realignment of the A12 eastbound off-slip road will impact the Ingrebourne River and Weald Brook. The mitigation measures to minimise the adverse effects to the water environment are outlined in the WFD compliance assessment report (application document TR010029/APP/6.7), the Biodiversity chapter (Chapter 7) and the Road Drainage and the Water Environmental chapter (Chapter 8) and have been incorporated into the design proposals for the Scheme. The following mitigation measures and water features are proposed:

- Realignment of approximately 200 m of existing straight channel of the Ingrebourne River to new sinuous course between Grove Farm and the Weald Brook confluence.
- Realignment of three sections of existing straight channel to new sinuous courses on the lower Weald Brook (70 m, 85 m and 250 m in length). Including the restoration of more natural functioning channel.
- Lowering of approximately 3,500 m^2 of floodplain, creation of backwaters on the Ingrebourne between Grove Farm and the Weald Brook confluence.
- Lowering of approximately 2,100 m^2 of floodplain a flood compensation area and creation of a backwater on the Weald Brook, just upstream of Duck Wood bridge.
- Lowering of approximately 7,800 m^2 of floodplain immediately in combination with a flood compensation area adjacent to Grove bridge and Maylands bridge.
- Regular maintenance works to manage riparian trees along the Ingrebourne and Weald Brook in a way that creates varied light intensity on the channel and riparian zone of the river.

2.5.13 As part of the Scheme further mitigation measures are proposed:

- Significant lengths of unlined ephemeral drainage ditch will be created to manage ‘clean’ runoff from non-pavement surfaces. These ditches will generate habitat that mitigates for loss of existing ephemeral drainage ditches to the Scheme.

- A natural river bed will be incorporated into the design of culverts carrying the Weald Brook under the M25 (Weald Brook culvert extension) and the Ingrebourne River beneath junction 28 (Grove culvert extension).
- The effects of the Scheme will be reduced by minimising the footprint on the floodplain by supporting the A12 eastbound off-slip road on a retaining wall instead of a large embankment structure.
- Within the restrictions defined by other constraints, proposed structures (Grove bridge, Maylands bridge and Duck Wood bridge) have been set as high and as wide from the watercourses as feasible to limit adverse geomorphological impacts, conveyance and shading effects.
- Channel crossings and realignments have been planned to limit the need for hard bank protection to reduce potential impacts on the biological and hydro-morphological quality elements. This affects the proposed Maylands bridge and Duck Wood bridge structures.
- The drainage system has been designed to meet WFD toxicity standards at points of discharge to natural water.
- Measures to prevent excessive scour or “wash-out” of bed material immediately downstream of Grove culvert extension are likely to include the construction of artificial riffle feature downstream of culvert or selective use of bed and bank protection.
- Measures to facilitate mammal passage through Grove culvert extension and Weald Brook culvert extension during higher than normal flows may comprise a shelf along which mammals can move, together with ramps for mammal access and egress.

2.5.14 Further off site mitigation, within the Ingrebourne River catchment area, is required to mitigate the deficit net effect of the Scheme on riverine habitat which has been discussed and agreed with the Environment Agency. The Applicant and the Environment Agency have also agreed that these off site mitigation measures can be most effectively delivered by the Environment Agency, as part of their programme of works within the Ingrebourne WFD water body with financial support from The Applicant. The Applicant is committed to ensuring that the financial support required to enable delivery of these measures by the Environment Agency is provided prior to the commencement of construction of the Scheme.

2.6 Construction, operation and long term management

Construction

2.6.1 The arrangements for construction of the Scheme have been developed by the buildability contractor to a level of detail sufficient to provide certainty on the land take required to build the Scheme, including the development of a high level construction programme (see further details in paragraphs 2.6.14 to 2.6.24 below), and defining key construction methods and equipment to inform the environmental assessment. The assessments of construction effects assume implementation of best practice, based on industry guidance and professional experience. Construction of the Scheme is planned to commence in spring 2022, with the Scheme planned to be open for traffic in autumn 2024.

2.6.2 The programme is based on the current preliminary design of the Scheme and will be updated by the Principal Contractor when appointed during detailed design stage.

Land required temporarily to build the Scheme

2.6.3 The contractor will require parcels of land to use for site compounds, materials storage for permanent and temporary works, haul roads for vehicles, heavy machinery and personnel around the site. The areas that would only be affected by temporary works are shown coloured green on the Land plans (application document TR010029/APP/2.2). The land will be restored to the reasonable satisfaction of the owners of the land with the exceptions outlined in paragraph 2.2.14 above.

2.6.4 Cadent Gas will require a minimum of 40 m wide corridor for the installation of the new underground gas pipeline. In addition, temporary working space requirements may be needed to accommodate welfare facilities and equipment at the crossings of the A12 and where connections are needed to tie into the existing pipeline. It is proposed that short sections of the diversion will be installed using trenchless techniques and the rest will be open trenched. The alignment of the gas pipe diversion, where it crosses the A12, has been located to minimise impact on land take and the diversion is proposed to take place in spring 2022.

Temporary works

2.6.5 Temporary bridges will be required at two locations to cross over Weald Brook during construction. The temporary bridges will be utilised primarily for the earthwork operations. They will comprise the temporary installation of simply supported truss bridges.

2.6.6 Other major temporary works that will be required during construction and will be further developed during detailed design include:

- Temporary watercourse diversions, both culvert and open cut and associated temporary works, including over pumping, to deal with flow of water.
- Plant crossing points over existing and new services.
- Lifting operations near the overhead power lines.
- Demolition or alteration of existing gantries requiring closures of the M25.
- Potential for temporary de-watering schemes for construction of abutment foundations and piers inside and/or outside of cofferdams.
- Temporary falsework and formwork for abutment stem walls will be required.
- De-watering of the cut to build the M25 northbound on-slip and temporary drainage solutions to keep the artificially created low point dry during the works.

Site compounds

2.6.7 The contractor requires site compounds to operate construction activities. This will include offices, welfare facilities and vehicle and materials storage and are presented on Figure 2.2 (application document TR010029/APP/6.2). There will be no planned overnight staff accommodation facilities.

2.6.8 The main site compound for the works would be located on the Glebelands Estate to the west of the proposed loop road and would operate for the duration of the works. This would occupy an area of land approximately 20,000 m^2 which is currently an empty field informally used by Maylands Golf Course. The compound would be accessed from the A12 (eastbound). The detailed internal layout of this compound and the secondary compound noted below would be developed during detailed design.

2.6.9 A second satellite compound would be required within the area of the proposed new loop road within Grove Farm which would include a small welfare facility and storage area for the structures team. This would also operate throughout the duration of the works. This site would be approximately 1,500 m^2.

2.6.10 Haul roads are required within the works area to construct the Scheme and these are all proposed to be located within Grove Farm and Glebelands Estate. One haul road would be required from the main construction compound to the main loop road construction site and one haul road would be required to run along the outside (western side) of the loop road. Proposed haul roads would be kept clear of construction works.

2.6.11 The haul roads would cross the Weald Brook in two locations, to the north and south of the new loop road.

Traffic management

2.6.12 Details of traffic management will be included in a traffic management plan to be produced by the Principle Contractor. No part of the construction alteration or improvement of the M25 or A12 would commence until a traffic management plan for that part had been produced by the Principal Contractor and approved by the Secretary of State in accordance with requirement 10 of the draft DCO (application document TR010029/APP/3.1). The key activities identified to date, associated with traffic management are as follows:

- Statutory undertakers work:
  - On the A12 eastbound
- Slip road works:
  - On the A12 eastbound to tie in the new A12 off-slip and on-slip
  - On the M25 northbound for the on-slip earthworks, verge works, to tie into the top of the new on-slip and off-slip
- Retaining wall works:
  - On the M25 northbound to undertake piling works for the retaining wall and the M25 on-slip
- Gantries:
  - On the M25 northbound and southbound at junction 28 to remove existing gantries and install a new gantry
  - On the M25 northbound and southbound between junctions 27 and 28 to remove an existing gantry and install a new gantry
  - On the M25 northbound on-slip to remove an existing gantry
- Construction of new roads:

  - For the A12 eastbound off-slip
  - For the M25 northbound on-slip
- Road markings:
  - For the A12 eastbound off-slip
  - For the M25 northbound on-slip
  - Roundabout resurfacing

2.6.13 Any diversions would be delivered in accordance with the requirements of the draft DCO (application document TR010029/APP/3.1).

Construction sequence

2.6.14 The main construction works will be divided into 5 phases. Pre-phases including early works, site mobilisation, utilities diversions and ecological mitigation and compensation works will also occur. The phases are not discrete and there will be some overlap between them.

2.6.15 The dates in this section reflect the assumed construction sequence for the assessment of effects.

Early works – Spring 2022

2.6.16 The first works to be undertaken for the construction of the Scheme include the following activities:

- Site clearance
- Site enabling works
- Environmental mitigation works
- Archaeology surveys and mitigation works

Site mobilisation – Spring 2022

2.6.17 The site mobilisation works include the following activities:

- Mobilise site compound areas, including the creation of alternate access and exit routes from the satellite yard in the middle of the loop road

Utilities diversions – Spring 2022 to autumn 2022

2.6.18 Two utilities diversions are proposed outside of the highway boundary - UKPN and Cadent Gas. In addition a number of further diversions are required within the highway boundary as follows:

- BT Openreach
- Essex and Suffolk Water
- NRTS
- Virgin Media
- Telent
- KPN
- Thames Water

- Telia
- Zayo and JSM

Ecological compensation area mitigation works – Spring 2022 to spring 2024

2.6.19 Ecological mitigation works will include the following activities:

- Spring 2022 - access to site:
  - Install temporary amphibian fencing and start programme to capture and remove newts from the working area (under licence) and any necessary enhancement works to retained habitat
- Summer 2022:
  - Works can commence in newt area (gas main / site preparation)
- Summer 2022 – spring 2023:
  - Construction works within compensation area (gas main diversion and deposit clay)
- Spring 2023:
  - Commence creation of new habitats when earthworks are complete (including treatment of invasive plant and creation of new ponds)
- Throughout 2024:
  - Localised treatment of invasive plant close to existing pond, habitat enhancement works

Phase 1 works – Spring 2022 to autumn 2023

2.6.20 Phase 1 works include the following the activities:

- Construct new A12 off-slip including new bridge (Maylands bridge) which includes excavating alluvium, realignment of the Ingrebourne River, installation of the culvert under the junction 28 roundabout, ground stabilisation, construction of embankments, construction of the bridge (Maylands bridge) and landscaping.
- Construct part of the M25 on-slip which includes the lane closure on the M25 and road marking alterations, construction of the retaining wall, construction of bridge (Alder Wood bridge), earthworks, paving and landscaping.
- Complete M25 on-slip/earthworks which includes earthworks on the eastern side of M25 on-slip and loop road and construction of road formation on the outside kerb on M25 slip road.

Phase 2 works – Summer 2023 to summer 2024

2.6.21 Phase 2 works include the following activities:

- Construct A12 east off-slip tie ins which includes the construction of embankments, road formation levels, paving and road markings and switching traffic on to new A12 eastbound off-slip.
- M25 northbound on-slip tie ins which include the completion of the carriageway from temporary to existing, a new retaining wall, completion of tie-ins and completion of the culvert extension.

Phase 3 works – Spring 2022 to summer 2024

2.6.22 Phase 3 works include the following activities:

- M25 junction 28 loop road tie in to the A12 which includes construction of the embankment, drainage, road works, signage, paving and road markings and landscaping.
- M25 junction 28 loop road off-slip which includes completion of new embankments, roadworks and (Duck Wood bridge), drainage, paving and road markings and landscaping.
- M25 junction 28 loop road bridge which includes construction of the new bridge (Grove bridge) and bridge approach embankments.
- M25 junction 28 loop road bridge which includes construction of the new bridge (Duck Wood bridge) and bridge approach embankments.
- Construction of the Grove Farm underpass.

Phase 4 works – Spring 2023 to winter 2024

2.6.23 Phase 4 works include the following activities:

- Loop road which includes construction of embankments, roadworks and drainage, install utilities, paving and road markings and landscaping along the loop road.

Phase 5 works – Spring 2024 to winter 2024

2.6.24 Phase 5 works include the following activities:

- Complete A12 eastbound nearside / construction loop road tie in which includes remarking the A2 eastbound on slip tie in, construction of the tie in to the A12 loop road and construction of the tie in of the M25 to the loop road.

Operation and long-term management

2.6.25 Once the commissioning activities have taken place the Scheme will be open to traffic. The Principal Contractor will be responsible for any construction defects that arise for a period of 12 months after opening. After this period the Scheme will be handed over to Connect Plus who operate the M25 corridor on behalf of the Applicant. The Applicant proposes that side roads and other rights of way would be handed over to the asset owner after opening, who would be responsible for ongoing maintenance.

2.6.26 Environmental works will be maintained by the Applicant after completion of those works to ensure that they become appropriately established and maintained. These are outlined in the REAC (application document TR010029/APP/7.3) and supported by the ecology and landscape maintenance and management operations set out in the Outline LEMP (Appendix 7.16 of the ES, application document TR010029/APP/6.3).

Decommissioning

2.6.27 In view of the indefinite design life of the Scheme it is not considered appropriate for demolition to form part of each environmental topic assessment, rather the focus is on seeking to minimise disruption and to re-use materials as the Scheme is upgraded, that will also form part of the materials assessment.

Demolition of the Scheme has therefore not been included in this ES.

3. Assessment of alternatives

3.1 Assessment methodology

3.1.1 The assessment of alternatives has been considered in accordance with the guidance in DMRB Volume 11 Section 2, Part 5, HA 205/08. The level of investigation and assessment of each of the options considered throughout the Project Control Framework (PCF) process has been directly proportionate to the feasibility of that option and benefits that it could provide. The PCF process is the framework that sets out the processes on how Highways England will manage and deliver major improvement projects.

3.1.2 A staged approach was undertaken when developing options for the Scheme.

3.1.3 This chapter provides a chronology of the options considered to meet the key objectives outlined in section 2.2 of this ES and as set out in the Case for Scheme (application document TR010029/APP/7.1).

3.2 Reasonable alternatives studied

3.2.1 This section is broken into the following Highways England PCF stages where options have been considered over the design development:

- Strategy, shaping and prioritisation pre-project
- Option identification
- Option selection
- Preliminary design

Strategy, shaping and prioritisation pre-project stage

3.2.2 In 2015, during this initial stage, a range of strategic options which could potentially be considered to address key problems at junction 28 were identified. The options considered are set out in Table 3.1.

Table 3.1: Strategic options

Strategic Option	Brief description
Option 1 – Do Minimum	This focuses on short term measures to reduce safety concerns and issues on the gyratory. Primarily it is concerned with introducing traffic signals on the A1023 Brook Street approach (currently uncontrolled), lane markings and signage.
Option 2 - Local access and demand management	This would consider options to change or reduce demand at the junction, for instance with new access strategies to and from Brentwood such as closing A1023 Brook Street and creating a new access on the A12.
Option 3 - Enhanced public transport	Improved bus and rail provision between key destinations (Brentwood, Havering, London, Chelmsford etc., including future Cross Rail).
Option 4 - Highway junction improvements	Junction capacity improvements to cater high demands for M25 anticlockwise to A12 Essex movements. This option would focus to reduce the impact of the dominant movements between the M25 and the A12 to Essex through the roundabout.
Option 5 - Do	Junction capacity improvements to cater all the high volume dominant

Strategic Option	Brief description
Maximum – Full junction improvements	movements between M25 and A12 including heavy right turn movements.
Option 6 - Strategic road network classification	A wider strategic option that would consider reviewing the classification of the Strategic Road Network (SNR) alongside future considerations for a Lower Thames Crossing. For examples, this may look to make best use/enhance the A13/A130, A12 and A127 corridors.

3.2.3 Upon review, the strategic option focussing on localised highway improvements (Option 4) was confirmed as the preferred solution as this proposal was focused on reducing the impact of the dominant movements between the M25 and the A12 to Essex through the roundabout. This option was considered to be strongly aligned to addressing the identified problems at junction 28 and the Scheme objectives and could be delivered within the RIS programme.

3.2.4 The timescales for the other options (Options 2, 3, 5 and 6) would extend beyond the RIS programme. Option 1 would not address the problems at the junction. Option 2 and 6 would only slightly reduce traffic flows and would not address the current problems. Option 3 would not address current problems and population density is low around the area so difficult to encourage rail/bus use. Option 5 (do-maximum) would perform well against addressing the problems however, it would not address the short term problems and the cost would significantly exceed the budget.

3.2.5 Based on the preferred strategic option (Option 4), it was considered that the provision of a new free flow link for right turning traffic between the M25 northbound carriageway and the A12 eastbound carriageway would be the best way to address congestion and safety issues. The provision of such a dedicated link would divert the large movement between the M25 northbound carriageway and the A12 eastbound away from the roundabout, reallocating capacity for other traffic movements. A range of highway improvement options were identified as concepts. These are listed in Table 3.2 below.

Table 3.2: Option improvement concepts

Option	Brief description
Do-Minimum	Focuses on short term measures with signal optimisation at junction 28.
Option 1 - Hamburger through-about	Provides additional connectivity from the M25 anticlockwise to A12 eastbound and M25 clockwise to A12 westbound. This includes signal-controlled junctions where the proposed link roads bypass through the centre of an existing circulatory with a Hamburger configuration. This option requires the centre of the existing circulatory to be raised, a new structure, and reconfiguration of the existing M25 viaduct columns.
Option 2 - Northern loop	Provides additional connectivity from M25 anti-clockwise to A12 eastbound via a proposed link road. This proposed link road exits the M25 after Nag's Head Lane and under the existing railway embankment. The proposed link then crosses the A12 and M25 on new structures before merging with the A12 eastbound before Wigley Bush Lane over-bridge.
Option 3 - Satellite roundabout	Provides a satellite roundabout to the south-west of the existing junction. In doing so, it reduces the number of conflict points at the existing junction thus improving capacity. This option requires a new structure, diversion of the A12 in both directions, reconfiguration of the A12 westbound on slip to include a structure over the diverted A12, and a

Option	Brief description
	culvert over Weald Brook.
Option 4 - Compact northern loop	Provides additional connectivity from M25 anticlockwise to A12 eastbound via a proposed link road. The proposed link requires a structure parallel to and then over the M25 before merging with the A12 eastbound before Wigley Bush Lane over-bridge.
Option 5 - Single cloverleaf	Provides additional connectivity from M25 anti-clockwise to A12 eastbound via a proposed loop road in the form of a cloverleaf. The proposed loop requires a structure parallel to the M25 and exits the existing highway boundary to the north-west before looping round to join the A12 eastbound.
Option 6 - Southern link	Provides additional connectivity from the M25 anticlockwise to A12 eastbound via a proposed link road. The proposed link requires several structures and extensive land take.
Option 7A - Do-Maximum, double cloverleaf	Incorporates all infrastructure associated with Option 5. Furthermore, this option provides additional connectivity from the A12 westbound to M25 anti-clockwise. The option achieves this via an additional proposed loop road in the south-west corner of the existing junction. The proposed loop diverges from the A12 westbound before the alignment is raised over the existing circulatory, existing A12 and the loop proposed in Option 5 on a structure before merging to the M25 anticlockwise. Further realignment of the existing M25 anti-clockwise on slip will be required for this option to accommodate the merging of the A12 westbound to M25 anti-clockwise traffic in the most compact layout possible. The proposed link requires several structures and extensive land take.
Option 7B - Do-Maximum, cloverleaf plus northbound link	Incorporates all infrastructure associated with Option 5. Furthermore, this option provides additional connectivity from the A12 westbound to M25 anti-clockwise. The option achieves this via an additional proposed link road. The proposed link diverges from the A12 westbound immediately after the existing junction, before crossing over the existing A12 on a structure then heading towards, and ultimately merging with the M25 anti-clockwise at the existing ground level. The proposed link requires several structures, a culvert of the Weald Brook and extensive land take.

3.2.6 These highway improvement options were assessed based on the expected impacts of achieving the identified transport objectives, indicative cost ranges, and key issues and risks relating to scheme delivery. This assessment aligned with the principles of the DfT's Early Assessment Sifting Tool (EAST)[19] approach, ensuring that this early assessment was consistent with the five case business case model approach was included in the assessment at an early stage.

3.2.7 The single cloverleaf option (Option 5) was considered to be the best performing option, presenting fewer delivery risks and issues. The option was considered technically feasible, minimising issues related to land take, disruption to local communities, acceptance by the public and local authorities, network rail issues and processes, and environmental impacts.

3.2.8 The assessment indicated that the hamburger through-about option (Option 1) and satellite roundabout option (Option 3) would have very little effect on achieving the project objectives, and that any noticeable improvements would only be short term. The assessment also indicated that Option 7 (A and B) offers

[19] Debarment for Transport, Early Assessment and Sifting Tool (EAST) Guidance
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/4475/east-guidance.pdf

a better solution for addressing the problems however, it would extend beyond the RIS timescale and exceed the cost. These options were therefore rejected.

3.2.9 Based on the assessment the following four options were recommended to be taken forward to the next stage (option identification stage). A further six options were developed for the cloverleaf option (Option 5) as this option offered the greatest potential to meet the objectives, as well as be refined and developed to best manage the impacts against the identified risks and constraints. The options included:

- Option 2 - Northern hook
- Option 4 - Compact northern loop
- Option 5 - Single cloverleaf loop (with six variants)
- Option 6 - Southern link

Option identification stage

3.2.10 The four options considered (options 2, 4, 5 (with six variants) and 6) are described in Table 3.3 below. Further details are provided in the M25 junction 28 Technical Appraisal Report[20].

Table 3.3: Option identification options

Option	Brief description
Option 2 - Northern hook	A two lane link with hard shoulder connects the M25 south with the A12 east via a two lane link (plus hard shoulder) that hooks around the north of junction 28 merging with the A12 to the east of Wigley Bush Lane. The option requires the realignment of Nags Head Lane overbridge, Wigley Bush Lane overbridge, footbridge over the A12 and Weald Park Way, together with new structures under the railway, over the A12 west and the M25 north.
Option 4 - Compact northern hook	This option is similar to Option 2 in that it is a two lane link with hard shoulder that hooks around the north of junction 28 to join the A12 east in the vicinity of Wigley Bush Lane. However, following the diverge from the M25 anti-clockwise the new alignment runs parallel to the M25 through widened structures until it reaches the A12, where a new structure takes it over the M25 north. This option also requires reconfiguration of Nags Head Lane overbridge, Wigley Bush Lane overbridge and Weald Park Way, together with a structure under the railway to the south.
Option 5 - Single cloverleaf loop (with six variants)	Option 5A – Cloverleaf loop variant 1: • A single lane with hard shoulder that connects the M25 anti-clockwise carriageway with the A12 east in the form of a cloverleaf type loop located in the north-west quadrant of junction 28. It requires a tunnel under the railway line for the realigned diverge from the M25, and the realignment of Nags Head Lane to the south. Option 5B – Cloverleaf loop variant 2: • As in Option 5A this option connects the M25 anticlockwise with the A12 east via a single lane cloverleaf type loop (with hard shoulder) located in the north-west quadrant of junction 28. However, by moving the layout further north compared to Option 5A, this option avoids impacting on the railway mainline to the south. It does involve the widening of the existing M25 structure to support the proposed new M25 anticlockwise diverge and of-slip road for accessing the new link. It also requires the realignment of the A12 west off-ramp to accommodate the merge with the A12 eastbound

[20] Highways England (November 2016) M25 junction 28 Technical Appraisal Report, https://highwaysengland.citizenspace.com/he/m25-junction-28-statutory-consultation/supporting_documents/Technical%20Appraisal%20Report%20volume%201%20of%202.pdf

Option	Brief description
	carriageway. Option 5C – Cloverleaf loop variant 3: • As Option 5B this option connects the M25 anticlockwise with the A12 east via a single lane cloverleaf type loop (with hard shoulder) located in the north-west quadrant of Junction 28. Similarly this option avoids impacting on the mainline railway to the south. By moving further north compared to Option 5B, Option 5C avoids the need to widen the existing M25 structures. Locating the diverge from the M25 for the new link to the north of Junction 28 requires realigning the existing M25 north on-slip road to pass under the new loop. It also requires the realignment of the A12 west off-ramp to accommodate the merge with the A12 eastbound. Option 5D – Northern loop: • This option connects the M25 south with the A12 east via a two lane loop (with hard shoulder) located in the north-west quadrant of Junction 28. However, unlike Options 5A, 5B, and 5C this loop option does not merge with the A12 under the existing Junction 28 circulatory structure. Instead the loop road crosses the M25 to the north of Junction 28 via a bridge structure and merges with the A12 to the east of Junction 28 in the proximity of Wigley Bush Lane. A realignment of the dedicated M25 north to A12 east lane is also required. Option 5E – Northern loop variant: • This option assumes the same configuration to Option 5D. The only variation is that the loop road passes under the M25 to the north of Junction 28 before merging with the A12 in proximity of Wigley Bush Lane. Option 5F – Cloverleaf loop variant 4: • This is a variation of Option 5C and was developed to understand the implications and feasibility of providing a two lane loop road merging with the A12 eastbound carriageway underneath the existing Junction 28 roundabout structure. Option 5F is essentially a 2 lane (with hard shoulder) variant of Option 5C.
Option 6 - Southern link	A two lane link with hard shoulder that connects the M25 anticlockwise with the A12 east passing directly through the south-east quadrant of the junction with various multispan viaducts to pass over the M25, Brook Street and the A12. This option also requires the realignment of Weald Park Way.

3.2.11 A review of the options (Options 2, 4, 5 (with six variants) and 6) during this stage involved refining and developing them, and better understanding the key issues, risks and constraints, as well as progressing the design. A key focus was to find an option that would achieve the identified benefits and be affordable.

3.2.12 Upon review of the options (Options 2, 4, 5 (with six variants) and 6) , three of the cloverleaf variants (Option 5B, 5C and 5F) were seen to offer the most value against achieving the objectives including performing best in the traffic, environmental and economic assessments. These three options were taken forward into the option selection stage.

3.2.13 The other options (Option 2, 4, 5A, 5D, 5E and 6) we rejected as the majority were significantly over budget and would be hard to implement and did not meet the desired objective and outcomes for the Scheme.

3.2.14 Full details of the selection process are provided in the Highways England M25 junction 28 Technical Appraisal Report, 2016[21].

[21] https://highwaysengland.citizenspace.com/he/m25-junction-28/supporting_documents/Stage%201%20Technical%20Appraisal%20Report%20M25%20JCT28%20PCF%20Product%20Vol%201of2%20v01.pdf

Option selection stage

3.2.15 Three variants of Option 5 (5B, 5C, 5F), the single cloverleaf option were shown to offer the greatest value in in terms of their impact in achieving the project objectives.

3.2.16 While all three options diverted traffic away from the roundabout by creating a new dedicated loop road between the M25 and the A12, each option required a different approach to achieve this. These are set out in Table 3.4.

Table 3.4: Option selection

Option	Brief description
Option 5B	Single lane loop road, widening existing M25 bridge over junction 28 to cater the new additional exit from the motorway. This option would involve: • Works on the M25 with the likely closure of the hard shoulder • Narrow lanes on the M25 • Speed restriction over a long period during construction
Option 5C	Single lane loop road, widening short section of M25 to cater the new additional exit from the motorway. This option was identified as having least impact in disrupting traffic across the network during construction.
Option 5F	Two lane loop road, widening short section of M25 to cater the new additional exit from the motorway. This option would require minimum disruption on the A12 eastbound and westbound carriageways during construction.

3.2.17 Engineering, traffic, economic and environmental assessments of these options were undertaken to inform the final option selection. The environmental assessment included consideration of all the environmental topics set out in this ES. This concluded:

3.2.18 All options had similar potential impacts in relation to air quality, however, Option 5B was marginally worse. All options had similar potential impacts in relation to noise, however, Option 5F was marginally preferable.

3.2.19 Option 5B had the least amount of land take which would reduce the likelihood and extent of disturbing buried archaeological remains. Option 5B would have the least visual impacts, people and communities and biodiversity. Option 5B is the smallest scale and so would have fewer components effecting the water environment.

3.2.20 All options would have beneficial effects on geology and soils.

3.2.21 All three options were presented at non-statutory public consultation (November 2016 to January 2017). Option 5F received the most support from those responding to consultation and based on the assessment of the options, Option 5F was selected as the preferred route for the Scheme.

3.2.22 Full details of the option selection process are provided in the Highways England M25 junction 28 Scheme Assessment Report, 2017[22].

3.2.23 Reasons for rejection of Options 5B and 5C are summarised in Table 3.5.

[22] https://highwaysengland.citizenspace.com/he/m25-junction-28/results/m25-j28-scheme-assessment-report.pdf

Table 3.5: Rejected options

Option name	Reason for rejection
Option 5B	Single lane loop road, widening existing M25 bridge over junction 28. Option 5B involves a departure from safety standards relating to the sub-standard distance between the successive diverges on the M25 anti-clockwise carriageway. This presents a significant concern over operational safety of the road user.
Option 5C	Single lane loop road, widening short section of M25. However, this option was identified as having least impact in disrupting traffic across the network during construction but option 5C also features a larger loop road than Option 5F, as moving the diverge further north along the M25 avoids the need to widen the existing M25 structures and addresses adverse safety and operational issues related to successive diverges.

Preliminary design stage

3.2.24 A summary of the consultation undertaken on the Scheme to date is presented in section 1.8 above and full details of the consultation process that has been undertaken in respect of the Scheme is provided in the Consultation report (application document TR010029/APP/5.1).

3.2.25 A summary of the key developments to the design since the PRA include:

- Change in location of the realigned A12 slip road to be located further north in consultation with National Grid to ensure the required clearance between the bridges and overhead lines is met.
- Watercourse design and mitigation in consultation with the Environment Agency has led to various sections of the Ingrebourne River and Weald Brook being realigned including other measures embedded into the design to mitigate the impacts on the water environment.
- Change in size and location of drainage ponds.
- Proposed locations of the construction compounds have been identified.
- Extra land included in the DCO boundary to accommodate the Cadent Gas high-pressure gas main diversion required to build the Scheme.
- Extra land included in the DCO boundary to ensure the effects on the Ingrebourne Valley SMI are adequately mitigated for including providing planting, provision of new habitats for species and management of habitats.

3.3 Justification for the chosen option

3.3.1 Taking into account transport performance, environment, economics and social aspects, Option 5F was selected as the preferred option. This was primarily because on the two-lane configuration of this option which would be the optimum solution in relation to network resilience, maintenance requirements and avoiding disruption to traffic.

3.3.2 This option was selected as achieving the Scheme objectives and balancing the needs of road users, the community, the environment and businesses. Option 5F is recommended as the preferred option based on the following:

- Performs strongest in achieving the primary objective of improving journey

times, particularly in the longer term beyond the 2037 design year.

- Options 5B and 5C are one lane options and forecast traffic volumes are expected to approach and exceed capacity beyond the design year. It is noted that two lanes cannot be provided on the Option 5B alignment.
- Option 5F can be constructed without the significant disruption to traffic on the M25 motorway as expected under Option 5B (which requires widening of the M25 viaduct over the junction 28 roundabout).
- Option 5B involves a departure from standard relating to the sub-standard distance between the successive diverges on the M25 anti-clockwise carriageway. This presents a significant concern over operational safety of the road user.
- Option 5F provides greater network resilience through having a second lane on the new link.
- Option 5F offers a two-lane link that is expected to be more advantageous in terms of maintenance and avoiding disruption to traffic.
- Provides a strong BCR of over 2 despite the additional cost associated with providing a second lane on the new link to cater longer term forecast demand flows.
- All options have similar implications on the environment including impacts on biodiversity (Ingrebourne SMI), landscape, water, cultural heritage and air quality due to similar footprints. Option 5F would have the least impact on the noise environment.

3.3.3 Option 5F is selected as the preferred option based on the reasons listed above, and that it also has the highest overall weighted Value Management score and was shown to be the preferred option noted as part of the public consultation (see paragraph 1.8.6 above).

4. Environmental assessment methodology

4.1 Environmental Impact Assessment process

4.1.1 EIA is a process for identifying the likely environmental effects (positive and negative) of proposed developments, and their significance, before development consent is granted.

4.1.2 The aim of EIA is to ensure that the following are undertaken:

- A thorough assessment of likely effects of a proposed development on the environment.
- Consideration of mitigation measures and alternatives in light of potential environmental effects.
- Assessment of the cumulative effects of proposed development.

4.1.3 Through this process the Scheme should include measures to prevent, reduce or offset any significant, adverse environmental effects of the proposals, and enhance the positive impacts. The findings of the assessment are presented in an ES.

4.1.4 The IP (EIA) Regulations 2017 impose procedural requirements for carrying out EIA for NSIPs which are considered as 'EIA development'. The ES is the document that reports on the likely significant effects on the environment resulting from the proposed development. The ES must as a minimum comply with Regulation 14(2) IP (EIA) Regulations 2017. Advice published by the Planning Inspectorate states that the ES should clearly explain the processes followed, the forecasting methods used, and the measures envisaged to prevent, reduce and where possible offset any significant adverse effects. This has been undertaken in respect of this ES and throughout the EIA process.

4.2 Structure of this Environmental Statement

4.2.1 The IP (EIA) Regulations 2017 set out the information that is required for an ES. These requirements are reflected in Highways England's DMRB Volume 11 (and associated documents) which sets out the structure for ESs and the topics to be covered for a highways project. The earlier chapters of this ES included an introduction, information on the Scheme and details of alternatives considered. The environmental chapters in the ES cover the topics that are required to be assessed under Regulation 5(2) of the IP (EIA) Regulations 2017 and include: air quality, noise and vibration, biodiversity, road drainage and the water environment, landscape and visual, geology and soils, cultural heritage, materials and waste, people and communities, climate and cumulative effects.

Structure of each environmental topic chapter

4.2.2 Each environmental topic chapter is structured as follows:

- Executive summary
- Introduction
- Competent expert evidence
- Legislative and policy framework

- Study area
- Assessment methodology
- Assessment assumptions and limitations
- Baseline conditions
- Potential impacts
- Design, mitigation and enhancement measures
- Assessment of effects
- Assessment of cumulative effects
- National Policy Statement for National Networks (NPS NN) compliance
- Monitoring
- Summary

4.2.3 Sections below provide a brief explanation of the content in each section of the ES chapters.

4.3 Competent expert evidence

4.3.1 This section provides evidence on the competence of the individuals responsible for undertaking the assessment, including their experience in their field, qualifications and membership of professional institutes.

4.4 Legislative and policy framework

4.4.1 This section sets out the key pieces of legislation and policy that are relevant to the topic and which the Scheme may be subject to or the assessment guided by.

4.5 Study area

4.5.1 Study areas are defined individually for each environmental topic according to the geographic scope of the potential impacts relevant to that topic or of the information required to assess those impacts. Establishing them draws on guidance in Highways England's DMRB Volume 11 and associated documents where this specifies the extent of study areas and other guidance where appropriate. The study areas are defined within each relevant topic chapter of this report.

4.6 Assessment methodology

4.6.1 The assessment methodology describes the guidance used for the assessment of each environmental topic, together with the criteria to determine the magnitude of effects and the sensitivity of receptors. For this Scheme, the assessment methodology has generally been adopted from DMRB Volume 11, Section 3 Environmental Assessment Techniques. Where there is no standard guidance this is stated, together with the methodology used to undertake the assessment.

4.6.2 The DMRB is a suite of documents which contains requirements and advice relating to works on motorway and all-purpose trunk through design, construction and operational stages of the highways assets.

4.6.3 The DMRB embodies the collective experience of the highway authority, their agents and designers. It provides requirements and advice resulting from research, practical experience of constructing and operating motorway and all-purpose trunk roads, and from delivering compliance to legislative requirements.

DMRB updates

4.6.4 The ES chapters have used the guidance present at the time of writing the EIA for the Scheme and it was felt that undertaking a sensitivity test would be appropriate to outline whether new environmental effects would be triggered by applying the latest DMRB guidance. During the period between July 2019 and January 2020, and as the development of the preliminary design for the Scheme was being finalised, a series of updates have been issued to the DMRB[23]. In view of the potential for change brought by the DMRB updates, the Applicant has undertaken sensitivity analysis to determine whether the application of the latest DMRB guidance, would lead to new or different conclusions to those reported in the ES prepared for the Scheme.

4.6.5 A summary of the key changes to the EIA methodologies and assessment is provided in Appendix 4.1 of the ES. This includes a high level summary of whether new environmental effects would be triggered by applying the updated DMRB guidance and would change the results of the EIA presented in ES chapters.

4.6.6 As reported in Appendix 4.1, no new or additional environmental effects have been identified following the sensitivity analysis save in one instance. The significance levels to be allocated to agricultural soils have been revised such that the assessment now reports a significant adverse effect rather than a slight adverse.

4.6.7 The ES should be read in conjunction with Appendix 4.1 (application document TR010029/APP/6.3).

4.7 Assumptions and limitations

4.7.1 Assumptions and limitations that have been identified in undertaking the EIA are listed. These can include limits on available design information at the time of writing the ES and assumptions on the type and methods of construction.

4.8 Baseline conditions

4.8.1 The existing baseline environmental conditions are defined to enable the assessment of changes or impacts that would be caused by the Scheme on the existing scenario. The identification of the baseline requires the description of the existing situation and then a prediction of how it is likely to evolve in the absence of the Scheme, i.e. ‘future baseline scenario’ based on available environmental information and scientific knowledge.

4.8.2 This includes taking into account current conditions and potential future development and using experience and professional judgment to predict what the baseline conditions might look like prior to the start of construction (2022) and operation (when the Scheme is first expected to open to traffic – 2024). The list of potential future development considered as part of both the future baseline

[23] https://standardsforhighways.co.uk/dmrb/

and the cumulative scenarios is discussed within Chapter 15.

4.8.3 The description of the baseline conditions should clearly identify receptors that may be affected by the Scheme and their 'value' or 'sensitivity' to potential changes.

4.8.4 The presence and absence of the Scheme are referred to as the 'Do Something' and 'Do Minimum' scenarios respectively. The 'Do Minimum' scenario represents the future baseline without the Scheme in place with other changes elsewhere within the Strategic Network but no construction of new infrastructure at junction 28. The 'Do Something' scenario is the scenario with the Scheme in place.

4.8.5 Depending on the topic, the effects are assessed for the 'Do Minimum' and 'Do Something' scenarios, during construction, in the opening year and in a future assessment year. For example, assessments might be undertaken for 15 years after opening, or the worst year in the first 15 years of operation.

4.8.6 The current implementation strategy proposes that, subject to the DCO being approved by the Secretary of State, main construction works would commence in spring 2022. The main works would be completed such that the Scheme would become operational in autumn 2024. It is assumed that the Scheme will be used to its maximum capacity from opening, however it is likely that there will be a period of growth in throughput over a number of years before the maximum capacity is reached.

4.9 Identification of potential effects

4.9.1 Schedule 4 Regulation 5, of the IP (EIA) Regulations 2017 requires:

4.9.2 *"A description of the likely significant effects of the development on the environment resulting from, inter alia –*:

*(a) the construction and existence of the development, including, where relevant, demolition works**;***

(b) the use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources;

(c) the emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste;

(d) the risks to human health, cultural heritage or the environment (for example due to accidents or disasters);

(e) the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources;

(f) the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change;

(g) the technologies and the substances used.

4.9.3 The description of the likely significant effects on the factors specified in regulation 5(2) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development. This

description should take into account the environmental protection objectives established at Union or Member State level which are relevant to the project, including in particular those established under Council Directive 92/43/EEC(1) and Directive 2009/147/EC(2)."

4.9.4 A range of environmental topics may be affected by the Scheme. Effects may be negative or positive, temporary or permanent. They may also be described as:

- **Direct or Primary**: caused by activities which are an integral part of the proposals resulting in a change in environmental conditions, such as construction works causing an increase in dust concentrations in the air.
- **Indirect or Secondary**: due to activities that affect environmental conditions or the receptors, which in turn affects other aspects of the environment or receptors.
- **Cumulative**: comprising multiple effects from different sources within the proposals (synergistic or interrelationships), or cumulatively with other developments (additive), on the same receptors.
- **Residual**: effects that remain after the positive influence of mitigation measures are taken into account.

4.9.5 Each of these effects can persist over a period of time and can be considered as:

- Temporary (e.g. demolition and construction phase)
- Short term (< 5 years)
- Medium term (5-10 years)
- Long term (> 10 years)
- Permanent (e.g. once the proposed works are completed and operational)

4.10 Design and mitigation process

4.10.1 Proposals for mitigation follow the mitigation hierarchy of avoid, reduce, mitigate and compensate. Incorporated mitigation includes best practicable measures, and construction environmental management procedures identified in a CEMP and design features that have been adapted to reduce or prevent impacts, such as noise attenuation measures. Incorporated mitigation is included within the assessment.

4.10.2 Mitigation is defined as "measures intended to avoid, reduce and, where possible, mitigate significant adverse environmental effects" (DMRB Volume 11, Section 2, Part 7 HA 218/08). Enhancement measures are defined as "measures over and above normal mitigation" (Interim Advice Note (IAN) 125/15). In the updated DMRB IAN125/15 has been replaced by LA104[24].

4.10.3 Consideration has been given to reducing or avoiding adverse environmental impacts and these will be developed further during the Scheme development as an iterative process. Mitigation measures have been informed by survey data being collected for the purposes of the preliminary design stage and developed in consultation with statutory environmental bodies including the Environment Agency and Natural England and local authorities as set out in the Consultation report (application document TR010029/APP/5.1). The Scheme includes all

[24] https://standardsforhighways.co.uk/dmrb/search?q=environment&pageNumber=1

mitigation considered necessary to reduce effects as far as possible and the assessment has reported on this basis.

4.10.4 Mitigation measures embedded in the design are described in Chapter 2 of this ES. A REAC (application document TR010029/APP/7.3) identifying the environmental mitigation commitments to address potential environmental effects of the Scheme which are identified in each topic chapter has also been prepared.

4.10.5 During construction, the responsibility for further environmental mitigation and adherence to the CEMP to be prepared by the Principal Contractor will be substantially in accordance with the Outline CEMP (application document TR010029/APP/7.2). As the Scheme progresses from construction to handover, a Handover Environmental Management Plan (HEMP) will be prepared to address the matters set out in the CEMP that are relevant to the operation and maintenance of the Scheme. The Outline CEMP details practices that the Principal Contractor is to apply on-site that will demonstrate commitments to environmental management. It details both generic and specifically targeted practices to enable construction to be undertaken with minimal impact on the environment and will also enable monitoring requirements to be set up.

4.11 Assessment of effects

Assessment of significance

4.11.1 The significance of an environmental effect is typically a function of the ‘value’ or ‘sensitivity’ of the receptor and the ‘magnitude’ or ‘scale’ of the impact. Combining the environmental value of the resource or receptor with the magnitude of change produces a significance of effect category. In arriving at the significance of effect, the assessor also considers whether the effect is direct, indirect, secondary, cumulative, short, medium or long-term, permanent or temporary, beneficial or adverse.

4.11.2 Methods and requirements specific to each assessment topic are set out in the relevant topic chapters (Chapters 5 to 15), however, the proposed general approach will be adopted in accordance with relevant guidance and best practice.

4.11.3 With the receptors identified and their sensitivity classified, the potential impacts of the proposed works to these aspects, for construction and operation where appropriate, will be determined and the magnitude of the impact determined.

4.11.4 In accordance with guidance in DMRB Volume 11, Part 5, for each topic the assessment will combine the magnitude of the impacts and the sensitivity of the resources/receptors that could be affected in order to classify the effect (see Table 4.1) to establish their significance (from very large to neutral). General descriptors for the significance of effect are provided in Table 4.2.

Table 4.1: Significance of effects

Environmental Value (Sensitivity)	Magnitude of impact (degree of change)				
	Major	Moderate	Minor	Negligible	No change
Very high	Very large	Large or very large	Moderate or large	Slight	Neutral

Environmental Value (Sensitivity)	Magnitude of impact (degree of change)				
	Major	Moderate	Minor	Negligible	No change
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

Table Source: Volume 11 Section 2 Part 5 HA 205/08, Table 2.4

Table 4.2: Descriptors of the significance of effect categories

Significance Category	Typical descriptors of effect
Very Large	Only adverse effects are normally assigned this level of significance. They represent key factors in the decision-making process. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category.
Large	These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process.
Moderate	These beneficial or adverse effects may be important but are not likely to be key decision-making factors. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse effect on a particular resource or receptor.
Slight	These beneficial or adverse effects may be raised as local factors. They are unlikely to be critical in the decision-making process but are important in enhancing the subsequent design of the project.
Neutral	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

Table Source: Volume 11 Section 2 Part 5 HA 205/08, Table 2.3

4.11.5 Whilst the criteria derived varies between disciplines (from a very formal set of criteria based on nationally recognised standards for air quality, to more qualitative criteria derived to assess landscape impact or heritage) each specialist has used the common terminology set out above alongside their topic-specific guidance and their professional judgement to assess the significance of effects. Effects that are moderate, large or very large are generally deemed to be significant; slight or neutral effects are not significant. However, where thisdeviates and an alternative basis of assessment applies, this is explained in the appropriate chapter.

Residual effects

4.11.6 Residual effects refer to those environmental effects predicted to remain after the application of mitigation and enhancement measures outlined in each environmental topic. The predicted residual effects are considered for each phase of the Scheme (construction and operation). In accordance with the criteria established in Table 4.2 above, significance has been determined for

each residual effect.

4.12 Cumulative effects

4.12.1 Cumulative effects are the result of multiple actions on environmental receptors. There are principally two types of cumulative impact:

- The combined action of a number of different environmental topic specific impacts upon a single resource/receptor (synergistic or interrelationships).
- The combined action of a number of different projects, in combination with the project being assessed, on a single resource/receptor (additive).

4.12.2 Schedule 4, Regulation 5, of the IP (EIA) Regulations 2017 requires an ES to include the assessment of cumulative effects. Schedule 3 Paragraph 3(g) of the IP (EIA) Regulations 2017 refers to the cumulation of impacts with other development, when listing possible significant effects of development that must be taken into account. Therefore, the environmental effects of the Scheme will also be assessed in combination with the effects of other projects as part of the EIA process, where relevant information is available. What projects should be considered as part of a 'cumulative' assessment for these purposes is not defined in the EIA Directive or Regulations and there is no standard approach to the assessment of cumulative effects, with different projects adopting different approaches. However, potential cumulative impacts with other major developments need to be identified, as required by the Directive. To aid in this, Planning Inspectorate's Advice Note 17 (Planning Inspectorate, 2015) suggests the categories of developments that should be included in such cumulative assessments.

4.12.3 The cumulative assessment for the Scheme therefore includes developments which fall into the following categories but are not necessarily limited to:

- Projects on the Infrastructure Planning Inspectorate's Programme of Projects.
- Trunk road and motorway projects which have completed the statutory planning processes, including those under construction.
- Other development projects under construction or with valid planning permissions, and for which formal EIA is a requirement or for which non–statutory EIA has been undertaken.
- Applications for consent which have been made, but which have not yet been determined.
- Projects identified in the relevant emerging or adopted Development Plans, with appropriate weight given as they move closer to adoption, recognising that information on these proposals may be limited at present.
- Projects identified in other plans and programmes which set the framework for future development consents/approvals, where such development is reasonably likely to come forward.

4.12.4 Using these categories, developments have been identified with reference to local knowledge, published information and consultation with local planning authorities in the area.

4.12.5 Further details on the scope of the cumulative effects assessment including the in-combination assessment is provided in the Assessment of Cumulative Effects

chapter (Chapter 15). Each environmental topic chapter (Chapter 5 to 14 in the ES) includes an assessment of the cumulative effects in relation to that topic and the Chapter 15 provides an overall summary of the assessments.

4.13 National Policy Statement for National Networks (NPS NN) compliance

4.13.1 This section provides evidence on how the assessment has complied with the guidance set out in NPS NN. Topic specific policy assessments are also be included in the Case for the Scheme (application document TR010029/APP/7.1) where relevant.

4.14 Monitoring

4.14.1 In accordance with the IP (EIA) Regulations 2017, monitoring requirements and procedures for the construction and operation of the Scheme are recommended, based on the requirement to maintain the current standard of the surrounding environment and to ensure the Scheme does not contribute to the degradation of the surrounding environment. The objectives of carrying out monitoring include:

- Providing a database against which any short or long term environmental impacts of the Scheme can be determined.
- Providing an early indication should any of the environmental control measures or practices fail to achieve acceptable standards.
- Monitoring the performance of the Scheme and the effectiveness of mitigation measures.
- Verifying the environmental impacts predicted in the ES.
- Determining the Scheme's compliance with regulatory requirements, standards and government policies.
- Taking remedial action if unexpected problems or unacceptable impacts arise.
- Providing data to enable an environmental audit.

4.14.2 The overall monitoring requirements for the Scheme are outlined in the Outline CEMP (application document TR010029/APP/7.2).

4.15 Vulnerability to major accidents and disasters

4.15.1 The IP (EIA) Regulations 2017 introduced a requirement to consider significant adverse effects of the Scheme on the environment deriving from the vulnerability of the Scheme to risks of major accidents and/or disasters relevant to the Scheme.

4.15.2 The general scope of the assessment covers:

- Vulnerability of the Scheme to risks of major accidents and/or disasters that are relevant to the Scheme (subsequently referred to as major events).
- Identification of any consequential significant adverse environmental effects from those major events.
- Measures to prevent or mitigate the significant adverse environmental effects

of those major events and details of the preparedness for and response to such major events.

4.15.3 The assessment of major events:

- Applied professional judgement in consultation with The Applicant to develop Scheme specific definitions of major events.
- Identified any major events that are relevant to and can affect the Scheme.
- Where major events are identified, described the expected significant effects arising from the vulnerability of the Scheme to the events.
- Reported the conclusions of this assessment within this section.
- Clearly described any assumed mitigation measures and details of the preparedness for and proposed response to such emergencies, to provide an evidence base to support the conclusions and demonstrate that likely effects have been mitigated/managed to an acceptable level.

4.15.4 The definition of a major accident used in this assessment is contained in the Control of Major Hazards Accident Regulations 2015 (COMAH) which define a "major accident" as an occurrence such as a major emission, fire, or explosion resulting from uncontrolled developments in the course of the operation of any establishment, and leading to serious danger to human health or the environment (whether immediate or delayed) inside or outside the establishment, and involving one or more dangerous substances. The terms which define a major accident are as follows:

- Injury to persons and damage to property:
  - A death
  - Six persons injured within the establishment and hospitalised for at least 24 hours
  - One person outside the establishment hospitalised for at least 24 hours
  - A dwelling outside the establishment damaged and unusable as a result of the accident
  - The evacuation or confinement of persons for more than 2 hours where the value (persons × hours) is at least 500
  - The interruption of drinking water, electricity, gas or telephone services for more than 2 hours where the value (persons × hours) is at least 1,000
- Immediate damage to the environment:
  - Permanent or long-term damage to terrestrial habitats
  - 0.5 hectares or more of a habitat of environmental or conservation importance protected by legislation
  - 10 or more hectares of more widespread habitat, including agricultural land
- Significant or long-term damage to freshwater and marine habitats:
  - 10 km or more of river or canal
  - 1 hectare or more of a lake or pond

  - 2 hectares or more of delta
  - 2 hectares or more of a coastline or open sea
  - Significant damage to an aquifer or underground water: 1 hectare or more
- Damage to property:
  - Damage to property in the establishment, to the value of at least EUR 2,000,000
  - Damage to property outside the establishment, to the value of at least EUR 500,000

4.15.5 Key terms used in the assessment have been developed by the project team and are listed below.

Table 4.3: Assessment terminology - vulnerability to major accidents and disasters

Significance category	Typical descriptors of effect
Major accident	The COMAH 2015 regulations define a 'major accident' as an occurrence such as a major emission, fire, or explosion resulting from uncontrolled developments in the course of the operation of any establishment and leading to serious danger to human health or the environment (whether immediate or delayed) inside or outside the establishment and involving one or more dangerous substances.
Natural disaster	A naturally occurring event such as extreme weather (storm, flooding) or a ground-related hazard event (subsidence, landslide, earthquake) with the potential to cause an event or situation that meets the definition of a major accident.
Risk	The likelihood of an impact occurring combined with the effect or consequence(s) of the impact on a receptor(s) if it does occur.
Risk event	An identified unplanned event which is considered relevant to the Scheme and has the potential to be a major accident or natural disaster subject to the identification of its potential to result in a significant adverse effect on an environmental receptor.
Serious damage	Serious damage includes the loss of life, permanent injury and temporary or permanent damage/destruction of an environmental receptor.
Vulnerability	In the context of environmental risk assessment, the term refers to the 'exposure and resilience' of the Scheme to the risk of a major accident or natural disaster.

4.15.6 By the above definitions, a significant adverse effect is considered to mean the loss of life or permanent injury, and/or permanent or long-lasting damage to an environmental receptor. The significance of this effect takes into account the extent, severity and duration of harm and the importance and sensitivity of the receptor.

4.15.7 The potential effects resulting from a major event and any consequences for receptors are reported (where applicable) in the individual environmental topic chapters (Chapters 5 to 15) and as such, vulnerability to major accidents and disasters is not a topic in itself.

Methodology

4.15.8 At the time of writing there is no published or adopted guidance for the assessment of major accidents and disasters. However, the methodology presented below is considered to provide an appropriate approach to the assessment.

4.15.9 The methodology adopted includes three main stages, as follows:

- Stage 1: a long list of all possible major events was developed. This list drew upon a variety of sources, including the UK Government's Risk Register of Civil Emergencies. Major events with little relevance in the UK were not included. Stage 1 also included an initial review of potential receptors to identify any groups that it was not considered necessary to include in the assessment.
- Stage 2: a screening exercise was undertaken to review the long list of major events and to give consideration to their relevance to the Scheme, and therefore whether they should be included on the Scheme specific short list of major events requiring further consideration. The study area for relevant major events was identified to be within 2 km of the Scheme.
- Stage 3: where further design mitigation is unable to remove the potential interaction between a major event and a particular topic, the potential consequence for receptors is identified.

Assessment findings

Stage 1

4.15.10 The long list of major events is provided in Appendix 4.2.

Stage 2

4.15.11 In general, major events, as they relate to the Scheme, fall into three categories:

- Events that could not realistically occur, due to the type of Scheme or its location.
- Events that could realistically occur, but for which the Scheme and associated receptors, are no more vulnerable than any other development.
- Events that could occur, and to which the Scheme is particularly vulnerable, or which the Scheme has a particular capacity to exacerbate.

4.15.12 A screening stage was undertaken to try to identify this third group of major events, which then formed the shortlist of events to be taken forward for further consideration.

Stage 3

4.15.13 Stage 2 of the assessment resulted in a short list of major events that are considered to need further consideration at Stage 3, though this may only mean that the risk needs to remain on the design risk register until it is closed out through design. Specific major events that have been included on the short list and are considered in more detail are presented in Table 4.4 below.

4.15.14 The three major events included on the shortlist are either already considered in the relevant topic chapter in the ES (where there is a potential related

environmental effect) or else it has been concluded that there is no need for further consideration. It is concluded that with the mitigation measures included in the design of the Scheme, no significant adverse effects from major events would be expected.

Table 4.4: Major events shortlisted for further consideration

Major event	Reason for consideration	Potential receptors	Consequence	Addressed in the ES	Mitigation and further consideration required
Ground instability	Instable ground from geological units or Made Ground/fill causing instability of the ground surrounding the Scheme. Potential for collapsible ground, compressible ground, landslides, running sand and shrinking/swelling clay. No historical underground mining has been identified within the vicinity of the Scheme.	Road users, infrastructure and property, surrounding environment.	Casualties, damage to infrastructure and property, disruption to services.	Geology and Soils chapter (Chapter 10) and Appendix 10.1 Preliminary Geo-environmental Assessment Report	As part of the Scheme design which will be informed by the Ground Investigation (GI). The risk can be removed through design. Depending on the findings of the assessment of the GI results, the Scheme design will be modified to prevent significant effects.
Utilities failure (gas, electricity, water, sewage, oil, communications)	Numerous utility routes cross the M25, A12 and are located in the new proposed loop road which could fail and cause damage to the Scheme. The required diversion of some utility routes due to the Scheme increases the risk of failure during diversion.	Road users, local residents, property, surrounding environment.	Potential for fire/explosion, pollution incident, injury.	No	All utilities companies have plans and arrangements in place to deal with supply disruptions and failures.
Cyber attack	The increased number of roadside technology and increasing reliance on this technology could render the Scheme more vulnerable to a cyber attack.	Road users	Accidents due to information boards displaying incorrect information, fatalities.	No	The roadside technology is designed to Highways England security arrangements to mitigate the effects of cyber attacks.

4.16 Dealing with uncertainty

4.16.1 The Rochdale Envelope principle has been applied in accordance with the Planning Inspectorate Advice Note 9 Using the 'Rochdale Envelope'. Where flexibility is sought in the Scheme design, the maximum potential adverse impacts of the Scheme have been assessed. The ES confirms the maximum and other dimensions of the Scheme, and that any changes to the development within such parameters will not result in any likely significant effects not previously identified and assessed.

4.17 Transboundary impact screening

4.17.1 Regulation 24 of the IP (EIA) Regulations 2017 requires the Planning Inspectorate 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. The Scheme is approximately 120 km from France, the closest EEA State.

4.17.2 The study areas for the various environmental topics define the extent of effects anticipated and are described fully in Chapters 5 to 15.

4.17.3 As none of these distances reach other EEA Member States, no transboundary effects are anticipated for the Scheme and therefore not considered further.

4.18 Health Impact Assessment and Equalities Impact Assessment

4.18.1 The assessment of the effect of the Scheme on people and communities is a requirement under the IP (EIA) Regulations 2017. Coverage of health in the ES will not equate to a full Health Impact Assessment (HIA) but will be informed by good practice guidance for HIA. Human health in this ES is principally assessed in the People and Communities chapter (Chapter 13), using the sub-topics scoped into this chapter as a basis for the assessment. Health effects have also been considered in each topic chapter as relevant to that assessment, for example, Air Quality and the effects of the Scheme on health issues relating to air quality.

4.19 Habitat Regulations Screening

4.19.1 A Habitat Regulations Assessment Stage 1 Screening has been undertaken in accordance with DMRB guidance. The screening has concluded that there are no likely significant effects on any European sites due to the fact that all European sites are sufficiently distant from the Scheme and that any potential impacts via hydrological pathways would be negligible. The HRA: No significant effects report is presented in application document TR010029/APP/6.9. Natural England has been consulted and agree with the findings of the assessment.

4.20 Climate change

4.20.1 In the ES (Chapter 14), climate change is covered in line with new requirements for climate as outlined in the IP (EIA) Regulations 2017. The scope of the assessment covers:

- Effects of climate (for example greenhouse gas emissions).
- Vulnerability of the Scheme to climate change (and impacts relevant to adaptation).

Glossary

Term	Acronyms and abbreviations	Description
Annual Average Daily Traffic	AADT	The number of vehicles travelling on a particular stretch of road on an average day.
Atmospheric Dispersion Modelling System Roads	ADMS Roads	A comprehensive software tool for investigating air pollution problems due to networks of roads that may be in combination with industrial sites
Assessment of Implications on European Sites	AIES	An assessment of the implications of highway construction or improvement projects on 'European Sites' where such sites are designated for their nature conservation interest.
Agricultural Land Classification	ALC	A framework for classifying land according to the extent to which its physical or chemical characteristics impose long term limitations on agricultural use. Agricultural land is classified into five categories according to versatility and suitability for growing crops. The top three grades, Grade 1, 2 and 3a, are referred to as 'Best and Most Versatile' land.
Archaeological Priority Area	APA	An area where there is significant known archaeological interest or potential for new discoveries. They are used to highlight where development may affect heritage assets.
Air Quality Action Plan	AQAP	A plan that must be compiled by a local authority if they declare an air quality management area.
Air Quality Management Area	AQMA	An area identified where the National Air Quality Objectives are not likely to be achieved. The Local Authority is required to produce a Local Air Quality Action Plan to plan how air quality in the area is to be improved.
Air Quality Strategy	AQS	The Air Quality Strategy sets out air quality objectives and policy options to further improve air quality in the UK from today into the long term.
Affected Road Network	ARN	The parts of the road network that would be affected by a change in traffic levels as the result of a transport scheme.
Biodiversity Action Plan	BAP	An internationally recognized program addressing threatened species and habitats and is designed to protect and restore biological systems. The original impetus for these plans derives from the 1992 Convention on Biological Diversity.
British Geological Survey	BGS	A partly publicly-funded body which aims to advance geoscientific knowledge of the United Kingdom landmass and its continental shelf by means of systematic surveying, monitoring and research.
Best and Most Versatile	BMV	Defined as Grades 1, 2 and 3a of the Agricultural Land Classification as land which is most flexible, productive and efficient in response to inputs and which can best deliver future crops for food and non-food uses such as biomass, fibres and pharmaceuticals.

Term	Acronyms and abbreviations	Description
Basic noise level	BNL	A measure of source noise at a reference distance of 10 m from the nearside carriageway edge.
Conservation Area		An area of special environmental or historic interest or importance, of which the character or appearance is protected by law against undesirable changes (Section 69 of the Planning (Listed Buildings and Conservation Areas) Act 1990).
County Wildlife Site		A non-statutory conservation designation in the UK which affirms a site's importance and value for wildlife in its county context. The designation is classified by Natural England as being a 'Local Site' designation, though sites can also be of a regional and national importance.
Construction, Demolition and Excavation	CD&E	A term used to describe waste arisings from construction, demolition and excavation activities.
Construction Environmental Management Plan	CEMP	A plan by the contractor describing how the environmental impacts of construction activities would be minimised and mitigated.
Continuous Monitoring Stations	CMS	An air quality monitoring station that houses analysers that continuously monitor the concentrations of air pollutants.
Carbon Dioxide	CO_2	A primary greenhouse gas emitted through human activities as well as natural sources.
Control of Substances Hazardous to Health	COSHH	Under the Control of Substances Hazardous to Health Regulations 2002, employers need to either prevent or reduce their workers' exposure to substances that are hazardous to their health.
Calculation of Road Traffic Noise	CRTN	Method of calculating (and measuring) road traffic noise levels for new and altered highways.
Conceptual Site Model	CSM	Serves to conceptualize the relationship between contaminant sources and receptors through consideration of potential or actual migration and exposure pathways.
Decibel	dB	Logarithmic scale for measuring sound levels.
Department for Communities and Local Government	DCLG	The UK Government department for communities and local government in England and whose job it is to facilitate great places to live and work, and to give more power to local people to shape what happens in their area.
Development Consent Order	DCO	The means of applying for consent to undertake a Nationally Significant Infrastructure Project (NSIP). NSIPs include, for example, major energy and transport projects.
Department for Environment, Food and Rural Affairs	Defra	Defra is the government department responsible for environmental protection, food production and standards, agriculture, fisheries and rural communities in the United Kingdom of Great Britain and Northern Ireland. Defra is a ministerial department, supported by 33 agencies and public bodies.

Term	Acronyms and abbreviations	Description
Department for Transport	DfT	Government department responsible for the transport network in England, and for aspects of the transport network in the devolved administrations.
Design Manual for Roads and Bridges	DMRB	A series of 15 volumes contains information about current standards relating to the design, assessment and operation of motorway and all-purpose trunk roads in the United Kingdom.
Do Minimum	DM	The conditions that would persist in the absence of the implementation of a construction or improvement project, but given that maintenance on the road network is ongoing.
Do Something	DS	The conditions that would occur as a consequence the implementation of a construction or improvement project.
Environment Agency	EA	A non-departmental public body with responsibilities relating to the protection and enhancement of the environment in England.
Early Assessment and Sifting Tool	EAST	A decision support tool that has been developed to quickly summarise and present evidence on options in a clear and consistent format. It provides decision makers with relevant, high level, information to help them form an early view of how options perform and compare. The tool itself does not make recommendations and is not intended to be used for making final funding decisions.
Environmental Impact Assessment	EIA	The process of assessing the likely significant environmental impacts of a proposed project as part of gaining planning consent.
Environmental Quality Standards Directive	EQSD	European policy which sets out environmental quality standards for the substances present in surface waters (river, lake, transitional and coastal).
Environmental Statement	ES	The document which reports the process, findings and recommendations of the EIA carried out to assess the environmental impacts of a scheme.
Ecological Zone of Influence	EZoI	The area in which there may be ecological features subject to impacts and subsequent effects as a result of the Scheme, including those that would occur as a result of habitat loss, and those that would occur through disturbance, such as noise.
Flood Risk Assessment	FRA	An assessment that determines the risk of flooding to a proposed project.
Greenhouse gas	GHG	An atmospheric gas such as carbon dioxide, methane, chlorofluorocarbon, nitrous oxide, ozone, or water vapour that slows the passage of re-radiated heat through the Earth’s atmosphere.
Ground Investigation	GI	An intrusive investigation undertaken to determine the ground conditions (including soil, groundwater and ground gas) at a site. Involves the collection of samples for analysis.
Greater London Archaeological Advisory Service	GLAAS	GLAAS is part of Historic England's London Local Office and a Chartered Institute for Archaeologists' (CIfA) Registered Organisation. They provide advice on the understanding on the significance of any heritage assets affected by development schemes.

Term	Acronyms and abbreviations	Description
Generic quantitative risk assessments	GQRA	An initial quantitative assessment of chemical data against generic assessment criteria to identify potentially unacceptable risks from contamination.
Historic Environment Record	HER	A record of all known archaeological finds and features and historic buildings and historic /landscape features, relating to all periods from the earliest human activity to the present day; maintained by each County and Unitary Authority in the United Kingdom.
Highways Agency Geotechnical Data Management System	HAGDMS	Geotechnical information about condition of the ground beneath the network and the earthworks (embankments and cuttings) that support the infrastructure.
Highways Agency Water Risk Assessment Tool	HAWRAT	A Microsoft Excel application which has been developed to assess the acute and chronic pollution impacts on aquatic ecology associated with soluble and sediment-bound pollutants respectively.
Heavy Duty Vehicle/Heavy Delivery Vehicle	HDV	Defined in the DMRB as vehicles with a gross weight greater than 3.5 tonnes. Includes HGVs and buses and coaches.
Highways England	HE	The strategic highways company appointed by the Secretary of State to be highways authority for the roads for which he was previously the highway authority (i.e. the strategic road network).
Historic England		Publicly funded body that champions and protects England's historic places, including Stonehenge and Avebury; also known as the Historic Buildings and Monuments Commission for England.
Historic Landscape Character	HLC	A programme initiated by English Heritage to increase understanding of the wider designed landscape, beyond that of the planned parkland of the country estate. Similar programmes operate in Scotland, Wales and the Republic of Ireland, although different terminology is used.
Habitats of Principal Importance	HPI	Under Section 41 of the Natural Environment and Rural Communities (NERC) Act, the Secretary of State is required to publish a list of habitats which are of principal importance for the conservation of biodiversity in England. Fifty-six habitats of principal importance are included on the S41 list. These are all the habitats in England that were identified as requiring action in the UK Biodiversity Action Plan and continue to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework.
Habitats Regulation Assessment	HRA	A formal assessment of the implications of any new plans or projects which are capable of affecting the designated interest features of European Sites.
Interim Advice Note	IAN	Contains specific guidance, which shall only be used in connection with works on motorways and trunk roads in England, subject to any specific implementation instructions contained within an IAN.
Institute of Environmental Management and Assessment (IEMA)	IEMA	The worldwide alliance of environment and sustainability professionals.

Term	Acronyms and abbreviations	Description
Joint Nature Conservation Committee	JNCC	A public body that advises the UK Government and devolved administrations on UK-wide and international nature conservation.
Local Air Quality Management Technical Guidance	LAQM.TG	A technical guidance document designed to support local authorities in carrying out their duties under the Environment Act 1995 and subsequent Regulations. These duties require local authorities to review and assess air quality in their area from time to time.
London Air Quality Network	LAQN	Map showing air pollution in London and south east England.
Lead Local Flood Authorities	LLFA	The authority responsible for developing, maintaining and applying a strategy for local flood risk management in their areas and maintaining a register of flood risk assets.
Outline Landscape and Ecological Management and monitoring Plan	LEMP	A plan outlining the monitoring and management of the ecology and landscaping works including management objectives, targets and prescriptions.
Lowest Observed Adverse Effect Level	LOAEL	The level of noise exposure above which adverse effects on health and quality of life can be detected. No observed effect level: this is the level of noise exposure below which no effect at all on health or quality of life can be detected.
Local Nature Reserve	LNR	A statutory designation made under Section 21 of the National Parks and Access to the Countryside Act 1949, and amended by Schedule 11 of the Natural Environment and Rural Communities Act 2006, by principal local authorities. A Local Nature Reserve must be of importance for wildlife, geology, education or public enjoyment.
Local Wildlife Site	LWS	Non-statutory designated sites selected for their local or county nature conservation value in accordance with set criteria.
Local Geological Site	LGS	Are non-statutory sites that have been identified by local geoconservation groups as being of importance.
Limit Values		Refers to airborne concentrations of chemical substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed, day after day, over a working lifetime, without adverse health effects.
Mineral Safeguarding Area		An area designated by Minerals Planning Authorities which covers known deposits of minerals which are desired to be kept safeguarded from unnecessary sterilisation by non-mineral development.
Ministry of Agriculture, Fisheries and Food	MAFF	A UK government department created by the Board of Agriculture Act 1889. The Ministry was dissolved in 2002, at which point its responsibilities were merged into the Department for Environment, Food and Rural Affairs (Defra).
Multi-Agency Geographic Information for the Countryside	MAGIC	A web-based interactive map to bring together information on key environmental schemes and designations in one place. Multi-Agency Geographic Information for the Countryside (MAGIC) is a partnership project involving six government

Term	Acronyms and abbreviations	Description
		organisations who have responsibilities for rural policy-making and management.
Motorised Travellers	MT	A person who travels by a motorised vehicle which is a vehicle that is fitted with an engine or a motor e.g. mobility scooter.
National Character Area	NCA	The subdivision of England into 159 distinct natural areas. Each area is defined by a unique combination of landscape, biodiversity, geodiversity, history, and cultural and economic activity. Their boundaries follow natural lines in the landscape rather than administrative boundaries.
National Cycle Network Route	NCNR	A UK-wide network of signed paths and routes for walking, cycling and wheeling.
Natural England	NE	Executive non-departmental public body responsible for the natural environment.
National Heritage List for England	NHLE	The official, up to date, register of all nationally protected historic buildings and sites in England - listed buildings, scheduled monuments, protected wrecks, registered parks and gardens, and battlefields.
Noise Important Area	NIA	Areas where the 1% of the population that are affected by the highest noise levels from major roads are located according to the results of Defra's strategic noise maps.
Non-Motorised User	NMU	Cyclists, pedestrians (including wheelchair users), and equestrians using the public highway.
National Nature Reserves	NNR	Reserves established to protect some of the most important habitats, species and geology in the United Kingdom, and to provide 'outdoor laboratories' for research. There are currently 224 NNRs in England with a total area of over 94,400 hectares - approximately 0.7% of the country's land surface. Natural England manages about two thirds of England's NNRs. The remaining reserves are managed by organisations approved by Natural England, for example, the National Trust, Forestry Commission, RSPB, Wildlife Trusts and local authorities.
Nitrogen Dioxide	NO_2	Formed by the oxidation of nitric oxide in ambient air
Nitrogen Oxide	NOx	Collective term for nitrogen dioxide and nitric oxide, released from the combustion of fuel and discharged by vehicles and power stations.
No Observed Effect Level	NOEL	This is the level of noise exposure below which no effect at all on health or quality of life can be detected.
National Planning Policy Framework	NPPF	The National planning policy framework for England, dated March 2012.
National Planning Practice Guidance	NPPG	The Planning Practice Guidance web based resource for England first introduced in March 2014 (and which largely superseded planning policy statements (PPGs)) providing guidance on National planning policy and the operation of the planning system.

Term	Acronyms and abbreviations	Description
Noise Policy Statement for England	NPSE	Sets out the long term vision of government noise policy, to promote good health and a good quality of life through the management of noise.
National Policy Statement for National Networks	NPS NN	Sets out the need for, and Government's policies to deliver, development of nationally significant infrastructure projects (NSIPs) on the national road and rail networks in England.
Nationally Significant Infrastructure Project	NSIP	A project of a type and scale defined under the Planning Act 2008 and by order of the Secretary of State relating to energy, transport, water, waste water and waste generally. These projects require a single development consent. Planning permission, listed building consent and scheduled monument consent amongst others are not required for Nationally Significant Infrastructure Projects.
National Vegetation Classification	NVC	The National Vegetation Classification was commissioned in 1975 by the Nature Conservancy Council (NCC) to provide a comprehensive and systematic catalogue and description of the plant communities of Britain. It has now been accepted as a standard, not only by the nature conservation and countryside organisations, but also by forestry, agriculture and water agencies, local authorities, nongovernmental organisations, major industries and universities.
Outline Construction Environmental Management Plan	Outline CEMP	A plan that sets out the mitigation needed to manage environmental effects associated with a development during the construction and operational phases.
Ordnance Survey	OS	National mapping agency for Great Britain.
Project Control Framework	PCF	A joint Department for Transport and Highways England approach to managing major projects. The Framework comprises a standard project lifecycle; standard project deliverables; project control processes and governance arrangements.
Potential Contaminant Linkages	PCL	A linkage between a contaminant and a receptor by the means of a pathway.
Pollution Climate Mapping	PCM	A collection of models designed to fulfil part of the United Kingdom's EU Directive (2008/50/EC) on ambient air quality and cleaner air for Europe, requirements to report on the concentrations of particular pollutants in the atmosphere. There is one model per pollutant, each with two parts: a base year model and a projections model. The Pollution Climate Mapping model provides outputs on a 1x1 km grid of background conditions plus around 9,000 representative road side values. The Mapping is also used for scenario assessment and population exposure calculations to assist policy developments and provides model runs to support the writing of Time Extension Notification applications for PM_{10} and NO_x.
Preliminary Conceptual	PCSM	Provides a summary of a site including details of its current land use, history, geology and hydrogeology and

Term	Acronyms and abbreviations	Description
Site Model		details of potential contaminants, pathways and/or receptors. It is used to support the decision making process in the management of contaminated land and groundwater.
Preliminary Environmental Information Report	PEIR	A report describing the preliminary environmental assessment during the pre-application process of an NSIP and was available during the statutory consultation process.
Planning Inspectorate		Executive agency supported by the Department for Communities and Local Government which deals with planning appeals, national infrastructure, planning applications, examinations of local plans and other planning related and specialist casework in England and Wales
Particulate Matter with a diameter of 10 micrometres or less	PM_{10}	Very small solid particles present in engine exhausts, categorised on the basis of the size of the particles.
Public Right of Way	PRoW	A way over which the public have a right to pass and repass. The route may be used on foot, on (or leading) a horse, on a pedal cycle or with a motor vehicle, depending on its status. Although the land may be owned by a private individual, the public may still gain access across that land along a specific route. Public rights of way are all highways in law.
River Basin District	RBD	A river basin or several river basins, together with associated coastal waters. A river basin district is the main unit for management of river basins under the Water Framework Directive.
River Basin Management Plan	RBMP	Government document that sets out how organisations, stakeholders and communities will work together to improve the water environment.
Road Investment Strategy	RIS	The long-term strategy to improve England's motorways and major A roads. The first RIS (known as RIS1) was published in 2014 and covers the period 2015-2020. A second RIS (RIS2) was published in 2015, and covers the post-2020 period.
Scheduled monument		A 'nationally important' archaeological site or historic building, given protection against unauthorised change and included in the Schedule of Monuments kept by the Secretary of State for Culture, Media and Sport. The protection given to scheduled monuments is given under the Ancient Monuments and Archaeological Areas Act 1979.
The Scheme		The M25 junction 28 scheme.
Strategic Economic Plan		A document produced by a Local Enterprise Partnership setting out its plans for the future and the funding that will be required to deliver these plans.
Strategic Road Network	SRN	The network of approximately 4,300 miles of motorways and major 'trunk' A roads across England, managed by Highways England.
Special Areas of Conservation	SAC	Areas of strictly protected sites designated under the EC Habitats Directive (92/43/EEC) on the conservation of natural habitats and of wild fauna and flora. The listed

Term	Acronyms and abbreviations	Description
		habitat types and species are those considered to be most in need of conservation at a European level (excluding birds).
Site of Metropolitan Importance	SMI	Locally important sites of nature conservation adopted by local authorities for planning purposes.
Sites of Importance for Nature Conservation	SINC	Locally important sites of nature conservation adopted by local authorities for planning purposes.
Significant Observed Adverse Effect Level	SOAEL	This is the level of noise exposure above which significant adverse effects on health and quality of life occur.
Special Protection Areas	SPA	Areas of strictly protected sites classified in accordance with Article 4 of the EC Birds Directive (2009/147/EC) on the conservation of wild birds. They are classified for rare and vulnerable birds (as listed on Annex I of the Directive), and for regularly occurring migratory species.
Species of Principal Importance	SPI	Species identified as being of principal importance under the Natural Environment and Rural Communities (NERC) Act 2006, and capable of being a material consideration in the determination of development proposals
Source Protection Zone	SPZ	Areas of land around over 2000 groundwater sources such as wells, boreholes and springs used for public drinking water supply. The zones show the risk of contamination from any activities that might cause pollution in the area. The closer the activity, the greater the risk. There are three main zones (inner, outer and total catchment) and a fourth zone of special interest, which is occasionally applied to a groundwater source. The zones are used in conjunction with the Groundwater Protection Policy to set up pollution prevention measures in areas which are at a higher risk, and to monitor the activities of potential polluters nearby.
Statement of Common Ground	SoCG	A written statement containing factual information about the proposal which is the subject of the appeal that the appellant reasonably considers will not be disputed by the local planning authority or stakeholder.
Site of Special Scientific Interest	SSSI	A conservation designation denoting to a protected area in the United Kingdom. The Sites are protected by law to conserve their wildlife or geology.
Sustainable Drainage Systems	SuDS	Drainage system that is considered to be environmentally beneficial, causing minimal or no long-term detrimental damage.
Site Waste Management Plan	SWMP	A Site Waste Management Plan should describe how materials will be managed efficiently and disposed of legally during the construction of the works, explaining how the re-use and recycling of materials will be maximised. This involves estimating how much of each type of waste is likely to be produced and the proportion of this that will be re-used or recycled on site, or removed from the site for re-use, recycling, recovery or disposal. It is the joint responsibility of the client and the principal contractor to ensure that a Site Waste

Term	Acronyms and abbreviations	Description
		Management Plan is in place before construction begins and to ensure that it is enforced.
Transport Analysis Guidance	TAG	Guidance produced by DfT on the process of appraisal of transport interventions.
Tree Preservation Order	TPO	A Tree Preservation Order is made by a Local Planning Authority to protect specific trees or a particular area, group or woodland from deliberate damage and destruction. TPOs can prevent the felling, lopping, topping, uprooting or otherwise wilful damaging of trees without the permission of the Local Planning Authority.
Unexploded Ordnance	UXO	An explosive weapon (bombs, shells, grenades, land mines, naval mines, cluster munition, etc.) that did not explode when they were employed and still pose a risk of detonation, sometimes many decades after they were used or discarded.
Waste electrical and electronic equipment	WEEE	A term used to describe Electrical and Electronic Equipment which has reached its end of life. The management of WEEE is covered by the Waste Electrical and Electronic Equipment (WEEE) Regulations 2006 (SI 2006/3289) as amended in 2007 (SI 2007/3454), 2009 (SI 2009/2957), 2010 (SI 2010/1155) and 2013 (SI 2013/3113).
Water Framework Directive	WFD	The Water Framework Directive (2000/60/EC) is a EU directive which aims to achieve good status of all water bodies (surface waters, groundwaters and the sites that depend on them, estuaries and near-shore coastal waters) and the prevent any deterioration. It has introduced a comprehensive river basin management planning system to protect and improve the ecological quality of the water environment. It is underpinned by the use of environmental standards.
World Health Organisation	WHO	A United Nations agency concerned with public health.
Written Schemes of Investigation	WSI	Documents which set out the approach to undertaking archaeological monitoring of ground investigation works.
Zone of Influence	ZOI	The temporal and spatial influence of a development project.
Zone of Theoretical Visibility	ZTV	A map, usually digitally produced, showing areas of land within which a development is theoretically visible.

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