

Regional Investment Programme M25 Junction 28 Improvements Preliminary Environmental Information Report Non-Technical Summary 28/11/18

Status: A1 APPROVED - PUBLISHED

Document Ref: HE551519-ATK-EGN-RP-LM-000004



Notice

This document and its contents have been prepared and are intended solely for Highways England's information and use in relation to M25 Junction 28 Improvement

Atkins Limited assumes no responsibility to any other party in respect of or arising out of or in connection with this document and/or its contents.

Document history

Job number: HE551519			Document ref: HE551519-ATK-EGN-RP-LM-000004				
Revision	Status	Purpose description	Originated	Checked	Reviewed	Authorised	Date
C03	A1	Issue for Consultation	AR	LJB	PG	PG	28/11/18
C02	A1	Draft 2 for HE Review	AR	AR	LJB	PG	21/11/18
C01	A1	Draft for HE Review	AR	AR	LJB	PG	16/11/18

Table of contents

Chapter	Pages
Table of contents	3
1. Introduction	4
2. Air Quality	7
3. Noise and Vibration	9
4. Biodiversity	11
5. Road Drainage and the Water Environment	14
6. Landscape and visual	16
7. Geology and soils	19
8. Cultural Heritage	21
9. Materials and Waste	23
10. People and Communities	25
11. Climate	27
12. Assessment of Cumulative Effects	30
13. Environmental Definitions	32

1. Introduction

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

1.1.1 Highways England has prepared this summary of the **Preliminary Environmental Information Report**, referred to as the “PEIR”, as part of the Development Consent Order (DCO) pre-application consultation material for the M25 Junction 28 Improvements scheme, referred to as “the scheme”.

1.1.2 The purpose of the PEIR is to enable specialist and non-specialist consultees from the community and consultation bodies to understand the potential environmental effects of the scheme and the proposed mitigation measures. The effects have been predicted at this time for each environmental assessment topic, to inform consultee responses at this DCO pre-application consultation stage.

1.1.3 The scheme design is currently being developed and baseline environmental information, such as surveys, is still being assembled. The information in the PEIR should be regarded as a preliminary account of the principal environmental issues. It includes a number of uncertainties and assumptions and may be subject to change as the environmental impact assessment of the scheme progresses.

1.1.4 The PEIR has been divided as follows:

PEIR Volumes 1-3 (www.highwaysengland.co.uk/m25j28)

- PEIR Volume 1: Main text that includes scheme information, alternatives considered, environmental assessments for each environmental topic, glossary and references;
- PEIR Volume 2: Appendices that describe the study areas, planning legislation and policy, methodology and relevant tables for each environmental topic; and
- PEIR Volume 3: Figures that include scheme and outline environmental design drawings and plans to inform each environmental assessment topic chapter in the PEIR Volume 1.

PEIR Summary (www.highwaysengland.co.uk/m25j28)

- PEIR Non-Technical Summary – A separate document that summarises the environmental assessment and current preliminary findings for each topic. Further information on the scheme, alternatives considered, and the preliminary environmental impact assessment can be found in the relevant chapters in Volumes 1-3 of the PEIR.

1.1.5 An environmental context plan and environmental definitions of technical terms relevant to the PEIR summary are included in the back of this document. A full glossary is included in the PEIR Volume 1.

1.2 What happens after consultation?

1.2.1 Following consultation, Highways England will take account of all comments and suggestions received from the consultees in relation to the proposed development and the PEIR, including this summary. Highways England will

integrate them into further environmental impact assessment work that will be documented in an Environmental Statement (ES) and will be submitted as part of the DCO application to the Planning Inspectorate in autumn 2019.

- 1.2.2 The DCO application will also include a Consultation Report that will document the outcomes of the consultation and how this has informed the design development of the final proposal.

1.3 Where is the scheme?

- 1.3.1 The scheme is located between Brentwood and Romford, on the border of London Borough of Havering and Brentwood Borough Council. Junction 28 is one of the major improvement projects planned within the south east and will provide better access towards Essex and London, as well as connecting Brentwood, Chelmsford, Colchester and Suffolk with London and other key destinations.
- 1.3.2 The scheme was announced by Highways England in July 2017 and comprises the following elements:
- A new two-lane loop road with hard shoulder, for traffic travelling from M25 to A12;
 - Works on A12 eastbound to maintain existing access to Maylands Golf Course;
 - An overbridge at A12 eastbound exit road to allow the proposed loop road to join the A12 eastbound carriageway;
 - Widening of the M25 anti-clockwise carriageway to provide proposed exit road; and
 - A bridge over the M25 anti-clockwise entry road to facilitate new loop road.
- 1.3.3 The scheme converts the use of the existing hard shoulder over the M25 viaduct to the proposed deceleration lane and associated diverge configuration. The diverge commences to the north of the existing structure, consequently requiring no works to the existing railway structure and the existing M25 viaduct. Following the diverge nose it begins to turn into the adjacent land, north-east of the existing junction. The existing circulatory/M25 northbound merge will be realigned to pass under the proposed link. The horizontal alignment continues in a loop while the vertical profile starts to decline from the proposed structure on an embankment following the existing topography downhill towards the A12.

1.4 What are the environmental objectives of the scheme?

- 1.4.1 The environmental objectives of the scheme include:
- Minimise the impact on local air quality and noise by smoothing traffic flow; and
 - Protect access for non-motorised users (pedestrians and cyclists) and improve conditions wherever possible.
- 1.4.2 Further objectives and benefits of the scheme are detailed in the DCO pre-application consultation brochure.

- 1.4.3 Alongside the objectives for the scheme, Highways England sets out its own approach to meeting the key performance indicators identified within the RIS of “no net loss of biodiversity by 2020”. The Highways England Delivery Plan 2015-2020 also sets targets to mitigate noise in at least 1,150 Noise Important Areas (NIAs) between 2015/2016 and 2019/2020. This document also demonstrates the ability of the project to meet the requirements within Highways England licence, specifically in relation to the environment.
- 1.4.4 Highways England published ‘The Road to Good Design’ in January 2018, which sets out design principles with view to delivering the aspiration to *‘deliver safer, better, beautiful roads which connect people and connect our country’*. The scheme will be designed in accordance with these principles.

1.5 What are the key environmental constraints?

- 1.5.1 The scheme is within a predominantly rural setting in a narrow strip of Green Belt between the edge of the settlement of Brentwood just to the east and Romford further to the west. Brentwood Borough Council have declared three Air Quality Management Areas (AQMAs); for the eastern half of the junction, the area comprising parts of Warescot Road, Hurstwood Avenue and Ongar Road, Brentwood and the A12 and the area near the junction of the A128 and A1203. The London Borough of Havering has declared a Borough wide AQMA which covers much of the area to the west.
- 1.5.2 The Department for Environment, Food and Rural Affairs (Defra) has recorded elevated nitrogen dioxide (NO₂) concentrations on the A12. There are a number of noise important areas (NIAs) within the area including one that is located on Junction 28. The traffic levels on the M25 and A12 give rise to noise and air quality problems in the area. Changes to flows brought about by the scheme may affect noise or air pollution levels.
- 1.5.3 There eight Grade II and II* Listed Buildings within the scheme area and The Nags Head is a Grade II Listed Building located just to the east of the junction on Brook Street and two Registered Park and Gardens are located at Warley Place to the south and Weald Park to the north.
- 1.5.4 There are no designations for landscape quality but there are a number of Ancient Woodlands around the junction. Vicarage Wood and Lower Vicarage Wood are both designated as Ancient Woodland are located to the north east. The Manor Local Nature Reserve (LNR) is located to the north west of the junction and the Ingrebourne Valley Site of Metropolitan Importance (SMI) is located directly west of the junction.
- 1.5.5 The area surrounding the junction is Grade 3 Agricultural Land Classification (ALC) of good to moderate quality. There is a former landfill site immediately to the north west of the junction and Maylands golf course is located further west. Two waterbodies cross the site, the Ingrebourne River and the Weald Brook which both have associated flood plains.

1.6 What is Environmental Impact Assessment (EIA)?

- 1.6.1 EIA is the process for identifying the likely environmental effects (positive and negative) of proposed developments, and their significance, before development consent is granted. The aim of EIA is to ensure that the following are undertaken:

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

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

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

- Air Quality
- Noise and Vibration
- Biodiversity
- Landscape and Visual
- Road Drainage and Water Environment
- Geology and Soils
- Cultural Heritage
- Material and Waste
- People and Communities
- Climate
- Cumulative Effects

2. Air Quality

2.1 What is the existing environment like?

2.1.1 The scheme is located within two Air Quality Management Areas (AQMAs) where air pollutant concentrations exceed national air quality objectives. These are Brentwood Borough Council Air Quality Management Area (AQMA) No. 2 which comprises parts of Brook Street, Brentwood and the A12; and the London Borough of Havering borough wide AQMA. There are other AQMAs within Brentwood Borough Council, which could be affected depending on changes in traffic within these areas as a result of the scheme.

2.1.2 There are a number of monitoring sites in the area of the scheme, which measure air pollution either continuously or using passive samplers. Monitored concentrations of nitrogen dioxide (NO₂), a key pollutant associated with traffic, currently exceed the annual average objective at a number of roadside sites close to the scheme, notably adjacent to M25 Junction 28 and the A12. However, concentrations of fine particulate matter (PM₁₀ and PM_{2.5}) currently meet the air quality objectives.

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

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

2.2.2 During construction, various activities within the site could lead to an increase in emissions of dust in the absence of appropriate mitigation, and the potential for dust deposition at nearby properties and ecological sites, particularly to the north east of the junction. There could also be changes to air quality arising from changes to traffic during the construction period, resulting from both additional vehicles travelling to and from the construction site bringing materials and labour, and from any traffic management measures required, such as speed changes or diversions. Implementation of best practice mitigation measures will generally control construction dust and minimise any short-term adverse effects.

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

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

2.3.1 The key receptors that can be affected by changes in air quality are human health receptors such as residential properties, schools and nurseries, hospitals and residential care homes, and ecological receptors, such as Sites of Special Scientific Interest (SSSIs). The air quality assessment considers the effect on selected receptors within 200 m of any road expected to have a change in traffic in line with criteria given in Highways England's guidance. It is best practice to select receptors which are expected to have the largest changes in pollutant concentrations, as well as those likely to have the highest concentrations. These include those receptors closest to the roads affected by the scheme, those that are representative of large numbers of properties, those that house the young, the elderly and other susceptible populations, as well as those near junctions, or locations with queuing traffic.

What are the potential effects of the scheme on the receptors affected by air quality?

2.3.2 During the operational phase, previous assessment indicates that there are expected to be imperceptible changes in pollutant concentrations at receptors close to the scheme, and that concentrations at the receptors are expected to be below the relevant air quality objectives in all cases.

2.4 How will other proposed development change the adverse effects and benefits of the scheme?

2.4.1 Other committed developments in the area are detailed in Table 15.1 (PEIR Main Text Volume 1 - Assessment of Cumulative Effects). During construction none of these are likely to affect receptors within the air quality study area for Junction 28 construction, and there is unlikely to be any cumulative air quality effects arising during the construction phase.

2.4.2 At Option Selection Stage, other committed developments were not included in the air quality assessment. However, the traffic model for the ES will include additional traffic from all relevant committed development. The air quality

assessment at the ES stage will therefore take into consideration cumulative effects during operation. The status of committed developments in the area will also be reviewed within the ES.

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

- 2.5.1 There are a number of uncertainties that are inherent in any air quality assessment. These include the suitability of the traffic data, emissions data, and meteorological data, as well as other datasets that are required for the assessment. To overcome these uncertainties, the relevant best practice guidance for assessment will be followed, and the most current and valid datasets used wherever possible.
- 2.5.2 The results presented in this PEIR are based on air quality modelling using traffic data from the Option Selection Stage that will be superseded as the Preliminary Design Stage progresses.
- 2.5.3 It is possible that the results presented in the Environmental Statement (ES) could be higher or lower than those previously reported, as a result of changes to these datasets. The determination of the overall scheme significance will therefore be reviewed and, where necessary, updated during preparation of the ES.

3. Noise and Vibration

3.1 What is the existing environment like?

- 3.1.1 The scheme is located between Romford and Brentwood, which are separated by agricultural land and the M25. Road traffic noise from the M25 and the A12 is the dominant source of ambient noise and a railway operating between Stratford and Shenfield is also to the south of the study area (approximately 290 m south of Junction 28), influencing noise levels to the south of the Harold Park and Brook Street residential areas.
- 3.1.2 The Department for Environment, Food, and Rural Affairs (Defra) have identified a number of “Noise Important Areas” (NIAs) near the junction, one NIA is located on Junction 28. NIAs are the locations where the 1% of the population most affected by the highest noise levels from major roads and railways are located. Locations of the NIAs are shown on the environmental context plan at the end of this document.

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

- 3.2.1 The scheme has the potential to have an impact on noise during both the construction phase and once the scheme is complete and operational. The construction noise impact will be dependent on the construction methods used, and the proximity of the works to residential properties and other noise sensitive buildings.
- 3.2.2 Where feasible, construction noise could be reduced through alternative construction methods, temporary noise barriers and best practicable means. The

contractor will be expected to keep residents and other affected parties informed of the progress of the works, including when and where the noisiest activities will be taking place and how long they are expected to last. All noise complaints will be effectively recorded, investigated and addressed.

- 3.2.3 Once the scheme is complete, the noise levels in the area could be affected by changes in road layout, traffic flows, vehicle types, and speeds on the roads and other local roads especially at those properties nearby.
- 3.2.4 The potential for further noise barriers will be investigated following the noise assessment of the current scheme.

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

- 3.3.1 The closest residential areas to the scheme are The Grove (within the loop road), The Poplars (50 m) and Nag's Head Lane (250 m). Further residential communities are located at Brook Street (600 m), Harold Park (800 m), Wigley Bush Lane (850 m), and South Weald (1.1 km). These are areas of mixed residential and commercial land use. Non-residential noise receptors include Harold Park Baptist Church, St Peters Church, St Peter's C of E Primary School, and Holiday Inn Brentwood.

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

- 3.3.2 Use of mitigation measures such as environmental noise barriers which can reduce noise up to 10 dB, may assist in reducing noise at locations already experiencing high road traffic noise levels, such as within NIAs, and at locations where predicted road traffic noise levels are predicted above the significant observed adverse effect level (SOAEL) and the usage of low noise road surfacing for new and modified roads can reduce noise levels up to 3.5 dB LA_{10,18h}. The benefits of environmental noise barriers will be investigated further during the detailed design stage once updated traffic data is available.

What are the potential adverse effects of the scheme?

- 3.3.3 During construction phase, activities such as an increase in vehicle movements, site preparation, demolition, piling, earthworks, retaining wall construction and road works have potential to affect nearby sensitive receptors. If closure of the motorway or A12 is required, then the potential for adverse noise impacts at night would be high. Good working practices and the use of noise barriers can minimise these affects. During operational phase, the noise levels at nearby receptors could be affected by changes in vehicle activity (flows, speeds and composition). Further assessment will enable the full impacts of the scheme to be assessed.

3.4 How will the other proposed development change the adverse effects and benefits of the scheme?

- 3.4.1 The traffic model used in the assessment takes into account the effects of major residential and employment developments proposed in the wider area, as these will affect traffic volumes. The impact of these developments is therefore considered in the operation phase assessment.

3.4.2 No cumulative effects are expected to arise for the smaller residential developments.

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

3.5.1 A "simple" Design Manual for Roads and Bridges (DMRB) noise assessment undertaken during the previous design phase highlighted the requirement for the project to proceed to a "detailed" DMRB assessment during the Preliminary Design Stage to confirm the level of operational noise impact for the preferred option. The detailed noise modelling will incorporate new traffic data obtained from a strategic traffic model and any new mitigation measures incorporated into the design.

3.5.2 A construction programme detailing the specific activities that will take place, phasing and duration of each activities, and a plant list are not yet available for the scheme.

3.5.3 An increase in vehicle movements is expected during the construction period, as a result of workers and heavy goods vehicles (HGVs) travelling to and from site. At this stage the numbers of expected vehicle movements are not yet known, so cannot be quantitatively assessed. It is also not yet known if existing traffic will need to be diverted during the construction phase. Consequently, it is not possible to undertake a construction traffic noise impact assessment at this time, however, the impacts from this will be assessed once the required information becomes available at detailed design stage.

4. Biodiversity

4.1 What is the existing environment like?

4.1.1 One statutory designated site, The Manor Local Nature Reserve (LNR) is situated 300 m to the north west of the scheme. There are no other statutory designated sites within 2 km of the scheme.

4.1.2 The scheme will be situated partly within Ingrebourne Valley SMI¹, which is a large designated site of importance within the Greater London metropolitan area. The Ingrebourne Valley SMI follows the Ingrebourne River, from close to Junction 28 to near Rainham in South Essex. The scheme is located close to the northern end of this designated site.

4.1.3 There are three Essex Local Wildlife Sites (LWS) immediately adjacent to the scheme. These are The Oaks, Lower Vicarage Wood, and Jermaines Wood, to the north-east, east and south of the scheme respectively. In addition, a further 30 non-statutory designated sites (including Local Wildlife Sites in Essex and Sites of Importance for Nature Conservation (SINC) in the London Borough of Havering) were identified within 2 km of the scheme. Sixteen parcels of ancient woodland are within 2 km of the scheme, Vicarage Wood is the closest and is

¹ Non-statutory, locally-designated nature conservation sites in Greater London are known as Sites of Importance for Nature Conservation (SINCs), and are categorised into Metropolitan, Borough (Grade 1), Borough (Grade 2), and Local-level sites based on their relative importance.

adjacent to the scheme. No veteran trees have been identified through desk study within the scheme boundary.

- 4.1.4 The main habitats within the scheme boundary are broadleaved and mixed woodland, broadleaved plantation, scrub, hedgerows, semi-improved grassland, tall ruderal vegetation, ponds and running water (rivers/stream/ditches). The main woodland areas within the scheme boundary are Grove Wood to the south and Alder Wood to the north of the scheme.
- 4.1.5 One pond is present within the scheme in Grove Wood, and a further four ponds are present within 250 m of the scheme. The River Ingrebourne, and Weald Brook are rivers that flow through the land within the scheme boundary.
- 4.1.6 The habitats within the scheme boundary have potential to support notable and protected species, in particular invertebrates (including dragonflies, damselflies, beetles and butterflies), amphibians, reptiles, birds and mammals. Ecological surveys for specific species have confirmed the presence of populations of notable and protected species within or close the scheme, and other species that make use of the habitats within the scheme for foraging or commuting to other habitats. These include six fish species, great crested newt, common lizard, common woodland and scrub birds, kingfisher, seven species of bats, otter and badger.
- 4.1.7 A herd of wild fallow deer was regularly recorded within the scheme boundary during surveys. The following invasive or legally-restricted species were also recorded within the scheme: Himalayan balsam, signal crayfish, ring-necked parakeet, grey squirrel and Chinese muntjac. Non-native goldenrod plants are profuse within the grassland in the west of the scheme boundary.

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

- 4.2.1 Impacts on biodiversity during the construction phase include permanent loss of habitat within the footprint of the new loop road during site clearance and clearance for temporary access routes for construction traffic and for site compounds will also result in temporary loss of habitat.
- 4.2.2 There will be direct impacts on Ingrebourne Valley SMI through loss of habitat. Potential indirect impacts include noise and visual disturbance as a result of the construction works and permanent and temporary loss of other habitats outside the SMI, including semi-improved grassland, scrub and hedgerows. Loss of habitat has the potential to affect notable species, including terrestrial and aquatic invertebrates, fish, great crested newts, reptiles, birds, bats, otter and badger; through loss or damage of foraging areas, or places for rooting, nesting or shelter. There will also be fragmentation of habitat resulting in populations being isolated and commuting routes disrupted.
- 4.2.3 The construction of the scheme may potentially cause changes to the local hydrology which could alter groundwater and surface water flows. This could alter the character of certain habitats, including those that form part of designated sites (such as the SMI or adjacent LWS), ancient woodland and veteran trees. There is the potential for the pollution of groundwater or surface water, or deposition of silt during construction, which could have direct or indirect

impacts on designated sites, ancient woodland or notable habitats, affecting certain species and degrading the biodiversity value.

- 4.2.4 The construction of the river crossings will result in the permanent shading of sections of river, potentially resulting in local changes to the river habitats and excluding certain species from those sections. There may also be localised shading of other habitats such as woodland and grassland from the new embankments.
- 4.2.5 During the operational phase of the scheme there is potential for effects on biodiversity. Movements of traffic could disturb and potentially displace species, such as birds. Operational lighting could impact on nocturnal species such as bats, otter or badger if directed onto key commuting/foraging routes. Local changes in air quality could affect adjacent designated sites, ancient woodland or habitats, and there could be accidental damage or pollution of adjacent habitats from traffic incidents.

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

- 4.3.1 A Habitats Regulation Assessment (HRA) screening has been undertaken which concluded there are no likely significant effects on international or European-level designated sites such as Special Conservation Areas (SACs), Special Protection Areas (SPAs), or Wetlands of International Importance (Ramsar sites).
- 4.3.2 The scheme has the potential to affect non-designated sites (LWS in Essex and SINCs in Greater London), notable habitats plants, terrestrial and aquatic invertebrates, fish, great crested newt, reptiles, birds, bats, otter and badger prior to mitigation.

What benefits will the scheme bring to the receptors affected by biodiversity?

- 4.3.3 The scheme has the potential to have beneficial effects on nature conservation resources including designated sites, habitats and species. This is due to the incorporation of compensation and enhancement measures built into the design. Compensation measures may include remodelling of the watercourses, the Weald Brook and River Ingrebourne to provide meanders and back waters, and provision of new habitats. Existing habitats will also be enhanced through measures to control invasive species, manage deer browsing, and increase the habitat suitability for notable species.
- 4.3.4 Enhancement measures will improve the quality of habitats in the long term, in particular riverine habitats. Due to the mitigation and compensation measures incorporated into the design, the scheme is considered to have a potentially beneficial effect on the Ingrebourne Valley SMI.

What are the potential adverse effects of the scheme?

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

4.4 How will the other proposed development change the adverse effects and benefits of the scheme?

4.4.1 The proposals for the wind energy development sites 500 m to the west of the scheme has the potential for cumulative impacts in combination with the scheme on designated sites (in particular Ingrebourne Valley SMI), as well as bats and great crested newts.

4.4.2 Without adequate mitigation there could potentially be an effect on the populations of great crested newts in proximity to the scheme of moderate significance, and an effect on bat populations in proximity to the scheme of slight significance. Mitigation and enhancement measures as detailed for this scheme may reduce cumulative effects, especially if additional measures are applied for later developments (and suitable maintenance of habitat areas is ensured), to a level that is not significant.

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

4.5.1 The assessment of impacts on biodiversity is based on ecological surveys undertaken in 2017 and 2018 which covered all the notable habitats and species potentially affected. The baseline information gathered is considered sufficient to undertake an assessment of the significance of effects on biodiversity receptors.

5. Road Drainage and the Water Environment

5.1 What is the existing environment like?

5.1.1 Waterbodies within the study area fall within the Thames River Basin District (RBD). There is one surface water body within the study area, the River Ingrebourne (GB106037028130). This currently crosses Junction 28, running parallel and north of the A12. The River Ingrebourne flows south with the Weald Brook (designated as a Main River) joining at Putwell Bridge. The Weald Brook lies to the west of the M25 and runs parallel to the motorway.

5.1.2 The scheme area is underlain by shallow aquifers, including alluvium associated with watercourses (River Ingrebourne and Weald Brook) and Head.

5.1.3 Fluvial and tidal flood risk –The study area includes areas of Flood Zone 2 (between 0.1% – 1% chance of flooding in any year) and Flood Zone 3 (1% or greater chance of flooding in any year). The flood maps suggest that there is surface water ponding on the land surrounding Junction 28 and the A12, potentially influenced by the existing culverts and bridges across the watercourses.

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

5.2.1 Construction activities have the potential to affect water quality through uncontrolled site runoff; the excavation of materials, and the subsequent deposition of soils, sediment, or other construction materials; the spillage of fuels

or other contaminating liquids; and the mobilisation of contamination following the disturbance of contaminated ground or groundwater.

- 5.2.2 The risk of surface water flooding during construction is most likely to arise from heavy rainfall when runoff may pond, potentially resulting in flooding of working areas and excavations.
- 5.2.3 A Construction Environmental Management Plan (CEMP) and Sustainable drainage solutions would be produced which would incorporate measures to protect both surface and groundwater quality. All works would be undertaken in accordance with Pollution Prevention Guidelines (PPGs) and temporary works sites, haul roads and other associated works would be designed and maintained to minimise impact.
- 5.2.4 During the operational phase, the new hard standing areas could increase road runoff and drainage, affecting the water quality through the discharge of pollutants. However, mitigation measures embedded within the scheme design will lead to appropriate drainage control/interpretation prior to discharge which is anticipated to lead to a reduction of pollution entering the watercourses.
- 5.2.5 New impermeable areas could increase surface water flood risk. Drainage of cuttings may increase receiving stream flows and impact on the flow conveyance and capacity of surface water receptors and flood risk. However, the scheme drainage design incorporates sustainable drainage to deliver attenuation of surface water runoff rates, such that greenfield rates are not exceeded. Drainage from cuttings would also be made in accordance with relevant consent parameters.

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

- 5.3.1 Key surface water receptors identified are the River Ingrebourne (GB106037028130) and Weald Brook and their associated floodplains. Key groundwater receptors include superficial aquifers, including Alluvium associated with watercourses (Ingrebourne River and Weald Brook) and Head.

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

- 5.3.2 With the scheme and mitigation measures in place, there is potential to benefit water quality as the mitigation is likely to be better than existing for road drainage. The scheme will improve safety and reduce the risk of an accident and resulting spillage occurring and the risk of contamination as a result.
- 5.3.3 Proposed river realignments present an opportunity to restore sections of channel to more natural form and function, including the creation of wet-woodland habitat which in turn, improves the ecological diversity.

What are the potential adverse effects of the scheme?

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

5.4 How will the other proposed development change the adverse effects and benefits of the scheme?

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

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

- 5.5.1 The assessment has relied upon the accuracy and level of detail from the documented data sources.
- 5.5.2 The study area is 1 km. This is assumed to be large enough to capture water receptors that could be affected by the scheme. Should the design change, then the study area could change.

6. Landscape and visual

6.1 What is the existing environment like?

- 6.1.1 The scheme area lays partially within the Green Belt, adopted by the London Borough of Havering and Brentwood Borough Council. The scheme is located within National Character Area (NCA) No.111 - Northern Thames Basin as defined by Natural England, and within the Weald Wooded Farmland and Great Warley Wooded Farmland landscape character areas.
- 6.1.2 The landscape north of Junction 28 and the land to the northwest of Brentwood is characterised by wooded rolling hills and slopes, narrow, tree-lined roads, and swathes of relatively open commons. The land to the south of Junction 28 and southwest of Brentwood is characterised by strongly undulating wooded farmland/ wooded hills with extensive patches of woodland, small-scale field patterns with mature tree lined field boundaries, and narrow, quiet and sinuous rural lanes connecting small-scale settlements.
- 6.1.3 The scheme is partially surrounded by blocks of woodland and small scale arable and pasture fields. The fields are bound by hedgerows with intermittent trees and linear woodland belts. Semi-mature woodland belts are present along the on and off slip roads of the M25 as well as along the A12 toward the urban fringe of Romford to the west. The Junction 28 roundabout is filled with existing mature woodland with some areas of scrub vegetation,
- 6.1.4 Thames Chase Community Forest, bisected by the M25, lies to the south of Junction 28 and abuts the A12 to the west of the junction and the A1023/ Brook Street to the east of the junction.
- 6.1.5 The Manor (Local Nature Reserve) is located wholly within the study area across two sites - the smaller site lays c.1,000 m directly west of the existing junction, the larger lays c.1,300 m to the north-west.
- 6.1.6 Weald Park, a Grade II Registered Park & Garden located c.800 m to the north of Junction 28, lies within the study area, as do approximately 62 Listed Buildings. Two Scheduled Monuments are also located within the study area.

6.1.7 Visibility towards Junction 28 is restricted by a network of hedgerows, woodland belts and areas and the surrounding landform, which slopes down towards the junction.

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

6.2.1 Post mitigation, potential impacts may arise due to site clearance to facilitate the new road layout, structures, earthworks, drainage, gantries, signage, lighting and construction access within the DCO pre-application boundary. These site operations could open up views to the highway and traffic affecting nearby receptors and has the potential to change the landscape character around Junction 28.

6.2.2 The design development aims to minimise the construction footprint and subsequent vegetation clearance. Additional measures and sensitive working practices will be undertaken to protect adjacent vegetation. Where clearance is necessary new native woodland would be implemented to reinstate the screening effect of highway planting once established.

6.2.3 Where possible there may be potential to provide mitigation measures for screening consisting of planting or mounds; if the field pattern is affected it should be reinstated where possible, through the addition of woodland copses, tree belts, or planting of hedgerow with trees. Where earth mounding or cuttings are proposed their profile should be modelled to fit with the local landscape character. Shallow gradients of slopes and shallow crests of embankments and cuttings should correspond with existing profiles.

6.2.4 Once the scheme is completed, there could be potential impacts resulting from views of the highway, earthworks and structures, including new lighting and gantries in the short term, while new planting is establishing. As best practice, Highways England aim for the lighting design throughout the scheme to minimise light spill. The use of an LED light source and good lighting design potentially provide a reduction of the environmental impact of the proposed lighting that will be considered in the assessment in the ES.

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

6.3.1 Key receptors that could be affected include:

- The landscape character around Junction 28; and
- Visual receptors comprising:
 - Residents of nearby properties including Grove Farm, Boyles Court Farm, Maylands Cottages, Oak Farm, Harold Park, May and Freemans Cottage, French's Farm and properties along Spital Lane, Wingrave Crescent and Nags head lane;
 - Patrons of Maylands Golf Course;
 - Users of the bridleway following Nags Head Lane;
 - Users of the open access land including Tylers Common;

- Users of Public Rights of Way (PRoW) such as the public footpath along A1023/ Brook Street and the Wigley Bush Lane overbridge.

What benefits will the scheme bring to the receptors affected by landscape?

- 6.3.2 The proposed new planting around the junction would potentially increase the extent of vegetation in the landscape and increase biodiversity in this area, whilst in the longer-term screening views of traffic from nearby properties.

What are the potential adverse effects of the scheme?

- 6.3.3 The key landscape effects expected from implementation of the scheme are loss of vegetation, alteration to the landform and field pattern, as well as the introduction of man-made features. The scheme will directly affect Alder Wood as the alignment cuts through a section of this Semi-Natural Woodland, and considerable loss of trees is expected along the entry and exit slip roads along both the M25 and the A12.
- 6.3.4 The scheme would also likely affect the existing levels of tranquillity in the local area. All these changes combined may potentially affect the local landscape character.

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

- 6.4.1 There are three potential development sites identified for inclusion into a high-level assessment of potential cumulative landscape and visual effects as they have either been identified for development by adopted local development plans or have been granted planning consent. The schemes are listed below:

- Crossrail - Approximately 400 m from the scheme;
- Cycleway Proposals - Approximately 500 m from the scheme; and
- Change of use of land to burial grounds including removal of existing agricultural buildings and erection of two pavilion buildings for associated usage, hard and soft landscaping, new access to A12 and internal roads and paths, parking, and workshop area for storage of associated equipment, tools and materials- Approximately 500 m from the scheme.

- 6.4.2 It is unlikely there will be significant cumulative effects from the proposals above as feature or elements will likely be set within the context of these development sites only.

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

- 6.5.1 Further investigations and surveys, which will be carried out in the coming months, are required to complete the earthworks design. The assessment in the ES will consider the impact that changes to the existing slopes would have on the vegetation loss.

7. Geology and soils

7.1 What is the existing environment like?

7.1.1 The solid geology beneath the site is London Clay which is bioturbated or poorly laminated, blue-grey or grey-brown (when weathered), silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay; The superficial geology is deposits at the site is with Alluvium anticipated at Ingrebourne river, Weald Brook and their tributaries. Alluvium typically comprises very soft and soft low strength organic clays and peat. Discrete layers of silt, sands and gravels may also be present in the materials. No sensitive geological sites (including geological SSSIs) are located within the study area.

7.1.2 There is one surface water body identified within the study area, the River Ingrebourne (GB106037028130) The scheme is not located in an area affected by mining or quarrying. A UXO Pre-Desk Study Assessment (PDSA) has been carried out by Zetica (2017), and identifies the study as having a moderate UXO hazard level.

7.2 What aspects of the scheme will potentially impact on geology and soils, and how can these impacts be reduced?

7.2.1 The construction phase will potentially introduce new sources of contamination and disturb and mobilise existing sources of contamination. Construction activities may also introduce new pathways for migration of existing contamination such as excavation and exposure of contaminated soil, remobilisation of contaminants through soil disturbance and the creation of preferential pathways for surface water run-off, groundwater and ground gas. Any dewatering activities have the potential to mobilise contaminated groundwater and, oil spill may introduce new source of contamination which will result in reduced soil quality.

7.2.2 Potential impacts on geology and soil resources during operation are anticipated from fuel spills or hazardous spills, exposure of future road users to contamination, and disturbance of geological strata which could lead to changes in the groundwater regime. it is anticipated that no new pathways will be created however accidents / incidents have the potential to introduce new sources.

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

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

7.3.1 The scheme has the potential to impact the following receptors:

- Environmental (controlled waters, ecology and property) and human health from the mobilisation of contamination;
- Increasing the risk of geological hazards;

- Degradation of soil quality; and
- Sterilisation of mineral resources from land take.

What benefits will the scheme bring to the receptors affected by geology and soils?

- 7.3.2 With respect to land contamination, the assessment of baseline conditions, and the magnitude of the potential impact (change) of the scheme has been assessed as significant. However, with the application of appropriate mitigation measures, the impact of the scheme on land contamination has been assessed as not significant (minor adverse to minor beneficial) following implementation of mitigation measures. The operational phase has been assessed as having a moderately beneficial to negligible effect and has therefore been assessed as being significant (beneficial).

What are the potential adverse effects of the scheme?

- 7.3.3 Pre-mitigation, potential impacts associated with the construction and operational phases include:
- The sterilisation of mineral resources;
 - Adverse effects on human health, controlled waters, ecology or property receptors associated with the potential mobilisation of existing contamination, exposing areas of contamination if present, or the introduction of either new sources of contamination, new pathways for the migration of contamination or new receptors;
 - Physical effects arising from changes in either topography, physical properties (associated with soil erosion or a reduction in soil quality); and
 - Risk to the scheme associated with potential aggressive ground conditions or ground stability hazards.
- 7.3.4 No significant effects are anticipated with the effective application of mitigation and design measures.

7.4 How will the other proposed development change the adverse effects and benefits of the scheme?

- 7.4.1 Only the Gypsy and Traveller Site at the Caravan Park, Putwell Bridge, located approx. 500 m from site, could result in cumulative effects with the Junction 28 scheme. The proposed development does not include large scale groundworks, however, it has the potential to introduce new receptors during construction and operation. The scheme will be operated in accordance with the relevant regulations and best practice guidance in applying Best Available Techniques and pollution prevention. The potential for cumulative effects is therefore considered to be low.

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

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

8. Cultural Heritage

8.1 What is the existing environment like?

- 8.1.1 Designated heritage assets in the immediate vicinity (500 m) of the scheme include 11 designated heritage assets, one Grade II registered park and garden, Two Grade II* listed buildings, six Grade II listed buildings; and two Conservation Areas. Fifty-six non-designated heritage assets have been identified within the study area. These assets include the London to Colchester Roman Road, a medieval woodland, as well as post-medieval domestic and agricultural buildings, and post-medieval parkland.

8.2 What aspects of the scheme will potentially impact on cultural heritage, and how can these impacts be reduced?

- 8.2.1 During construction, direct physical impacts are likely to occur as a result of earthmoving operations, construction activities, introduction of construction machinery, compounds and vegetation removal with the potential to create new sightlines and views of the M25 Junction 28. The following known heritage assets will be affected by the construction of the scheme:
- London to Colchester Roman Road (Archaeological Priority Area), along the A12 to the west of the junction;
 - Alluvium Deposits (Archaeological Priority Area), along the A12 to the south west;
 - Post-medieval park at Dagnam, north west of the junction;
 - The Grove Farm Buildings and nearby unroofed buildings (non-designated heritage assets), located immediately west, west of Grove Farm and north along the A12 respectively; and
 - Stony Hills Farm (Grade II Listed Building), south of the junction along the M25.
- 8.2.2 Operational effects are long term and permanent, it is, however, expected that a programme of mitigation will take place where impacts are anticipated. Mitigation could include planting which will mature gradually following construction. Where possible the scheme will introduce design measures to remove these impacts or apply mitigation measures to reduce the effects, providing additional enhancements where possible.

- 8.2.3 The scheme shall seek to avoid direct impacts on known heritage assets during enabling and construction works. This would be achieved through careful design, including well designed screening and siting works away from heritage assets.
- 8.2.4 A programme of archaeological investigation will be undertaken in areas affected by the scheme, including construction compounds and access routes, where there is potential for significant archaeological remains to survive. The scope and extent of such investigations should be developed in consultation with the Archaeological Officers of the Greater London Archaeology Advisory Service and Essex County Council, and subject to a Written scheme of Investigation for their approval. This work will comprise geophysical survey in the first instance, with an archaeological watching brief on all geotechnical investigations to ascertain the paleoenvironmental potential of the study area.

8.3 What are the key receptors that will potentially be affected?

- 8.3.1 Key receptors include designated heritage assets including one Grade II registered park and garden, two Grade II* listed buildings, six Grade II listed buildings and other non-designated heritage assets.
- 8.3.1 A full list of all heritage assets which could be affected by the scheme can be found in Table K.1 in the PEIR Volume 2 Appendices.

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

- 8.3.2 Mitigations such as planting which will mature gradually following construction and provide screening. Where possible the scheme will introduce design measures to remove the impacts and to reduce the effects, providing additional enhancements where possible.

What are the potential adverse effects of the scheme?

- 8.3.3 During construction, direct physical impacts are likely to occur as a result of earthmoving operations, creation of site compounds, road formation/ construction; and construction of proposed overbridges and other structures. Setting impacts are likely occur due to of the introduction of construction machinery, compounds and vegetation removal with the potential to create new sightlines and views of the M25 Junction 28.

8.4 How will the other proposed development change the adverse effects and benefits of the scheme?

- 8.4.1 A preliminary assessment of cumulative effects indicates that, it is unlikely there will be cumulative effects on archaeology with other development. Impacts to below ground heritage assets are proposed to be mitigated either through preservation in situ or through a programme of archaeological excavation and recording.
- 8.4.2 Cumulative effects on the setting of heritage assets, principally The Grove, may result from the operation of the scheme and surrounding developments (particularly the small, medium and large wind developments and Crossrail), however it is not thought that this effect would be significant. It is anticipated that

any effects will be reduced or eliminated following incorporation of mitigation measures.

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

- 8.5.1 A programme of archaeological evaluation will investigate the potential buried archaeological remains. This will comprise geophysical survey in the first instance, with an archaeological watching brief on all geotechnical investigations to ascertain the palaeo environmental potential of the study area.

9. Materials and Waste

9.1 What is the existing environment like?

- 9.1.1 The existing environment in terms of materials and waste is informed by the national demand for key construction materials, and the non-hazardous and hazardous waste generation and waste management capacity.
- 9.1.2 The key construction materials to be used in the scheme will likely include, aggregate, concrete and asphalt. These materials may be sourced from the Greater London and East of England regions which are close proximity to the scheme. According to the Mineral Products Association Profile of the UK Mineral Products Industry 2018 report, the total material sales (capacity) of these regions to supply the key materials mentioned above is 35,450,000 tonnes. This will be used as the materials baseline.
- 9.1.3 No Mineral Safeguarding Areas (MSAs) are likely to be impacted by the scheme according to the Essex Minerals Local Plan and the London Borough of Havering Local Aggregate Assessment.
- 9.1.4 Essex has both non-hazardous (8,363,799 tonnes capacity) and hazardous (894,863 tonnes capacity) waste infrastructure available to manage the schemes waste arisings. These quantities have been estimated according to available data and will be used as the waste infrastructure baselines. During the schemes construction, its non-hazardous arisings will be 6,446,361 tonnes and its hazardous arisings will be 35,618. These quantities have been estimated according to available data and will be used as the waste arisings baselines. As Essex already has its own waste arisings within the region the additional waste generated by this scheme will add to its impact on its waste infrastructure capacity. The total waste arisings will fluctuate year on year based on the number, type and size of construction schemes underway.
- 9.1.5 No Mineral Safeguarding Areas (MSAs) are anticipated to be impacted by the scheme according to the Essex Minerals Local Plan and the London Borough of Havering Local Aggregate Assessment.

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

- 9.2.1 Materials will be used during the construction phase and waste will be produced across the Construction Demolition and Excavation (CD&E) phases of the scheme.
- 9.2.2 During the operational phase of the scheme, it is expected that there will be negligible material use and waste production. Most wastes are likely to be in the form of litter and maintenance wastes.
- 9.2.3 Mitigation measures during construction and operation will aim to move waste up the waste hierarchy by identifying where it is suitable for materials wastes to be reused or recycled therefore, minimising the amount of construction materials used and the amount waste requiring disposal.

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

- 9.3.1 Receptors which have the potential to be impacted by material resources use and waste generation, are defined as:
- The market for key construction materials, which are to be used throughout the scheme;
 - The waste arisings baseline - the amount of waste that is predicted to be produced during the CD&E phases of the scheme and
 - The predicted capacity of waste infrastructure both regionally (non-hazardous and inert) and nationally (hazardous) which are anticipated to arise from the scheme during the construction phase.

What are the potential adverse effects of the scheme?

- 9.3.2 Receptors which have the potential to be impacted by material resources use and waste generation, are defined as:
- The market for key construction materials, which are to be used throughout the scheme;
 - MSAs as defined by the Essex Minerals Local Plan 2014;
 - The waste arisings baseline - the amount of waste that is predicted to be produced during the CD&E phases of the scheme and
 - The predicted capacity of waste infrastructure both regionally (non-hazardous and inert) and nationally (hazardous).
- 9.3.3 Pre-mitigation, the scheme could cause adverse effects by using construction materials (i.e. depleting natural resources), like asphalt and concrete, and temporarily or permanently occupying capacity of regional and/or national waste infrastructure.

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

- 9.3.4 Best practice waste management not only reduces the environmental effects of a development through reducing waste to landfill or incineration, but also has the potential to reduce the cost of disposal.

9.4 How will the other proposed development change the adverse effects and benefits of the scheme?

- 9.4.1 A review of relevant planning applications will be undertaken at the next stage of assessment to identify the potential cumulative impacts of other proposals which may affect material resources and identified waste receptors.

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

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

10. People and Communities

10.1 What is the existing environment like?

- 10.1.1 There are five private dwellings, one farm building, Properties along Wigley Bush Lane and Weald Park Way, to the north east of the junction, Putwell Bridge Caravan Park, south of the A12 Colchester Road, The Maylands Golf Club and Henderson Sports and Social Club are located in Harold Park approximately 700 m and 1 km, the Pool man swimming pool and Spirit Health Club are within 500 m of the scheme.
- 10.1.2 A cluster of community facilities and services are located along Brook Street in Harold Park, extending approximately 800 m from Junction 28 along the A12. Local businesses are located in the study area including farms, South Weald Service station, a petrol station and restaurants. Commercial properties are located along Wigley Bush Lane and Weald Park Way.
- 10.1.3 Brentwood Borough Council proposes a cycleway approximately 500 m to the south of the junction. There is one significant permitted planning application within the study area, for the change of use of land south of the A12 Colchester Road and west of Harold Park to burial grounds (P1742.14).
- 10.1.4 There are two Public Rights of Way within the study area:
- Bridleway on the south side of Nag's Head Lane, running to west and east of the M25; and
 - Footpath which is located south east of Junction 28, 300 m from the red line boundary at its closest point.

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

10.2.1 It is considered that all aspects of the scheme will impact people and communities, either temporarily or permanently. This includes, land take, severance of connectivity, access restrictions, effects to amenity to human health.

10.2.2 The scheme design will include a range of built in mitigation. Such as

- The protection of existing NMU access arrangements to reduce severance during the operational phase of the scheme;
- Land take during the construction and operational phases will be limited to that required; and
- Completion of a CEMP, which will outline best practice construction methods to reduce disruption.

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

10.3.1 The scheme has the potential to affect a range of receptors including dwellings, community facilities, local businesses, agricultural land, development land, NMU and vehicle travellers and human health.

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

10.3.2 The scheme will contribute to enhancement of the national road network to improve journey quality, reliability and safety. The scheme will also improve quality of life, accessibility and inclusivity by linking communities and reducing community severance.

10.3.3 The scheme incorporates measures to avoid and mitigate environmental and social impacts, including access to open spaces, impacts on PRow and opportunities for sport and recreation.

What are the potential adverse effects of the scheme?

10.3.4 The dwellings within the Grove Farm property are considered of high sensitivity and will be potentially most affected by the scheme. The scheme has potential to result in impacts to nearby residential properties relating to visual, air quality or noise and vibration during both construction and operation. The landscape and visual assessment anticipates significant adverse during construction and operational phase.

10.3.5 The scheme will require agricultural land for highway works, construction compound and laydown, flood mitigation and accommodation work. There will therefore be some permanent agricultural land take from Grove Farm. Land occupied or disturbed temporarily during the construction phase will be returned in a condition equivalent to its original state, or as otherwise agreed.

10.4 How will the other proposed development change the adverse effects and benefits of the scheme?

- 10.4.1 The outcome of the scheme in relation to people and communities is affected by significant effects identified within the other environmental topics (such as noise and vibration, and air quality). This has been included in the assessment of in-combination amenity impacts.
- 10.4.2 Other cumulative effects relate to the effects of any concurrent development in the vicinity. Two potential cumulative effects are identified. The potential wind farm sites within Maylands Golf Course, if developed during the construction phase of the scheme, may exacerbate negative impacts to this community asset. However, the cumulative effect would be temporary and not significant. The proposed cycleways to the south of the scheme, if completed before the proposed scheme is operational, could assist in reducing adverse effects on amenity.

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

- 10.5.1 The assessment provides a broad, high level indication of effects based on preliminary assessment. Further assessment of effects will be possible when more details concerning the scheme design, in particular the construction of the scheme, is available.

11. Climate

- 11.1.1 The preliminary assessment within the Climate chapter is divided into two sub-sections to address climate change:
- The potential effects of the scheme on climate, including the magnitude of greenhouse gases emissions emitted during both construction and operation; and
 - The vulnerability of the scheme to climate change, including the impacts of extreme weather (caused by climate change) during operation and construction and adaptation to mitigate the effects of these impacts.

11.2 What is the existing environment like?

- 11.2.1 The assessment of the effects on climate quantifies emissions of greenhouse gases from the scheme to the atmosphere. Sources of direct emissions include vehicles using the existing road and nearby roads and sources of indirect emissions include maintenance and refurbishment activities, materials production and energy use by technology and lighting on the scheme.
- 11.2.2 The conditions of the existing environment are based on the quantity of emissions that are generated. No emissions estimates are currently available however it is possible to understand the emissions in more details by comparison with other schemes and total UK emissions and UK carbon reduction targets.
- 11.2.3 The total UK national emissions for 2016 (last reported year) were 467.9 million tonnes of CO₂e (Carbon dioxide equivalent) with transport producing 125.8

million tonnes of CO₂e of this. Emissions from any single road scheme are unlikely to result in a significant impact on climate in relation to overall national emissions. However, following the determination of emissions for the scheme, measures to reduce emissions will be identified.

- 11.2.4 The assessment of the vulnerability of the scheme to climate change depends on the sensitivity of the scheme to climate hazards (extreme weather events) and the geographic exposure to these hazards. The assessment will consider the key climate variables including extreme temperatures and rainfall and hazards (flooding, snowstorms) and how they are expected to change over the lifetime of the project (warmer and colder temperatures, higher rainfall).

11.3 What aspects of the scheme will potentially impact on climate, and how can these impacts be reduced?

- 11.3.1 All aspects of the scheme that directly or indirectly result in emissions of greenhouse gases have the potential to result in climate effects. These include:

- Production, manufacturing and transportation of construction materials;
- Construction processes, including, construction plant energy use, water use, energy use from on- and off-site worker facilities, worker commuting waste transportation off-site, and off-site waste processing;
- Operation of the scheme, including, vehicles using the road network, street lighting, and signage; and
- scheme maintenance, including, inspection works, and maintenance and repair works.

- 11.3.2 Mitigation measures for minimising the effects of the scheme on climate change include applying the Highways England carbon reduction hierarchy; Avoid/prevent, Reduce and Remediate.

- 11.3.3 Mitigation measures for Vulnerability of the scheme to climate change include appropriate design for climate change, using a higher degree of ground compaction, green/blue infrastructure, developing dust management plans and implementing water efficiency measures.

11.4 What are the key receptors that will potentially be affected?

- 11.4.1 The only direct receptor of GHG emissions is the atmosphere.

- 11.4.2 Receptors from extreme weather events may be summarised as roads and supporting infrastructure, including bridges, embankments, earthworks and drainage.

What benefits will the scheme bring to the receptors affected by climate?

- 11.4.3 The scheme could potentially result in a significant reduction in emissions during the operation phase. However, this is considered unlikely as initial modelling suggests that there will be an increase in vehicle volumes.
- 11.4.4 Climate change can bring warmer temperatures during winter and this may result in reduced winter maintenance costs as less ice and snowfall could occur.

What are the potential adverse effects of the scheme?

- 11.4.5 The construction of the scheme will result in an adverse effect on climate due to the emission of greenhouse gases. Initial modelling suggests that the scheme will also result in an increase in emissions from road user vehicles during operation.
- 11.4.6 Warmer temperatures during summer can increase thermal loading on bridges and pavements causing expansion, bleeding and rutting which will need repairing. Repairs cannot be performed until temperatures reduce.
- 11.4.7 Higher winds can damage roadside furniture, such as traffic signs, and blow nearby vegetation onto the road.
- 11.4.8 Higher rainfall can lead to increased flooding which can damage road infrastructure and cause disruption.

11.5 How will the other proposed development change the adverse effects and benefits of the scheme?

- 11.5.1 Other proposed development will not change the scheme's effects on climate. However, global warming is cumulative with many smaller emission sources contributing to a wider global impact.
- 11.5.2 The scheme and its climate change adaptation measures could create wider cumulative impacts on other projects / stakeholders and their resilience to climate change. These impacts may be positive or negative. The ES will consider if there are any cumulative impacts for other projects and stakeholders in a climate change adaptation context.
- 11.5.3 There is also potential for in-combination effects across receptors (e.g. droughts affecting rivers, which then affect ecosystem and impact on services being delivered by the catchment).

11.6 What are the limitations and assumptions of the current information?

- 11.6.1 There is currently insufficient design information available to conduct a full assessment of the effects of the scheme on climate so a partial assessment has been undertaken to inform the PEIR. A full assessment of the construction emissions will be calculated and presented as part of the environmental assessment.
- 11.6.2 The baseline for climate change vulnerability includes an assessment of a range of future climate projections. Future projections are based on the United Kingdom Climate Projections 2009 (UKCP09). The projections are probabilistic, which means that rather than a single 'best-guess' of the impact of climate change, they give a range of outcomes based on an 'ensemble' of multiple climate model runs. This better represents the uncertainty of climate prediction science. The UKCP09 probabilistic projections are based on three scenarios of greenhouse gases emissions (Low, Medium and High) and are provided for seven-time periods ('time slices') throughout the 21st century. The analysis of projections for the scheme location is done under the 50th percentile of the high emissions scenario. Additionally, the level of uncertainty of the projections is

dependent on the climate variable. For example, there is greater confidence around changes in temperature than there is in wind. The level of certainty of each projection is included in the baseline.

12. Assessment of Cumulative Effects

12.1 What is the existing environment like?

12.1.1 A review of planning applications located within 500 m of the scheme has identified the following developments:

- Gypsy and Traveller Site in Brentwood. The Caravan Park, Putwell Bridge and Small, Medium, Large Wind Development Sites (Council area - Brentwood) Approx. 500 m from site;
- Cycleway Proposal in Brentwood, which is located approx. 500 m from the site;
- Change of use of land to burial grounds including removal of existing agricultural buildings and erection of two pavilion buildings for associated usage, hard and soft landscaping, new access to A12 and internal roads and paths, parking, and workshop area for storage of associated equipment, tools and materials. (Council area –Havering) which is located approximately 500 m from the site; and
- 032 Housing development Proposal for 150 residential units Approx. 650 m from site (Council area – Brentwood).

12.1.2 The level to which these developments interact and have cumulative effects with the scheme is dependent on a number of factors including proximity to each other, size, scale and type of development, and how far the mitigation proposed reduces the various effects.

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

12.2.1 The following is considered as part of the cumulative assessment:

- Combined effects: impact is the result of the combined action of different environmental topic-specific effects acting upon a single receptor. For example, noise, dust and traffic may impact upon a residential property; and
- Cumulative effects: impact results from the combined action of a number of different projects, in combination with the project being assessed, on a single receptor.

12.2.2 Cumulatively, the various developments between Brentwood and Romford, on the border of London Borough of Havering and Brentwood Borough Council improvements will likely result in significant changes to the locality, and potentially to the wider region.

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

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

What benefits will the scheme bring to the receptors affected by cumulative?

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

What are the potential adverse effects of the scheme?

12.3.3 A cumulative negative effect on landscape and visual through a three project construction phase would impact on the fabric of the landscape as a result of removal of or changes in individual landscape elements or features, and the introduction of new elements or features.

12.4 How will the other proposed development change the adverse effects and benefits of the scheme?

12.4.1 Each of the other developments will propose mitigation measures where necessary to reduce the impacts of that development. However, where residual effects remain, these may interact with the residual effects of this scheme resulting in the overall effect (both positive and negative) being more significant or amplified.

12.4.2 Developments close to the scheme and larger scale projects are more likely to result in cumulative effects.

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

12.5.1 The cumulative effects assessment is based on a search of current planned development. As new applications come forward and extant applications are 'varied' the list will need to be updated. The list of development projects listed in the cumulative effects assessment will be updated in discussions with London Borough of Havering and Brentwood Borough Council

12.5.2 This list will be updated with further details including the number of dwellings proposed, the number of jobs expected to be created and the anticipated phasing for the delivery of the development.

12.5.3 The list of other development is speculative and, whilst the Local Planning Authorities and potentially developers will have been consulted on phasing, the developments may not be delivered in line with the assumptions.

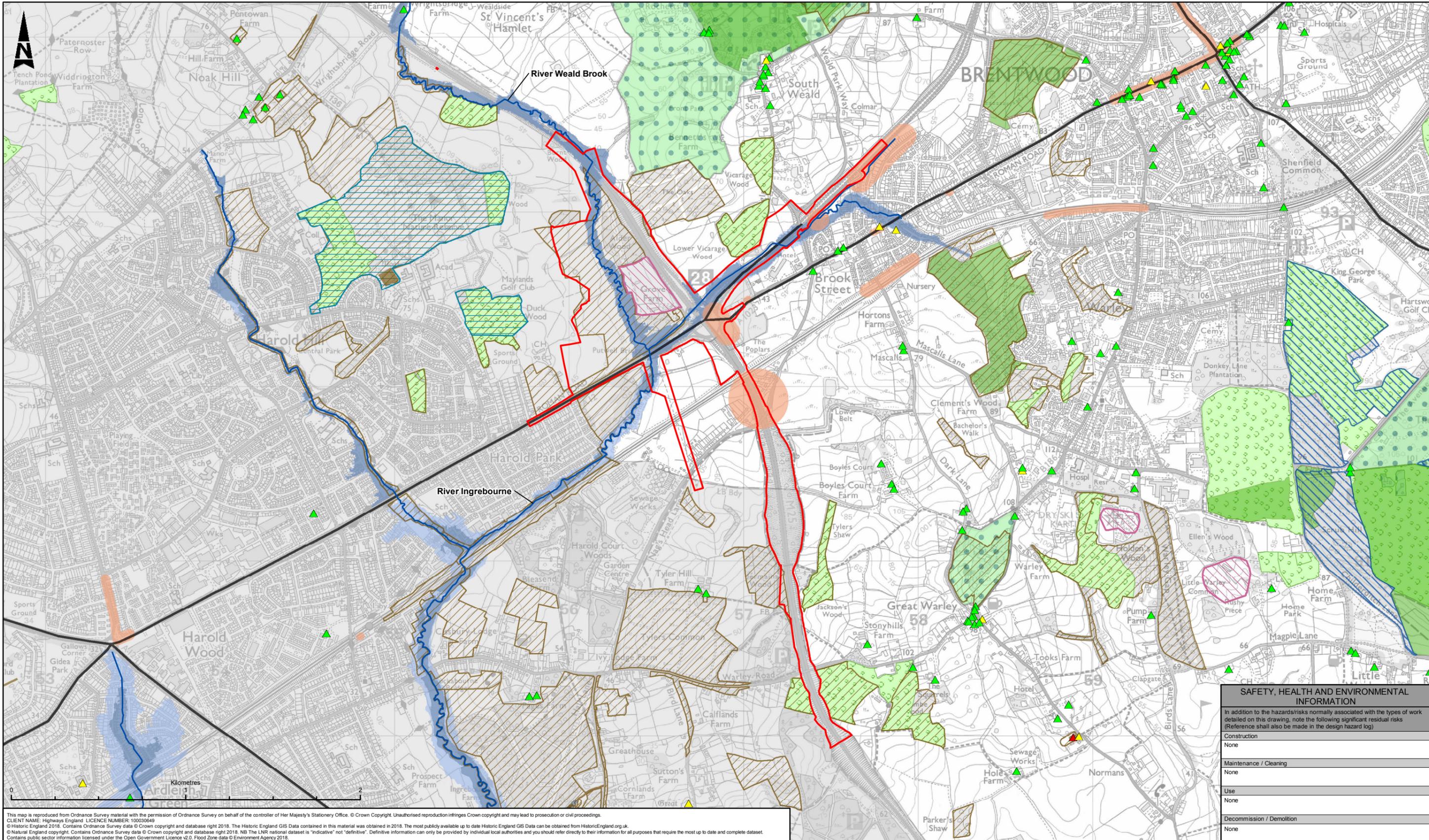
13. Environmental Definitions

Acronyms and Abbreviations	Description
AQMA	Air Quality Management Area
ASNW	Ancient Semi-Natural Woodland
CD&E	Construction, Demolition and Excavation
CEMP	Construction Environmental Management Plan
CTRL	Channel Tunnel Rail Link
dB	Decibel
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges
EIA	Environmental Impact Assessment
ES	Environmental Statement
FRA	Flood Risk Assessment
LGS	Local Geological Site
LWS	Local Wildlife Site
NIA	Noise Important Area
NMU	Non-Motorised User
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen Oxide
PEIR	Preliminary Environmental Information Report
PM ₁₀	Particulate Matter with a diameter of 10 micrometres or less
PRoW	Public Right of Way
SMI	Site of Metropolitan Importance
SOAEL	Significant observed adverse effect level
SPZ	Source Protection Zones
SSSI	Site of Special Scientific Interest
WFD	Water Framework Directive
Terms	Description
Air Quality Management Area	An area identified where the National Air Quality Objectives are not likely to be achieved. The Local Authority is required to produce a Local Air Quality Action Plan to plan how air quality in the area is to be improved.
Air Quality Objectives	The national air quality objectives are set by the UK Government for the protection of people's health. There are both long-term objectives (measured as an annual average) and short-term objectives (measured over an hour or a day), depending on the length of exposure to the pollutant.

Acronyms and Abbreviations	Description
DEFRA	DEFRA is the government department responsible for environmental protection, food production and standards, agriculture, fisheries and rural communities in the United Kingdom of Great Britain and Northern Ireland. Defra is a ministerial department, supported by 33 agencies and public bodies.
Local Geological Site	Are non-statutory sites that have been identified by local geo conservation groups as being of importance.
Local Wildlife Site	Local wildlife sites are non-statutory designated sites, given protection through policies in the Local Development Plan.
Non-Motorised User	Cyclists, pedestrians (including wheelchair users), and equestrians using the public highway.
Noise Important Area	Areas where the 1% of the population that are affected by the highest noise levels from major roads are located according to the results of Defra's strategic noise maps.
Priority Species	Species of Principal Importance for the Conservation of Biological Diversity on the England Biodiversity List are notified under Section 41 of the NERC Act 2006.
Public Right of Way	A way over which the public have a right to pass and repass. The route may be used on foot, on (or leading) a horse, on a pedal cycle or with a motor vehicle, depending on its status. Although the land may be owned by a private individual, the public may still gain access across that land along a specific route. Public rights of way are all highways in law.
Scheduled monument	A 'nationally important' archaeological site or historic building, given protection against unauthorised change and included in the Schedule of Monuments kept by the Secretary of State for Culture, Media and Sport. The protection given to scheduled monuments is given under the Ancient Monuments and Archaeological Areas Act 1979.
The scheme	Regional Investment Programme M25 Junction 28 Improvements
Site of Special Scientific Interest	A conservation designation denoting to a protected area in the United Kingdom. The Sites are protected by law to conserve their wildlife or geology. Protected under the Wildlife and Countryside Act 1981 (as amended) and The Countryside and Rights of Way Act 2000.
Source Protection Zone	Areas of land around over 2000 groundwater sources such as wells, boreholes and springs used for public drinking water supply. The zones show the risk of contamination from any activities that might cause pollution in the area. The closer the activity, the greater the risk. There are three main zones (inner, outer and total catchment) and a fourth zone of special interest, which is occasionally applied to a groundwater source. The zones are used in conjunction with the Groundwater Protection Policy to set up pollution prevention measures in areas which are at a higher risk, and to monitor the activities of potential polluters nearby.
Vulnerability	The quality or state of being exposed to the possibility of being attacked or harmed, either physically or emotionally.
Water Framework Directive	The Water Framework Directive (2000/60/EC) is a EU directive which aims to achieve good status of all water bodies (surface waters, groundwaters and the sites that depend on them, estuaries and near-shore coastal waters) and the prevent any deterioration. It has introduced a comprehensive river basin management planning system to

Acronyms and Abbreviations	Description
	protect and improve the ecological quality of the water environment. It is underpinned by the use of environmental standards.

Appendix A. Environmental Constraints Plan



This map is reproduced from Ordnance Survey material with the permission of Ordnance Survey on behalf of the controller of Her Majesty's Stationery Office. © Crown Copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings.
 CLIENT NAME: Highways England LICENCE NUMBER: 100030649
 © Historic England 2018. Contains Ordnance Survey data © Crown copyright and database right 2018. The Historic England GIS Data contained in this material was obtained in 2018. The most publicly available up to date Historic England GIS Data can be obtained from HistoricEngland.org.uk.
 © Natural England copyright. Contains Ordnance Survey data © Crown copyright and database right 2018. NB The LNR national dataset is "indicative" not "definitive". Definitive information can only be provided by individual local authorities and you should refer directly to their information for all purposes that require the most up to date and complete dataset.
 Contains public sector information licensed under the Open Government Licence v2.0. Flood Zone data © Environment Agency 2018.

LEGEND	
	Scheme Boundary
	Sites of Special Scientific Interest (SSSI)
	Scheduled Monuments
	Ancient Woodland
	Historic Landfill Sites
	Registered Parks and Gardens
	Local Nature Reserves (LNR)
	Local Wildlife Sites (LWS)
	Country Parks
	Noise Important Areas
	Air Quality Management Areas
	Flood Zone 3
	Flood Zone 2
	River Network
	Pollution Climate Mapping (PCM) Links
	Listed Buildings Grade I
	Listed Buildings Grade II*
	Listed Buildings Grade II

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction	None
Maintenance / Cleaning	None
Use	None
Decommission / Demolition	None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	P02	SD	AR	VA	PG	12/11/18

FOR INFORMATION

ATKINS
Member of the SNC-Lavalin Group

Epsom Gateway
Ashley Avenue
Epsom
Surrey
KT18 5AL

Tel: +44 (0) 1372 726140
Fax: +44 (0) 1372 740055
www.atkinsglobal.com

Copyright © Atkins Limited (2017)

highways england

Project Title	ROAD IMPROVEMENT PROGRAMME M25 Junction 28	
Drawing Title	FIGURE A-3 ENVIRONMENTAL CONSTRAINTS	
Drawing Number	Project	Originator
	HE551519 - ATK - EGN	XX - GS - GI - 000001
Original Size: A3	Scale: 1:20,000	Project Ref. No: ---
Sheet: 1 of 1	Rev: P02	

© Crown copyright (2018).

You may re-use this information (not including logos) free of charge in any format or medium, under the terms of the Open Government Licence. To view this licence:

visit www.nationalarchives.gov.uk/doc/open-government-licence/

write to the Information Policy Team, **The National Archives, Kew, London TW9 4DU**,
or email psi@nationalarchives.gsi.gov.uk.

Printed on paper from well-managed forests and other controlled sources.

Registered office Bridge House, 1 Walnut Tree Close, Guilford GU1 4LZ
Highways England Company Limited registered in England and Wales number 09346363