A12 Chelmsford to A120 Widening scheme

ENVIRONMENTAL SCOPING REPORT

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Contents

1. Introduction

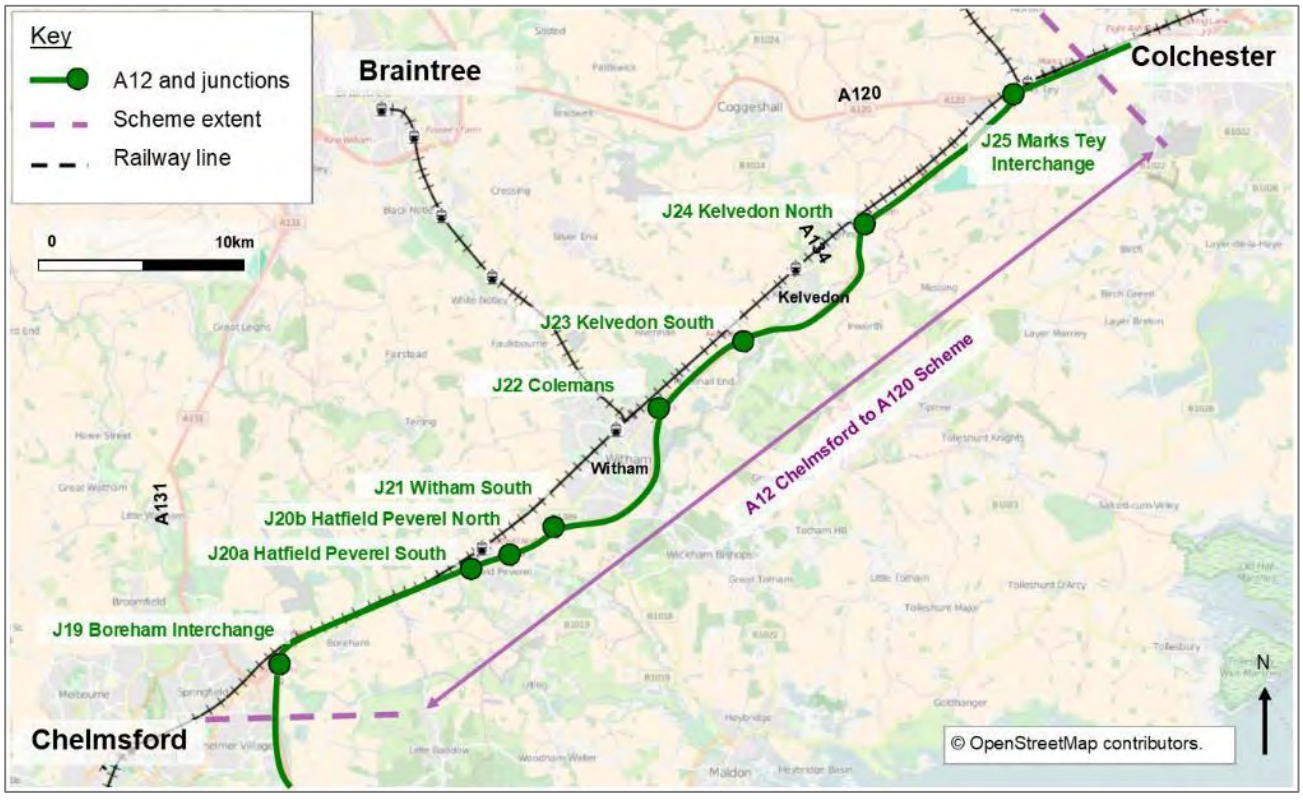
1.1 Overview of the project

1.1.1 The A12 Chelmsford to A120 Widening Scheme (the 'Proposed Scheme') comprises improvements to the A12 between junction 19 (Boreham) and junction 25 (Marks Tey), a distance of approximately 24km, or 15 miles (inset 1.1). The Proposed Scheme involves widening the A12 to three lanes throughout with a bypass between junctions 22 and 23 and a second between junctions 24 and 25. It also includes safety improvements, including closing off existing at grade accesses, and reducing access to cyclists along the dual carriageway by providing an alternative route for walkers, cyclists and horse riders (WCH).

1.1.2 The Proposed Scheme would involve construction of a highway which is wholly in England, where Highways England is the highway authority and the speed limit for any class of vehicle is expected to be 50 miles per hour or greater and would have a footprint greater than 12.5ha. The Proposed Scheme is therefore classed as a Nationally Significant Infrastructure Project (NSIP) under the Planning Act (2008), triggering the need to apply for a Development Consent Order (DCO).

1.1.3 The Proposed Scheme falls under the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the 'EIA Regulations'). It falls under Schedule 2, Section 10f, infrastructure projects, construction of roads unless included in Schedule 1. The selection criteria in Schedule 3 of the EIA Regulations have been used to screen the Proposed Scheme and identified the potential for significant effects. The Proposed Scheme therefore requires a statutory EIA to support the DCO application.

Inset 1.1: Location plan



1.2 Purpose of this report

1.2.1 This report is the Environmental Scoping Report for the Proposed Scheme. It has been prepared in line with guidance on EIA Scoping provided in the Planning Inspectorate's Advice Note Seven Environmental Impact Assessment: Preliminary Environmental Information, Screening and Scoping (June, 2020).

1.2.2 The Environmental Scoping Report has been produced to document the proposed scope of the EIA, including a description of the aspects which will be considered within the Environmental Statement. The Environmental Scoping Report sets out the environmental features and constraints that have been identified from a desk-based study and preliminary field surveys and provides a description of the potential impacts that could arise from the Proposed Scheme. The outcomes of the scoping assessment have been used to reach a reasoned conclusion on the likely significant effects of constructing and operating the Proposed Scheme on the environment, and provide justification, supported by evidence, for scoping aspects and matters in or out of further EIA.

1.2.3 The environmental aspects covered include those within the EIA Regulations and the Design Manual for Roads and Bridges (DMRB). The structure of the report is set out in table 1.1. This report has been prepared in accordance with Section 10 of the EIA Regulations. It is submitted on behalf of Highways England to request a scoping opinion for the Proposed Scheme.

Table 1.1: Structure of the Environmental Scoping Report

Chapter	Contents
1. Introduction	Provides an overview of the Proposed Scheme and the purpose of this report.
2. The project	Provides a statement on the need for the scheme, sets out the scheme objectives, and provides a description of the scheme location and design.
3. Assessment of alternatives	Provides a summary of the development of the Proposed Scheme and the various options considered during the design process. Also includes consideration of how the environmental assessment has influenced the option selection process.
4. Consultation	Provides a summary of consultation undertaken to date and consultation strategy going forward.
5. Environmental assessment methodology	Provides an overview of the environmental assessment methodology, including significance criteria and surveys and predictive techniques.
6-15. Aspect chapters	There is a chapter for each environmental aspect. Each sets out the baseline environment including the study area used and the value of existing receptors within the study area. Each chapter also describes the potential impacts, likely significant effects, and proposed assessment methodology.
16. Assessment of cumulative effects	Provides a summary of how the cumulative effects assessment will be undertaken.
17. Summary of assessment scope	Summarises the aspects and matters that will be scoped in and out of the EIA.
Acronyms, glossary, references	Description of acronyms, definitions of technical terms, and a reference list of document sources.
Appendices	Figures and supporting information are provided in the appendices.

2. The project

2.1 Need for the project

2.1.1 The A12 is an important economic link in Essex and across the east of England. It provides the main south west/north east route through Essex and Suffolk, connecting Ipswich to London and to the M25.

2.1.2 The section between Chelmsford and Colchester (junction 19 Boreham interchange to junction 25 Marks Tey interchange) carries high volumes of traffic, with up to 90,000 vehicles every day. Heavy goods vehicles are between 9% and 12% of the traffic on this section due to its important freight connection, especially to Felixstowe and Harwich ports. This section of the A12 is also an important commuter route between Chelmsford and Colchester. The resulting congestion leads to delays and means that, during the morning commute, a driver's average speed can be particularly slow in both directions for an A-road.

2.1.3 Previous studies, including the East of England Route Strategy (Highways England, 2017), the A12 / A120 Route Based Strategy (Highways Agency, 2013) and the Essex Local Transport Plan (LTP3), indicate several problems between junction 19 and junction 25 of the A12. The key problems and issues from these studies are documented in an Options Assessment Report (OAR) (Jacobs, 2016) and summarised in table 2.1. The OAR can be viewed at the following website: https://highwaysengland.citizenspace.com/he/a12-chelmsford-to-a120-widening-scheme/.

Table 2.1: Current issues along the A12

Strategic issue	Locations
Traffic flows and congestion	Congestion is experienced routinely on all links along the length of the A12. The busiest link is between J20b and J21 and is linked to the commuter route between Braintree and Maldon. These routes put pressure on traffic through Witham at J21 and affect the performance of the A12 between Boreham and Marks Tey.
Consistency in standard	The A12 has been improved in a piecemeal way which has resulted in a route with little consistency in terms of provision. It varies between dual 2-lane and dual 3-lane all-purpose carriageways and has numerous variations of junction types, surfacing, geometry, access, asset condition, lighting and lay-by provision. There is also limited technology along the whole route.
Resilience	There are limited suitable diversion routes for the A12, which makes the route vulnerable to incidents and can cause significant disruption over a wide area. The lack of diversion routes also makes it more difficult to undertake maintenance to the route.
Safety	There were approximately 132 collisions in the section of A12 between J19 and J25 between 2015 and 2017. The section of A12 analysed has a Fatal Weighted Index casualty rate above the national average, with J18-J19 and J22-J23 being of most note. The A12 also has a killed and seriously injured percentage above the national average. Motorcyclists and pedestrians have been identified as 'vulnerable' road user groups; however, this is based on low numbers and as such are more vulnerable to fluctuation. There are elements of substandard geometry, including the slip roads and visibility at junctions and bends where the horizontal radii are below the desirable minima. There are also several at-grade accesses to residential, commercial and agricultural properties, particularly the section between J24 and J25.

Strategic issue	Locations
Walkers, cyclists and horse riders and public transport provision	As the A12 becomes busier, there is an aspiration to move walkers, cyclists and horse riders (WCH) and bus stops onto safer alternative routes. There are also severance issues regarding existing rights of way that were truncated during the construction of the current A12 alignment.

2.1.4 The Proposed Scheme was included within the first Roads Investment Strategy (RIS) as one of the projects to be delivered in Road Period 1 between 2015 and 2020. The RIS1 investment strategy identified a phased approach to major improvement works to the A12 corridor. The Proposed Scheme was identified as phase 1 of a programme of major upgrades to the A12. It was described as 'widening the A12 to three lanes between junction 19 (north of Chelmsford) and junction 25 (A120 interchange)' and was allocated funding within RIS1.

2.1.5 In 2017 Highways England was asked to consider alternative options that sought to avoid the proposed Colchester Braintree Borders Garden Community (CBBGC) between junctions 24 (Kelvedon North) and 25 (Marks Tey). CBBGC (also referred to as the Marks Tey Garden Community) was one of three garden communities being proposed within Essex, included in the North Essex Authorities[1] emerging Local Plan. There was a commitment to 2,500 homes within the local plan period (as part of an overall total of between 15,000 – 24,000 homes). Alternative alignments for the Proposed Scheme were considered between junctions 24 and 25 to account for the potential footprint of this development. Although the CBBGC has now been removed from the emerging local plan (see chapter 3, assessment of alternatives, for more details), the extended options stage means that the Proposed Scheme would now be constructed within Road Period 2 between 2020 and 2025. The scheme is a committed scheme in Road Investment Strategy 2: 2020-2025.

2.1.6 Excluding the CBBGC, there are over 40,000 dwellings and 20,000 jobs planned within the region over the coming years (Tempro Version 7.2). In addition, the investment in the Haven Ports is likely to increase heavy vehicles along the route. An increase in overall traffic volume by 37% during peak periods is expected on the A12 by 2038 (do minimum versus base scenario). Further details can be found within the OAR (Jacobs, 2016).

2.2 Project objectives

2.2.1 The overall aim of the Proposed Scheme is to solve strategic traffic problems and congestion, and associated safety issues, along the strategic road network (SRN) between junctions 19 (Boreham) and 25 (Marks Tey).

[1] The North Essex Authorities consist of the Braintree, Colchester, and Tendring local authorities.

2.2.2 Scheme specific objectives have been used to develop the preferred option for the Proposed Scheme (table 2.2). The environmental objectives were developed based on the commitments within the Highways England Licence to reduce the environmental impacts of operating, maintaining and improving its network; protecting and enhancing the environment to achieve the best practicable environmental outcomes across its activities; and seeking to improve the well-being of road users and communities affected by the network.

Table 2.2: Scheme specific objectives

RIS objective	Scheme specific objective
Supporting economic growth	a) Support the growth identified in Local Plans by reducing congestion related delay, and improve journey time reliability and increase the overall transport capacity of the A12
	b) Promote specific traffic flow across the highway network
	c) Deliver infrastructure that advances and supports emerging strategic plans for housing, business investment and development
A safe and serviceable network	a) Improve road user safety
	b) Improve road worker safety
A more free flowing network	a) Increase the resilience of the transport network to cope with incidents including collisions, breakdowns, maintenance and extreme weather
	b) Fully understand the impacts of other schemes and recognise other RIS schemes
An improved environment	a) Improve the environmental impact of transport on communities along the existing A12 corridor
	b) Reduce the impact of new infrastructure on the natural and built environment
A more accessible and integrated network	a) Provide a safe walkers, cyclist and horse riders route between communities and seek to address severance
	b) Improve safe and effective access for public transport users
Customer satisfaction	a) Improve customer satisfaction
	b) Improve scheme profile
	c) Meet corporate key performance indicators

2.3 Project location

2.3.1 A location plan (figure 1.1) is included in Appendix A. Key environmental constraints are included for each environmental aspect in respective constraints plans in Appendix A.

2.3.2 The Proposed Scheme lies within Essex, passing through mainly the Braintree and Colchester administrative areas, as well as the Chelmsford and Maldon administrative areas. Chelmsford is located to the south-west of the Proposed Scheme and Colchester to the north-east. The A12 lies adjacent to the smaller settlements of Boreham, Hatfield Peverel, Witham, Rivenhall End, Kelvedon, Feering and Marks Tey. There are also individual business and residential properties which front directly onto the A12.

2.3.3 The A12 runs in parallel and to the south of the Great Eastern Main Line (GEML) railway for most of its length between junctions 19 and 25. Major connecting roads include the A130 which joins the A12 at junction 19 (Boreham) and the A120 which joins the A12 at junction 25 (Marks Tey). The B1018 and the B1019 link Maldon to Witham and Hatfield Peverel respectively. The B1023 links Kelvedon and Tiptree.

2.3.4 Existing vegetation includes highway vegetation, the pattern of small woodland blocks and copses scattered throughout the wider surrounding landscape, hedgerow boundaries, well treed watercourses, and the woodland and locally distinctive plantations along the River Blackwater.

2.3.5 The network of ditches and streams, water bodies and rivers (including the River Blackwater, River Ter and Domsey Brook) are key distinctive features of this flat and low-lying landscape. The sinuous routes of the rivers and smaller waterways influence field pattern, provide a strong sense of place and offer continuity throughout the landscape.

2.3.6 Key environmental designations and features along the route include the Blackwater Valley Landscape Character Area; Whetmead Local Nature Reserve (LNR) to the east of the A12 at Witham; Boreham House and Braxted Park Registered Parks and Gardens at junction 19 (Boreham) and Rivenhall respectively; Rivenhall Long Mortuary Enclosure Scheduled Monument, located south of Rivenhall End; and a geological Site of Special Scientific Interest (SSSI) to the north of junction 25 (Marks Tey).

2.3.7 There are several noise important areas (NIA) along the route, including at Boreham, Hatfield Peverel, Witham, Rivenhall End, junction 24 (Kelvedon North) and Marks Tey. There is also a large minerals proposal site identified by Essex County Council, with an active quarry at Colemans Farm, within the river valley at Rivenhall End.

2.3.8 There are several development proposals within the study area that have been considered during the project development. A full list of committed development will be produced for the cumulative effects assessment, as set out in chapter 16. The key strategic developments include:

- Beaulieu Park development – this is a large development with planning permission to the north of junction 19. It includes 3,000 new homes, a 45,000m^2 office business park, a secondary school, two primary schools, four nurseries and a neighbourhood centre. It is currently being constructed and includes proposals to improve junction 19. Highways England is working with the developer to understand how the developer's proposals tie in with the Proposed Scheme. There is also planning permission approved for construction of a new railway station to serve the proposed Greater Beaulieu Park development.
- Chelmsford North East Bypass (CNEB) – this is a new road scheme that Essex County Council is promoting. The route links with junction 19 (Boreham) and is orientated north to join the A131 at Deres Bridge. The scheme has secured funding from the Government's Housing Infrastructure Fund, as well as the South East Local Enterprise Partnership, and intends to submit a planning application in 2021. The A12 designs at junction 19 (Boreham) allow for passive provision of the CNEB to be constructed in the future to reduce disruption to the A12 corridor.

- A120 Scheme between Braintree and the A12 – Essex County Council (ECC) conducted an option appraisal for the A120 indicating that the A120 would connect to the A12 at junction 23. The ECC option appraisal is currently being reviewed by Highways England who will progress the project. The A120 Scheme is currently included in the pipeline for Road Period 3 to be delivered between 2025-2030. This means proposals will be developed during RIS2 so that they could enter construction in RIS3, however, funding for construction of these schemes has not yet been committed.

2.3.9 At PCF Stage 2 the CBBGC was considered as a major future development along the A12 corridor, and options were developed to accommodate this (see chapter 3, assessment of alternatives). As the CBBGC was not taken forward in the North Essex Authorities Local Plan, it is no longer being considered as a future development.

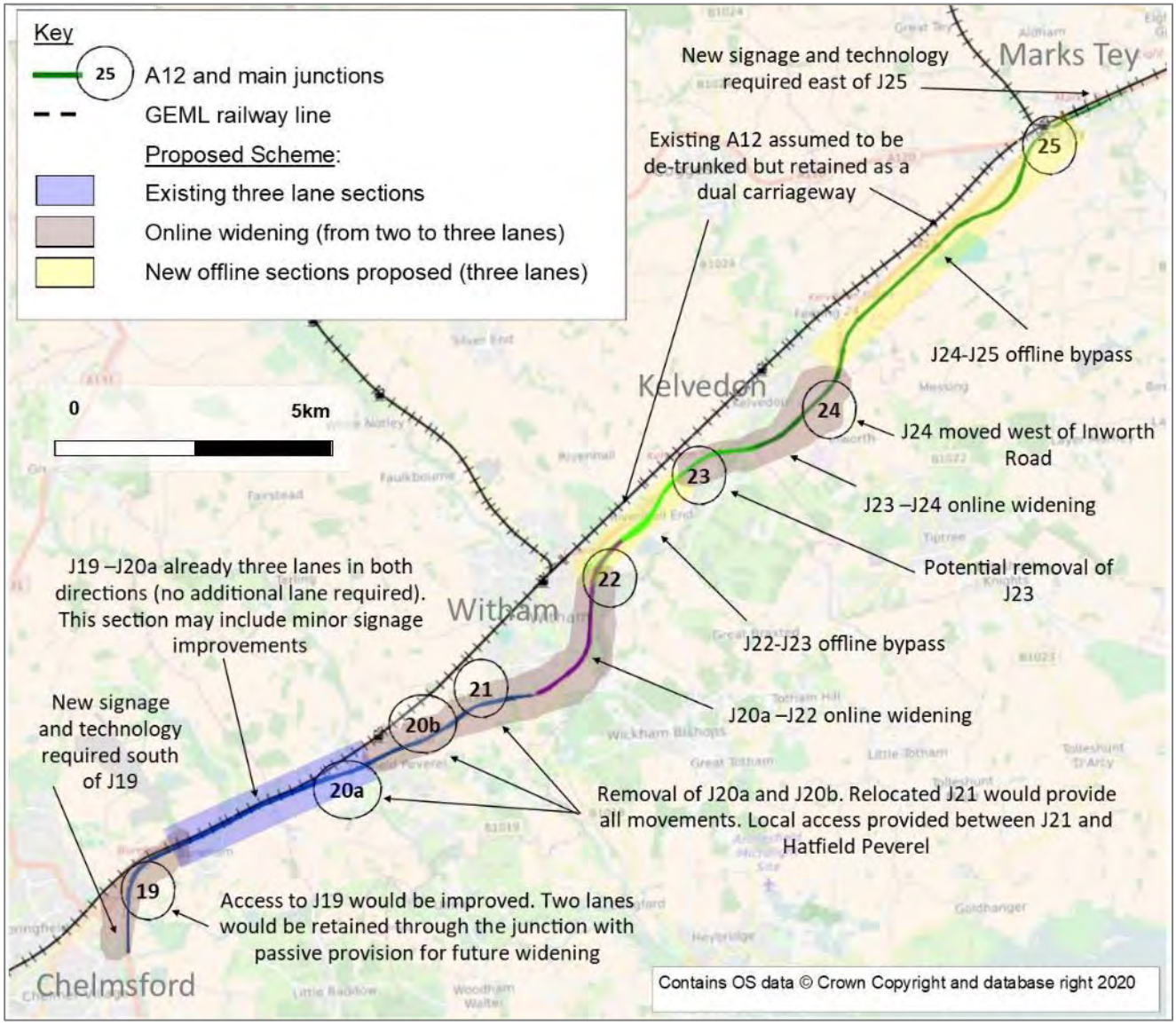
2.4 Project description

Highway alignment

2.4.1 The existing A12 between junctions 19 and 25 is 24km in length and is predominantly a dual two-lane carriageway, with a limited length of dual three-lane carriageway between junction 19 (Boreham) and 20a (Hatfield Peverel South). There are a number of at grade accesses, particularly between junction 22 (Witham North) and 23 (Kelvedon South) and junctions 24 (Kelvedon North) and 25 (Marks Tey).

2.4.2 The Proposed Scheme involves widening the existing A12 to three lanes throughout in each direction (inset 2.1). This would involve online widening in the main, with offline bypasses created between junctions 22 and 23 (Rivenhall End Bypass) and 24 and 25 (Kelvedon to Marks Tey). This would be accompanied by junction improvements (junctions 19 and 25), construction of new all movement junctions (junctions 21, 22, and 24), and removal of existing junctions (junctions 20a, 20b, and 23).

Inset 2.1: Overview of Proposed Scheme design



2.4.3 Table 2.3 describes the alignment for each section of the Proposed Scheme. The scheme alignment and provisional order limits are shown on figure 1.1 (Appendix A). The order limits include permanent land take required for the Proposed Scheme (including environmental mitigation) and temporary land take required for construction, including construction compounds, temporary works, statutory undertaker diversions, local road mitigation, material storage, haul routes, and potential borrow pit areas.

Table 2.3: Description of Proposed Scheme alignment

Section of the A12	Alignment description
Junction 19 to 21	Junction 19 (Boreham) would be upgraded to improve the performance of the A12 and to tie in with the Beaulieu Park road improvements. The scheme boundary extends to the south of junction 19 to allow for temporary traffic management and ancillary works in the verges, e.g. new signage, associated with the junction 19 improvements. The section between junction 19 and 20a (Hatfield Peverel South) is already three lanes. Therefore, improvements to this section would consist of improvements to ancillary infrastructure (such as signage and technology) only. The existing two lane A12 section through Hatfield Peverel would be widened to accommodate an additional lane on both sides. This would require widening of all three road bridges over the A12 (Bury Lane bridge, Station Road Bridge, and Wellington Bridge). Junction 20a and junction 20b (Hatfield Peverel North) would both be closed and replaced by a new junction 21 (Witham South) to the east of Hatfield Peverel, with a local access road back to Hatfield Peverel to provide a two way connection between Hatfield Peverel, the new junction 21, and Witham. This would also have a dedicated WCH route.
Junction 21 to 22	The existing A12 would be widened to three lanes in both directions through the new junction 21 up to junction 22 (Coleman's Interchange). Junction 22 would be replaced to provide an all movements dumbbell roundabout to the south-east of the existing junction.
Junction 22 to 23	A new three lane in each direction carriageway would be created between junctions 22 and 23 to effectively bypass Rivenhall End and the direct accesses along the existing A12. This would run parallel to the existing A12 but offset approximately 200m to the south up until Braxted Road (south of Rivenhall End). East of Braxted Road the carriageway would re-join the A12, with construction slightly off-set to the north of the existing road, before continuing on beyond the existing junction 23. The existing A12 would be de-trunked and used as a local access road where the new offline sections of road are constructed.
Junction 23 to 24	Junction 23 (Kelvedon South) would be removed with access to Kelvedon from Witham being provided by a local access road. The existing A12 would be widened to provide three lanes in both directions around Kelvedon, up to a new junction 24. The new junction 24 would be provided to the west of Inworth Road with an all movements dumb-bell layout and a link to Inworth Road from the southern roundabout.
Junction 24 to 25	A new three lane in each direction carriageway would be created between junctions 24 and 25 to bypass local accesses along the existing A12. This would run parallel to the existing A12 to the south. The existing A12 would be de-trunked and used as a local access road where the new offline route is constructed. The bypass would tie into the existing A12 just to the south of the existing junction 25 (Marks Tey). Junction 25 would be improved and would provide access to the de-trunked A12. The scheme boundary extends to the north of junction 25 to allow for temporary traffic management and ancillary works in the verges e.g. new signage, associated with the junction 25 improvements.

Structures

2.4.4 Throughout the length of the Proposed Scheme, structures such as bridges, overpasses, and underpasses would need to be improved or widened to accommodate the proposed alignment of the A12. In some cases, these improvements could be undertaken online. In other cases, a new structure may need to be constructed adjacent to the existing structure, which would then be demolished once the new structure is complete. At this stage, the assessment of options is still underway to establish the best solution for each structure.

2.4.5 New structures would also be required where proposed offline sections of the A12 cross existing roads, water courses, and WCH routes.

2.4.6 The design solutions for the new and existing structures is ongoing. Table 2.4 provides an indicative summary of the types of structure that will be included in the Proposed Scheme design.

Table 2.4: Indicative types of structures along the Proposed Scheme

Structure type	No. improved structures	No. new structures
Rail bridge	0	0
Road overbridge	0	12
Road underbridge	4	2
Watercourse bridge	3	1
Viaduct	0	0
Underpass	2	0
Footbridge	0	7

Access to the A12

2.4.7 There would be no direct access onto the new A12 corridor other than at the numbered junctions. The Proposed Scheme may sever existing accesses to property. Alternative access would be provided to these properties in discussion with the landowners and other relevant stakeholders (Essex Highways Authority).

Walkers, cyclists and horse riders

2.4.8 WCHs would be prohibited from using some sections of the new A12. The Proposed Scheme would include improvements to facilities on routes away from the A12 to improve the suitability of these routes for WCH to use safely in preference to the A12. This is likely to include the B1137 through Boreham and Hatfield Peverel and the B1024 along Kelvedon High Street. The proposals for WCH will be developed further as the design progresses, but it is likely to include features such as improved crossing facilities and shared use facilities.

2.4.9 All crossings over the A12 would be grade separated with minimal diversion of WCH facility. Severance created by enlarged grade separated junction improvements would be mitigated to provide improvements by provision of local facilities to enable users to access facilities on the correct side of the alignment.

Watercourse crossings

2.4.10 The Proposed Scheme would require new crossings of watercourses and potential improvements to existing culvert and bridge crossings. This includes twenty proposed new culvert structures, and improvements to ten existing culvert structures and two existing bridges. Designs would take into account climate change considerations as appropriate and a flood risk assessment is being prepared to inform requirements.

Drainage design

2.4.11 The Proposed Scheme would result in an additional paved area of approximately 90ha, which would require additional attenuation storage to reduce the risk of flooding. Attenuation ponds would be used and these would be located outside of the floodplain to avoid the requirement for additional flood compensation storage, although there may be a need for online storage in pipes at certain constrained locations. Runoff rates would be restricted to existing site condition runoff rates for online road widening, or greenfield runoff rates for new offline road sections.

Lighting

2.4.12 The existing A12 is partially lit with high intensity discharge lamps. All the existing sections of the A12 mainline and junctions that are currently lit would remain lit. All new and improved junctions would be lit. The lighting design is still to be developed, however, it is assumed that modern lighting would be used such as use of efficient full cut-off lighting technology and light emitting diodes.

Technology

2.4.13 Standard technology for an all-purpose trunk road is proposed. This is likely to include additional signage and gantries, particularly on the approaches to junctions. This would assist in identifying incidents and queues, such as on the approaches to junctions.

De-trunked A12 sections

2.4.14 The existing A12 would be de-trunked where the offline improvements are provided. De-trunking is part of Highways England's responsibility and the details need to be agreed with the Local Highways Authority (ECC). Highways England have started engagement with ECC to establish a de-trunking Strategy. For the purposes of the Environmental Scoping Report it is assumed that the existing A12 would be retained as a dual carriageway with a national speed limit.

Utilities

2.4.15 The Proposed Scheme would affect several statutory undertakers (such as power, gas and water suppliers) and would require the diversion or protection of their services and apparatus. This work would be required for both the temporary and permanent works.

2.4.16 There are high pressure, intermediate and medium pressure gas mains (near junction 19 and junction 22) and high voltage power lines (near Boreham and Easthorpe) that would be affected. It is assumed that the environmental assessment associated with these would be done by the third parties but would be considered as part of the cumulative effects assessment within the EIA where relevant.

Environmental design

2.4.17 The scheme design is an iterative process which considers the key potential significant effects on environmental receptors. Environmental considerations that have influenced the option development and selection process are set out in chapter 3, assessment of alternatives. The ongoing design development will continue to be influenced by the EIA process.

2.4.18 Environmental mitigation can be incorporated within the highways design, where appropriate, to mitigate environmental effects from the Proposed Scheme. Examples of this include noise barriers and bunds to mitigate noise level increases from road traffic, drainage features, and landscape planting to screen visual effects. More detail on aspect specific mitigation is provided in chapters 6-15 of this Environmental Scoping Report. Mitigation measures will continue to be developed throughout the design development, informed by the EIA.

2.5 Construction

Construction programme and phasing

2.5.1 It is currently assumed that the Proposed Scheme would be constructed as a single project. To help mitigate the extent of simultaneous online roadworks across the whole scheme (junctions 19 to 25), the envisaged programme would start with the predominantly online works between junction 19 and junction 21, which would likely take approximately 2-3 years to construct.

2.5.2 Whilst the section of work between junction 19 and 21 is taking place, the offline (by-pass) works between junction 22 and 23 (Rivenhall End by-pass) and junction 24 and 25 (Kelvedon to Marks Tey) are envisaged to be constructed. This progresses the major earthworks and offline pavement construction. The offline sections of new junctions will also be constructed simultaneously with the bypasses. The new bypasses are likely to take approximately 1.5 to 2 years to construct.

2.5.3 The online widening of the existing Witham bypass (junction 21 to 22) and Kelvedon bypass (junction 23 to 24) are envisaged to take place later in the programme, as the extent of junction 19 to 21 works reduce. The construction of the online bypass widening is likely to take approximately 1 to 1.5 years.

2.5.4 Construction of these bypasses and offline junction works then helps to facilitate diversions of mainline traffic onto the new carriageway and enable work to tie into the existing bypasses and online junction works to progress with less disruption to traffic. The construction of the online junction elements and tie-ins is likely to take approximately 1 year.

2.5.5 The whole scheme could take approximately 4 years to construct, with an assumed opening year of 2027. However, this will be reviewed as the scheme detailed design is refined and a construction programme developed.

2.5.6 Works required to enable construction include environmental, ecological, and archaeological works to ensure areas are clear for construction. The protection or diversion of existing utility services is also required. Demolition of existing structures is required where they are deemed unsuitable to retain or modify and are replaced by new structures. Temporary arrangements and safe construction site crossing points for maintaining existing WCH access will also be addressed.

Compounds and haul roads

2.5.7 A scheme of this size requires a main temporary site compound and also several smaller satellite compounds at strategic work locations along the route. The location for the main site compound is likely to be between junction 22 and 23. Satellite compounds would be envisaged at junctions 19, 21, 24 and 25. Small temporary office and laydown areas would be required at bridge locations.

2.5.8 To reduce the amount of construction traffic using the existing road network, the provision of offline haul routes, particularly between junctions 21 and 25 and accessing the selected borrow pits, is required. Where practicable, these are likely to be routed along the existing mainline route, however, where this is not practicable, additional temporary land use may be required.

2.5.9 Construction traffic that is required to use the existing road network would use the SRN, as far as is reasonably practicable.

Traffic management

2.5.10 It is assumed that the existing A12 would be kept open during construction of the Proposed Scheme. However, where construction activities such as existing online bridge demolition or online bridge construction (for example, bridge deck beam installation) prohibits safe road operation, road closures may be required at night / weekend / bank holidays to minimise disruption, which could potentially create light and noise disturbance. Widening of online sections of the A12 would require temporary traffic management measures during construction, such as narrow lanes, lane closures, contraflow and tidal flow. The two bypasses would be constructed offline, minimising the disruption to traffic flows along the existing A12 in these areas.

Plant and equipment

2.5.11 Construction activities would involve the use of heavy plant items with the potential to emit high levels of noise and vibration and contribute to pollution, e.g. excavators, dumper trucks, dozers and compaction equipment. Noisy activities also include demolition of existing features and piling for structures.

2.5.12 To mitigate the impacts associated with construction plant and equipment, the following measures would be undertaken, as necessary during the implementation/construction phase of the works:

- Programming works, where practicable, so that the requirement for working outside normal working hours is minimised.
- All machinery used on site would be maintained according to manufacturers' instructions. Engines must be switched off during periods of prolonged inactivity.
- Selection of low noise/vibration methods and equipment and use of hoods/shrouds/mufflers/rubber lining to minimise plant noise and vibration, where practicable.
- Where practicable, keep noisy plant and vibration generating activities away from sensitive receptors, position plant to face away from receptors, and adopt working hours which avoid sensitive times of the day.
- Where practicable, works that result in elevated noise levels would be confined to the hours between 8am and 6pm with no weekend working.

Earthworks

2.5.13 Large amounts of fill material would be required for construction, particularly for junctions and the offline sections at Rivenhall End and Marks Tey. A proportion of this material may be generated from the construction works at the existing junctions, and if suitable, would be used within other sections of the construction works to minimise importing material. However, there is still a large shortfall of material, estimated at over 2,000,000m^3.

2.5.14 Options have been assessed for import of bulk material or the use of on-site borrow pits to source the required material. The preferred option is to use on-site borrow pits which would reduce potential impacts associated with transport of imported fill. Ground investigations are ongoing at 11 potential borrow pit sites, all located within the provisional order limits illustrated on figure 1.1, to identify a short-list of sites for further assessment, including potential restoration options. There may also be an opportunity to source material from the active quarry at Colemans Farm, through which the Proposed Scheme alignment is currently routed.

Dewatering

2.5.15 Dewatering could occur as a result of the Proposed Scheme and have a negative impact on groundwater and groundwater quality. However, further assessment will be undertaken to identify the impacts of dewatering activities. Ground investigations are also being undertaken to assess the risk of contaminated land impacting on groundwater and any need for protective measures.

Carbon management

2.5.16 In order to deliver Highways England's aspirations with respect to the minimisation of carbon emissions and the efficient use of resources, the carbon intensity of the Proposed Scheme will be established and monitored throughout the design and construction phases.

Sustainable procurement

2.5.17 In addition to ensuring a carbon efficient design, a sustainable procurement strategy will be implemented to ensure that low carbon materials are, where practicable, specified and that the carbon intensity of materials and sub-contract packages is measured and monitored throughout.

Materials and waste management

2.5.18 The recycling and re-use of site won (including demolition) materials arising from the scheme will be implemented and where practicable construction materials will be sourced from local sources of supply.

2.6 Rochdale envelope

2.6.1 This Environmental Scoping Report is based on an early preliminary design of the Proposed Scheme. The location and provisional order limits of the Proposed Scheme are shown on figure 1.1 (Appendix A). In accordance with the guidance provided in the Planning Inspectorate's Advice Note Nine - Rochdale Envelope (July 2018), the provisional order limits have been drawn at this stage to allow some flexibility. The project design process is ongoing and as such it is not possible at this point in time to define exactly the footprint of the Proposed Scheme. Figure 1.1 is intended to show the 'worst case' scenario, including temporary working areas that could be required for construction compounds, temporary works, material storage, haul routes and potential borrow pits, based on current knowledge.

3. Assessment of alternatives

3.1 Introduction

3.1.1 This chapter outlines the alternative design options that have been considered during the development of the Proposed Scheme. The options appraisal process is summarised below within the context of Highways England's project control framework (PCF):

- PCF Stage 0 – strategy, shaping and prioritisation. At this stage initial analysis and appraisal are conducted to assess the viability of transport scheme solutions to the problem, including road network and non-road network solutions.
- PCF Stage 1 – options identification. At this stage traffic modelling and economic and environmental assessment is undertaken on a number of options. The key output is the Technical Appraisal Report (TAR) which documents the decisions made on which options to present during non-statutory public consultation.
- PCF Stage 2 – options selection. At this stage the public are consulted on the recommended options from PCF Stage 1. Refinements are then made to the option designs, traffic modelling and economic and environmental assessments following feedback from the consultation. At the end of the stage a Preferred Route Announcement (PRA) is made to announce the decision on which option to progress.
- PCF Stage 3 – preliminary design. This is the stage the Proposed Scheme is currently in and involves developing a single preferred option to the required level for undertaking an EIA and applying for a Development Consent Order. Alternative ways of delivering the preferred option will be explored throughout PCF Stage 3 (see section 3.3).

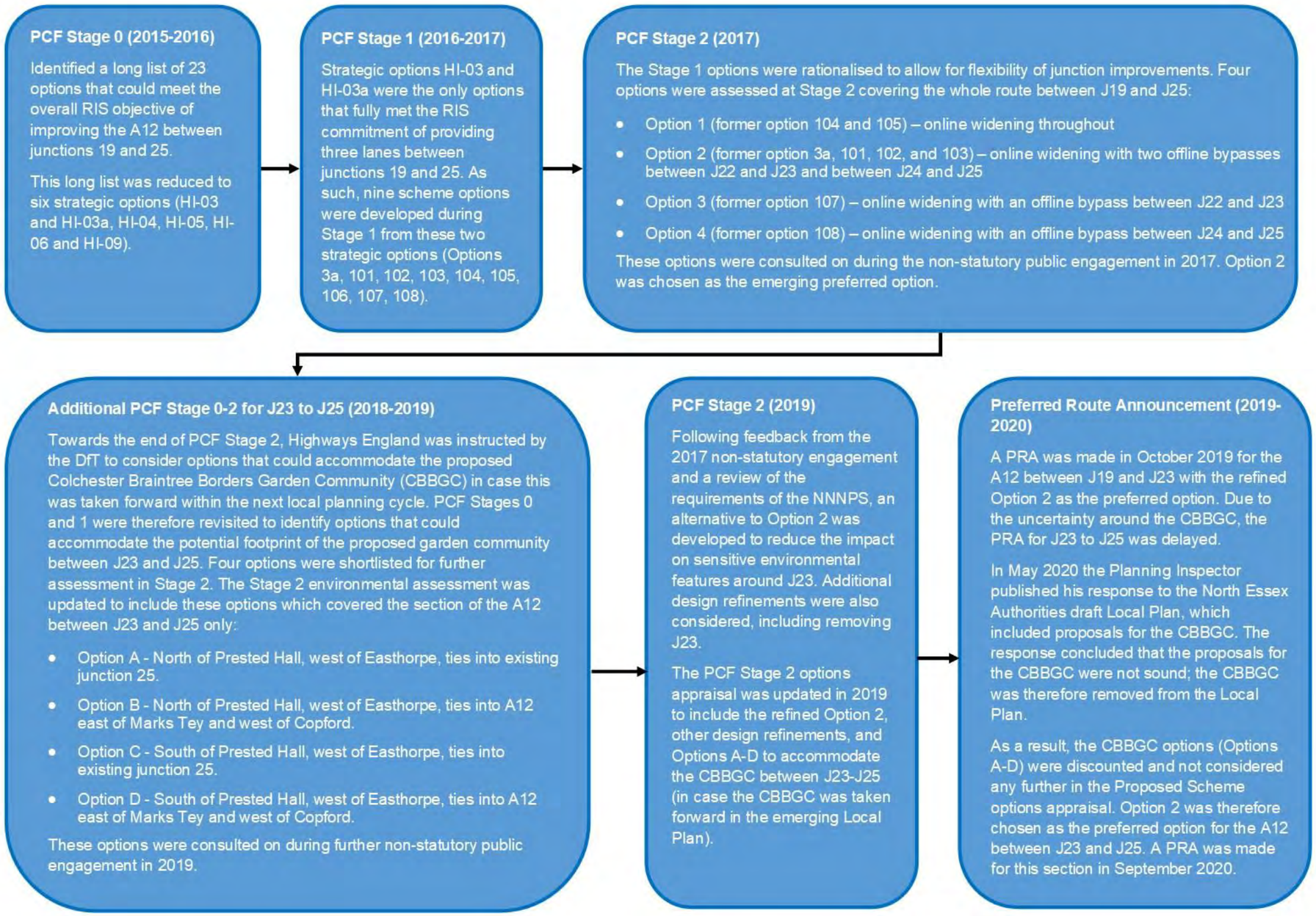
3.1.2 In 2017, a non-statutory consultation was held to widen the A12 from junction 19 at Chelmsford to junction 25 where the A120 joins the A12. Four options were presented for the stretch of road running from junctions 19 to 25 (Options 1-4).

3.1.3 However, the North Essex Authorities were pursuing a joint Local Plan which proposed several garden communities (including the CBBGC). If the CBBGC were to go ahead, it would likely impact on Options 1-4 that were presented in the 2017 consultation, specifically on the section between junction 23 and junction 25. Additional options therefore had to be developed to consider the section of the A12 between these junctions that could accommodate the potential footprint of the proposed garden community (Options A-D).

3.1.4 Given the uncertainty that the CBBGC introduced to the Proposed Scheme option development, two PRAs were made for the scheme (one covering junctions 19 to 23, and another covering junctions 23 to 25).

3.1.5 An overview of the design evolution is provided in inset 3.1. Section 3.2 provides more detail on the scheme options considered at each design stage, the preferred option, and the environmental considerations in coming to this decision.

Inset 3.1: Design evolution overview

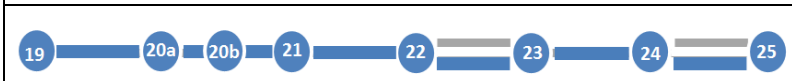


3.2 History of the Proposed Scheme

PCF Stage 0 options appraisal (strategy, shaping and prioritisation)

3.2.1 The OAR (Jacobs, 2016) set out a long list of 23 options that could meet the overall objective of improving the A12 between junctions 19 (Boreham) and 25 (Marks Tey). It included 15 highways improvement options, five public transport options and three collision reduction and incident management measures. The long list of options (including non-road options such as improvements to public transport) was reduced to six strategic options using the Department for Transport's (DfT) Early Assessment and Sifting Tool (EAST). The six options included two options that fully met the RIS commitment of improving the A12 corridor to three lanes between junctions 19 and 25 (options HI-03 and HI-03a) and four lower cost options that looked at improvements to the most congested sections of the corridor (HI-04, HI-05, HI-06 and HI-09). Table 3.1 summarises the PCF Stage 0 strategic options.

Table 3.1: PCF Stage 0 strategic options (blue links indicate 3-lane carriageway capacity through existing, new or upgraded roads. Blue circles indicate junction upgrades. A black circle indicates junction removal / rationalisation)

Option	Comments	Summary
HI-03: Offline improvements between J22 and J23 and J24 to J25. Online widening and junction improvements including removal of J20b. 	Strong strategic case as it provides upgrades to the whole section between J19-J25. It is a higher cost option but offers good value for money.	Taken forward to PCF Stage 1
HI-03a: Offline improvements between J22 and J23 and J24 to J25. Online widening and junction improvements with reduced specification. 	Strong strategic case providing upgrades to the whole section of the A12 between J19-J25. This is a slightly lower cost option than HI-03.	Taken forward to PCF Stage 1
HI-04: Offline improvements between J22 and J23 and J24 to J25. Online widening and junction improvements. 	Good strategic and lower cost scheme. However, by not including J23-J24, it may be difficult to justify upgrading this section at a later date.	Dismissed
HI-05: Offline improvements between J22 and J23. Online widening and junction improvements. 	Good lower cost option which would provide a viable solution to the scheme objectives. Initially taken forward, but later dismissed as did not meet the RIS objectives.	Dismissed
HI-06: Offline improvements between J22 and J23. Online widening and junction improvements. 	Option would offer a good strategic and lower cost scheme. However, by not including J21-J22 and J23-J25, it may be difficult to justify upgrading these sections at a later date.	Dismissed

Option	Comments	Summary
HI-09: Online widening between J20a and J21 and junction improvements. 	Lower cost option but provides a low strategic benefit compared to other options. Initially taken forward, but later dismissed as did not meet the RIS objectives.	Dismissed

PCF Stage 1 options appraisal (options identification)

3.2.2 PCF Stage 1 involved developing further options that would meet the overarching RIS statement and the scheme specific objectives. As HI-03 and HI-03a were the only options that met the RIS commitment, these were taken forward into PCF Stage 1 for further assessment. Nine scheme options were developed from these two strategic options. These included four options which had two offline bypasses but different junction arrangements (Options 3a, 101, 102, 103), two which were wholly online with different junctions (104 and 105), one option with a significant length of new bypass to the north of the existing A12 (106) and two options with a single bypass (107 and 108). These options were appraised within the PCF Stage 1 TAR (Jacobs, 2016).

3.2.3 Option 106 was discounted at PCF Stage 1 as it involved two major structures crossing the GEML railway, which would have significant costs and significant environmental impacts in terms of landscape and visual. The TAR also concluded that most junctions were likely to require some level of improvement, although there was some flexibility around improvements and potential closing of one or more junctions at Hatfield Peverel (junctions 20a, 20b and 21). Therefore, four alternative alignments (ignoring junction variations) were taken forward to the non-statutory engagement in PCF Stage 2:

- Option 1 (former option 104 and 105 alignment) – online widening throughout and provision of a local access road to provide alternative access to existing at grade junctions
- Option 2 (former 3a, 101, 102 and 103 alignment) – online widening with two offline bypasses between junctions 22 and 23 and between junctions 24 and 25
- Option 3 (former 107 alignment) – online widening with an offline bypass between junctions 22 and 23
- Option 4 (former 108 alignment) – online widening with an offline bypass between junctions 24 and 25

3.2.4 The PCF Stage 1 options are summarised in table 3.2.

Table 3.2: PCF Stage 1 scheme options

Option number	Description	Taken forward to PCF Stage 2
3a	Three lanes provided throughout with offline sections to the south of the A12 between J22-J23 and J24-J25 to remove local at grade accesses.	Option 2
101	Three lanes provided throughout with offline sections to the south of the A12 between J22-J23 and J24-J25 to remove local at grade accesses. Remove J20a and J20b and replace with a combined J20 to the south of Hatfield Peverel.	
102	Same as 101 except without a new J20 and assumes complete removal of J23.	
103	Three lanes provided throughout with offline sections between J22-J23 and J24-J25 to remove local at grade accesses. Remove J22 and J24 but upgrade J21 and J23 to provide access to Witham and Kelvedon respectively.	
104	Three lanes provided throughout completely online with removal of at grade junctions by providing local access roads. Remove J20a and J20b and replace with a combined J20 to the south of Hatfield Peverel.	Option 1
105	Three lanes provided throughout completely online with removal of at grade junctions by providing local access roads. Remove J20a and J20b and replace with an improved J21 with access roads to Hatfield Peverel.	
106	Same as 101 but offline to the north of the A12 (and railway) between J22-J25.	Dismissed
107	Three lanes provided throughout with offline sections to the south of the A12 between J22-J23.	Option 3
108	Three lanes provided throughout with offline sections to the south of the A12 between J24-J25.	Option 4

PCF Stage 2 options appraisal (option selection)

3.2.5 Options 1 to 4 were taken forward to public consultation in January 2017 at the start of PCF Stage 2. In addition, further work was undertaken to develop technical, economic and environmental assessments for the scheme. An interim Environmental Assessment Report (EAR) was produced in 2017 which documented the outcome of the PCF Stage 2 environmental assessment of Options 1 to 4.

3.2.6 The interim EAR concluded that Option 1 was the environmentally preferred option. This is because the option would be constructed online within the existing A12 corridor rather than creating a new infrastructure feature within the landscape. This would have less ecological, landscape and setting effects than Options 2, 3 and 4.

3.2.7 The offline options at Rivenhall (Option 2 and Option 3) would extend over an area of known minerals deposits, some of which have a licence to extract, and other areas that do not currently have permission for extraction. There was a risk that the offline options could sterilise minerals, or that time would be required in the programme to allow extraction prior to construction of the road. Sterilisation of mineral deposits is a topic highlighted within the National Networks National Policy Statement (NNNPS). In addition, Options 2, 3 and 4 would affect larger areas of the Best and Most Versatile (BMV) land (Grade 2 or 3 land under the Agricultural Land Classification).

3.2.8 The offline options at Rivenhall would also involve offline development in the Blackwater Valley, with the potential to significantly affect the sensitive landscape character, as well as archaeological and ecological assets within this area. These options also lie close to the Rivenhall Long Mortuary Scheduled Monument and would likely have a significant effect on the setting of this site and the surrounding historic landscape.

3.2.9 Option 2 was assessed as the least favourable for environment overall, due to the likely significant effects on cultural heritage, mineral deposits, landscape, ecology and flood risk. However, it would also have benefits in relation to air quality and noise effects for receptors along the existing A12, notably through the community of Rivenhall End. It was seen to be the most resilient of the four options, as it assumes that the existing dual carriageway would remain. It would also be safer for road workers during both construction (due to the length of offline sections that could be constructed away from live traffic) and operation (as there would be an alternative route along certain sections of the A12 on which to divert traffic during road maintenance). Option 2 was also the most popular option from the non-statutory public consultation (see chapter 4).

3.2.10 Therefore, the Scheme Assessment Report produced in 2017 concluded that Option 2 was the recommended preferred route (Jacobs, 2017).

Additional options appraisal (PCF Stage 0-2) – CBBGC options

3.2.11 Towards the end of PCF Stage 2, Highways England was instructed to consider options that could accommodate the proposed CBBGC in case this was taken forward within the next local planning cycle. Further options were therefore developed that could accommodate the potential footprint of the proposed garden community.

3.2.12 All of the CBBGC options appraisal work assumed that Option 2 was emerging as the preferred option from the previous PCF Stage 2 work described in the above section. Option 2 designs were therefore assumed up to junction 23 (Kelvedon South) and the new options looked at alternatives to incorporate the proposed CBBGC between junction 23 and junction 25.

3.2.13 Four CBBGC options were shortlisted for more detailed assessment, as follows:

- Option A – alignment goes north of Prested Hall, west of Easthorpe, and ties into the existing junction 25
- Option B – alignment goes north of Prested Hall, west of Easthorpe, and ties into the A12 east of Marks Tey and west of Copford
- Option C – alignment goes south of Prested Hall, west of Easthorpe, and ties into the existing junction 25
- Option D – alignment goes south of Prested Hall, west of Easthorpe, and ties into the A12 east of Marks Tey and west of Copford

3.2.14 Options A-D were presented at a non-statutory consultation in November 2019 to gain views from stakeholders and the local community on the options proposed to accommodate the CBBGC (if taken forward in the emerging Local Plan).

3.2.15 In May 2020 the Planning Inspector published his response to the North Essex Authorities draft Local Plan, which included proposals for the CBBGC. The response concluded that the proposals for the CBBGC were not sound. As a result, the North Essex Authorities decided to remove the CBBGC from the Local Plan.

3.2.16 The CBBGC options were therefore discounted and not considered any further in the Proposed Scheme options appraisal and the preferred option between junction 23 and 25 reverted back to Option 2.

Design refinements (PCF Stage 2)

3.2.17 The 2017 Scheme Assessment Report recommended Option 2 as the preferred route. However, through value engineering and subsequent option refinement, elements of the option designs were adjusted, and had to be re-assessed. As well as scope changes through value engineering, designs were refined to take on board stakeholder consultation (see chapter 4) and to better align the Proposed Scheme with policy within the NNNPS, as required for development consent.

NNNPS review

3.2.18 Although Option 2 was chosen as the emerging preferred option in 2017, it was assessed as the least favourable in terms of the environmental impact. This meant it had potential for a lower compliance with the NNNPS with associated risks during examination and consenting. The key risks identified were:

- Flood risk: for the Exception Test to be passed it must be demonstrated that the project provides wider sustainability benefits to the community that outweigh flood risk; and a flood risk assessment must demonstrate that the project will be safe for its lifetime, without increasing flood risk elsewhere and, where possible, will reduce flood risk overall. Option 2, prior to design refinements, would have involved offline development in the River Blackwater floodplain.
- Historic environment: where the proposed development would lead to substantial harm to or total loss of significance of a designated heritage asset, the Secretary of State should refuse consent unless it can be demonstrated that the substantial harm or loss of significance is necessary in order to deliver substantial public benefits that outweigh that loss or harm. Historic England raised concerns over Option 2, prior to design refinements, as the new offline bypass would have likely resulted in substantial harm to the Rivenhall Long Mortuary Enclosure scheduled monument, as well as associated archaeological remains that contribute to the wider historic setting of the monument.
- Minerals sterilisation: where a proposed development has an impact on a Mineral Safeguarding Area (MSA), the Secretary of State should ensure that the applicant has put forward appropriate mitigation measures to safeguard mineral resources. Option 2 had the largest footprint in the MSA.
- Best and most versatile agricultural land: applicants should take into account the economic and other benefits of BMV agricultural land (defined as land in grades 1, 2 and 3a of the Agricultural Land Classification). Where significant development of agricultural land is demonstrated to be necessary, applicants should seek to use areas of poorer quality land in preference to that of a higher quality. Option 2 had the largest footprint in areas of BMV land.

3.2.19 A refined Option 2 alignment was created to reduce impacts on the Rivenhall Long Mortuary scheduled monument and the River Blackwater flood zone. For the refined Option 2, the length of the bypass between junctions 22 and 23 was reduced, re-joining the existing A12 at a point just east of Rivenhall End, thereby taking the alignment away from the scheduled monument and reducing potential development in the floodplain. The refined option would also result in reduced loss of BMV land and sterilisation of minerals compared to the original Option 2. By reducing the impacts on these receptors, the refined Option 2 complies better with the NNNPS.

Value engineering

3.2.20 In addition to the refined Option 2 described above, a number of additional design refinements were introduced as part of a value engineering exercise:

- Descoping verge and central reserve works between junction 19 and junction 20a. The carriageway is already three lanes in this section, so descoping works here would still be consistent with the RIS commitment for three lane provision.
- Potential removal of existing junction 23 (the previous proposals had included a new junction 23).
- Given the potential removal of junction 23, a local access road (LAR) would be required to facilitate access in and around Kelvedon. The entire existing A12 between junctions 22 and 23 would be retained as a LAR, with provision of a new mini-roundabout to provide access over the A12 to the Essex Fire and Rescue HQ. The LAR would be retained as a dual carriageway from junction 22 to Essex Fire and Rescue HQ. A single carriageway would be provided from the mini-roundabout connecting to the B1024 into Kelvedon.
- Retaining the River Ter Bridge width (i.e. three lanes gained by changing verges, working widths and lane markings, as opposed to physically widening the bridge).
- Assumption on the use of borrow pits for fill material instead of importing material. A number of potential borrow pit locations are under investigation and a short list of sites will be identified and developed further in PCF Stage 3.

3.2.21 The outcome of the PCF Stage 2 options appraisal, including the design refinements described above, is shown in table 3.3. Although the refined Option 2 superseded the original Option 2 from 2017, the original alignment is shown in table 3.3 to demonstrate the difference in impacts as a result of the design refinements.

Table 3.3: Potential effects from PCF Stage 2 options

Option	Overall environmental score	Conclusions of the environmental appraisal (this is based on a high-level assessment of the PCF Stage 2 designs; the likely significant effects could change as more detailed assessment is undertaken)
Do nothing	Not assessed	This is assessed as the baseline to compare other options to. Air quality and WCH access is likely to get worse due to increased congestion and traffic.
Option 1 (online)	Potential significant adverse effect – mitigation may be possible	An online option would have less impact to ecology and landscape in general, as there would be minimal land take and severance. It would also avoid impacts to the proposed quarry site near Rivenhall. There would be impacts to people and the landscape of urban areas as the road is widened, and from the loss of existing vegetation screening. There would be no improvement to noise important areas (NIA) due to the traffic remaining online at these locations. Although Option 1 is likely to have the least overall impact, there are still potential significant effects, particularly to the landscape and setting of historic buildings along the A12. It is likely these effects could be mitigated.
Original Option 2 (two bypasses)	Significant adverse effect – unlikely to be able to mitigate	This option has the potential for significant environmental effects, particularly in relation to the offline sections which would sever areas of the best and most versatile agricultural land and have a detrimental effect on landscape and ecology. The offline section between J22-J23 would be within the Blackwater Valley, with the potential to cause significant effects to the landscape character. The footprint would also affect an archaeologically rich area and would likely cause substantial harm to the setting of the Rivenhall Long Mortuary Enclosure scheduled monument, as well as associated archaeological remains that contribute to the wider historic setting of the monument. Large areas of floodplain, an operational quarry, and a mineral safeguarding area would also be affected. The operational quarry at Colemans Farm near Rivenhall has a planning condition for restoration to be one of Essex's flagship biodiversity sites. If the footprint of the road were to impinge on the planned restoration area, then equivalent biodiversity areas would need to be provided elsewhere. The offline section between J24-J25 would result in significant impacts on the setting of a number of listed buildings, notably major impacts to the grade II listed building, Doggets Hammer Farm, located within 20m of this option. Mitigation would include reducing the extent of works into these sensitive features. However, it is likely that some effects could not be mitigated, with significant residual effects remaining (particularly on archaeological remains).
Refined Option 2 (two bypasses; J22-J23 bypass ties back into A12 east of Rivenhall End)	Potential significant adverse effect – mitigation may be possible	As with Option 2, this option has the potential for significant environmental effects, particularly in relation to the offline sections which would sever areas of best and most versatile agricultural land and have a detrimental effect on landscape and ecology. However, the proposed bypass between J22 and J23 would tie back into the existing A12 east of Rivenhall End and would therefore have a reduced impact on the Rivenhall Long Mortuary Enclosure scheduled monument and on the setting of the Palaeolithic landscape compared to Option 2. This alignment would also reduce the area of development in the River Blackwater floodplain. Although there would still be adverse effects on these sensitive features, it is likely that mitigation could be implemented to reduce the effect. Areas of floodplain, the operational quarry, a mineral safeguarding area, and the listed buildings between J24-J25 would all still be affected.

Option	Overall environmental score	Conclusions of the environmental appraisal (this is based on a high-level assessment of the PCF Stage 2 designs; the likely significant effects could change as more detailed assessment is undertaken)
Option 3 (Rivenhall bypass)	Significant adverse effect – unlikely to be able to mitigate	This option has the potential for significant environmental effects. The main difference compared to Option 2 is that it only includes the Rivenhall bypass between J22 and J23, and not the second bypass between J24 and J25. The offline section would sever areas of best and most versatile agricultural land and would have a detrimental effect on landscape and ecology. The offline section would be within the Blackwater Valley, with the potential to cause significant effects to the landscape character. The footprint would also affect an archaeologically rich area and would likely cause substantial harm to the setting of the Rivenhall Long Mortuary Enclosure scheduled monument, as well as associated archaeological remains that contribute to the wider historic setting of the monument. Large areas of floodplain, the operational quarry at Colemans Farm, and a mineral safeguarding area would also be affected. Mitigation would include reducing the extent of works into these sensitive features. However, it is likely that some effects could not be mitigated, with significant residual effects remaining (particularly on archaeological remains).
Option 4 (Marks Tey bypass)	Potential significant adverse effect – mitigation may be possible	This option has the potential for significant environmental effects. The main difference compared to Option 2 is that it only includes the Marks Tey bypass between J24 and J25, and not the second bypass between J22 and J23. This offline section would sever areas of best and most versatile agricultural land and would have a detrimental effect on landscape and ecology. There would also be significant impacts on the setting of a number of listed buildings, notably major impacts to the grade II listed building, Doggets Hammer Farm, located within 20m of this option. There would be no bypass between J22 and J23; the option would therefore avoid impacts on the Rivenhall Long Mortuary Enclosure scheduled monument. This alignment would also reduce the area of development in the River Blackwater floodplain. There is still potential for significant effects on other receptors from the proposed Marks Tey bypass, but it is likely these could be mitigated.
Option A to D (options to accommodate the CBBGC between J23-J25)	N/A	Options discounted as a decision was made to remove the CBBGC from the North Essex Authorities draft Local Plan, on the basis that the Planning Inspector found the proposals to be not sound.

Preferred Route Announcement

3.2.22 Option 2 was chosen in 2017 as the emerging preferred option. Given the reduced environmental impact of the refined Option 2 compared to the original Option 2 alignment, a PRA was made in October 2019 for the A12 between junctions 19 and 23 with the refined Option 2 as the preferred option (incorporating the design refinements described in the previous section).

3.2.23 Following the decision to remove the CBBGC from the North Essex Authorities emerging Local Plan, and the subsequent dismissal of the CBBCG options (Options A-D), Option 2 has been chosen as the preferred option for the A12 between junctions 23 and 25. A PRA was made for this section in September 2020.

3.3 Further scheme development

3.3.1 Section 3.1 provides a summary of the scheme's design evolution to provide context for the scheme description provided in section 2.4. The Environmental Statement will provide a full description of the alternatives considered as well as a justification for why the preferred option was selected.

3.3.2 Now that a preferred route has been announced, the environmental assessment will consider alternative ways of delivering the Proposed Scheme. This will include consideration of:

- the location and type of technology to be included (e.g. traffic signals)
- the construction methodology and programme (including the phasing of construction works and number and location of compounds and haul roads)
- optimising the cut-fill balance to reduce material requirements and waste
- the location and extent of carriageway widening
- The alignment of new offline carriageway
- the location and design of proposed WCH routes
- the type, location and extent of environmental mitigation

3.3.3 The assessment will fully consider the environmental impact of delivering the Proposed Scheme, including incorporating any mitigation embedded into the scheme design to avoid or reduce environmental effects. This will be documented in the Environmental Statement.

4. Consultation

4.1 Consultation undertaken to date

4.1.1 A public consultation was held for Options 1-4 between 23 January and 3 March 2017. The consultation included seven public information events held in communities along the A12 corridor. The consultation received 907 responses, of which 824 were positive, 757 expressed a preference for one of the four options, and 67 had no preference. The most popular option was Option 2 (bypass between junctions 22 and 23, and a bypass between junctions 24 and 25) with 49% of respondents stating this as their preferred option. A considerable amount of support for this came from the local councils and local communities, who felt that Option 2 would have the least impact on residents of Rivenhall End. Additional reasons for support of Option 2 included:

- it would be the most future proof
- it would cause the least disruption during construction
- it would be the most resilient
- it would have the least impact on local residents

4.1.2 The second most popular option was Option 1, with 28% of respondents stating this as their preferred option. Although there was support for this option due to the reduced impact on ecology, landscape, and archaeology, there were also concerns that it would not be as resilient, and if it would be feasible to construct (given the disruption anticipated from online construction).

4.1.3 The consultation also asked whether respondents felt improvements were needed at each junction along the length of the scheme. All junctions received a majority of support for improvements, with many respondents citing poor visibility, unclear signage and dangerous slip roads. In particular, there was support from both the public and local authorities for rationalising junctions 20a and 20b (Hatfield Peverel), providing a new all-movements junction. Junction 23 received the least amount of support for improvement, but still a majority, with 51% feeling improvements were needed. For those who did support the need for improvements, the primary concern was the existing junction arrangement which respondents suggested led to congestion in the village of Kelvedon.

4.1.4 Options A-D were presented at a second public consultation in November 2019 to gain views from stakeholders on the options proposed to accommodate the CBBGC. The feedback received was independently analysed and published alongside the PRA for junctions 23-25, but as the CBBGC was not taken forward in the emerging North Essex Authorities Local Plan, these options were not considered further.

4.1.5 In addition to the public consultation events, a detailed programme of engagement has been developed and implemented throughout PCF Stages 1 and 2. This engagement has focused on forums and workshops with a wide range of relevant stakeholders, including statutory environmental bodies and local/county authority environmental officers. The purpose of these forums and workshops was to communicate key messages about the Proposed Scheme and to gather informal feedback about the scheme options in advance of the non-statutory consultation events.

4.1.6 Table 4.1 highlights key responses from statutory environmental bodies during the options appraisal, and subsequent meetings to progress the development of the preferred option.

Table 4.1: Key consultation responses

Stakeholder	Consultation response
Environment Agency	The Environment Agency did not wish to state a preferred option but reiterated general principles that should be considered as the scheme progresses, including: • The scheme presents an opportunity to provide improvements to the water environment along the route. • The flood risk assessment will need to demonstrate that the Proposed Scheme would result in no impediment to flows or net loss of floodplain for all events up to and including the 1% (1 in 100 year) fluvial event inclusive of climate change. • The Proposed Scheme must not cause deterioration in a water body's status or prevent its achievement of good ecological status/potential in the future, to be compliant with the Water Framework Directive. • The Proposed Scheme will need robust pollution prevention measures and a high level of treatment for surface water run off to protect surrounding water bodies. A meeting was held with the Environment Agency in October 2019 to discuss and agree drainage design criteria and methodologies for flood risk assessment. A series of subsequent meetings were held to review the results of baseline fluvial modelling studies for the seven main rivers affected by the Proposed Scheme. A meeting was held in July 2020 to discuss methodologies for groundwater impact assessment and for Water Framework Directive compliance assessment.
Natural England	Natural England did not wish to state a preferred option but reiterated general principles that should be considered as the scheme progresses, including: • Habitat along and adjacent to roadsides is often used by a wide range of species, such as bats, birds and reptiles and there may be licensing requirements. There are also several areas of priority habitat along the A12 which are likely to be impacted by the widening scheme. • Natural England welcome the enhancement of existing habitat where possible and creation of new habitat where current areas are lost through the scheme. They would wish to see plans which seek to achieve a net increase in biodiversity. The wider environment will also need consideration depending on bypass options, for example the bypass near J22, as this is near Whetmead Local Nature Reserve. A meeting was held with Natural England in September 2020 to discuss the Proposed Scheme. An update was provided on the results of ecology surveys undertaken and the proposed scope and methodologies for future surveys, including the potential to adopt Natural England's District Level Licensing approach for great crested newts. In addition, the conclusions of the Stage 1 Habitats Regulations Assessment (HRA) were presented.

Stakeholder	Consultation response
Historic England	Historic England had concerns regarding Option 2 and Option 3, and to a lesser degree, Option 4, with respect to appropriate preservation of the historic environment. Option 1 should be given great consideration as it would be within an existing highway corridor, as opposed to creating a new corridor (leading to further urbanisation). In addition, they provided the following feedback: • The A12 corridor has a high archaeological importance / sensitivity. Previous applications for quarrying in the area have been refused due to the impacts to cultural heritage. The Rivenhall End section is particularly sensitive given the number of known assets within the area. These contribute to a wider Palaeolithic landscape. • There is currently one scheduled monument, but the area has not been subject to detailed assessment. The appreciation of the value of the historic environment should not rely solely on an appreciation of the location of designated heritage assets but consider the interactions with the wider landscape. There is significant potential for further nationally important sites to be discovered along this section. • Historic England asked why a bypass was required along the Marks Tey section and whether the project had considered providing a local access road to allow private accesses to be removed instead, as this would have less impact than the dual carriageway. They also noted that the Marks Tey section has very few records, but this should be treated as an absence of information, due to lack of surveys, rather than an absence of archaeology. It is likely to be a high-risk area for archaeology as there are often strings of settlements and villas that follow the line of roman roads. A meeting was held with Historic England, Essex County Council (county archaeologist), and Colchester Borough Council (archaeological advisor), in October 2019 to discuss the concerns around the off-line section of Option 2 at Rivenhall End and the refined alignment to reduce the length of this offline section, thereby moving the alignment away from the Rivenhall Long Mortuary scheduled monument. There was general agreement in the meeting that the revised alignment would be acceptable, subject to further investigations and assessments for unknown archaeology. The approach and scope for geophysical surveys and trial trenching was discussed and follow-up meetings held.

4.2 Proposed consultation

Statutory consultation

4.2.1 This Environmental Scoping Report will be used by the Planning Inspectorate to consult relevant bodies on the proposed scope of the EIA. Stakeholders will be invited to provide feedback to the Planning Inspectorate, and such feedback will be used by the Planning Inspectorate in formulating the scoping opinion for the Proposed Scheme.

4.2.2 Highways England will consult with prescribed consultees as per the requirements of Section 42 of the Planning Act 2008. The consultees will include, for example, Natural England, the Environment Agency and Historic England, relevant planning authorities, and interested parties (e.g. landowners and tenants).

4.2.3 The local community and wider public will be consulted on the Proposed Scheme via a statutory consultation programme in line with Section 47 of the Planning Act 2008.

4.2.4 The statutory consultation is expected to be undertaken during late spring / early summer 2021. A Statement of Community Consultation (SoCC) will be produced and published prior to the formal statutory consultation period. The SoCC will outline how Highways England will formally consult with the local community about the Proposed Scheme.

4.2.5 The purpose of this consultation will be to seek comments from the local community and statutory consultees on the Proposed Scheme. A Preliminary Environmental Information Report (PEIR) will be produced to support the consultation. The PEIR will include environmental information to enable consultees (both specialist and non-specialist) to understand the likely significant environmental effects of the Proposed Scheme, and measures proposed to mitigate such effects, to help inform their consultation responses.

4.2.6 The approach to statutory consultation has not yet been finalised but is likely to include (without being limited to): meetings and workshops with local community groups and other local stakeholders; publication of brochures, reports and other information made available in local community facilities and online; and public exhibitions where members of the community can meet with the project team. In addition, an online exhibition will be set up to assist in reaching all sections of the community.

4.2.7 A Consultation Report will be produced and submitted as part of the DCO application. This will summarise the feedback received during the consultation as well as how the project team have considered this feedback in the scheme design and EIA. The Consultation Report will demonstrate how Highways England has complied with the consultation requirements of the Planning Act 2008.

Technical consultation

4.2.8 Stakeholders have been consulted during the scoping process, including:

- the Environment Agency, Natural England, and Historic England
- local authority environmental health officers (Chelmsford, Braintree, Maldon and Colchester)
- local and county authority landscape and heritage officers

4.2.9 Stakeholder feedback relevant to the proposed assessment scope and methodology is provided in the individual aspect chapters (chapters 6-15).

4.2.10 Technical engagement will continue throughout PCF Stage 3 to discuss the scope, potential effects, and proposed mitigation with relevant stakeholders. This engagement will take the form of email exchanges, telephone calls, virtual meetings, and face to face meetings where required.

5. Environmental assessment methodology

5.1 National Networks National Policy Statement

5.1.1 Sections 104 (2) and (9) of the Planning Act 2008 require applications to be decided in accordance with the relevant National Policy Statement. The National Networks National Policy Statement (NNNPS) (DfT, 2014) sets out principles by which applications for road and rail schemes should be assessed. Paragraph 4.3 of the NNNPS states:

'In considering any proposed development and in particular when weighing its adverse impacts against its benefits, the Examining Authority and the Secretary of State should take into account:

- *Its potential benefits including the facilitation of economic development, including job creation, housing and environmental improvement, and any long-term or wider benefits;*
- *Its potential adverse impacts, including any longer-term and cumulative adverse impacts, as well as any measure to avoid, reduce or compensate for any adverse impacts.'*

5.1.2 The Proposed Scheme will need to meet the policies outlined in the NNNPS. Each aspect chapter in the Environmental Statement will set out the key NNNPS policy relevant to the aspect and highlight how the Proposed Scheme meets these requirements.

5.1.3 In addition to the NNNPS, the EIA will also consider local planning policy. The local planning policy framework is set out in Appendix B.

5.2 Surveys, predicative techniques and methods

Design Manual for Roads and Bridges

5.2.1 The environmental assessment will be based on the general standards set out within DMRB LA 104 Environmental Assessment and Monitoring (Highways England, 2019), as well as the aspect specific DMRB standards (as previously contained within DMRB Volume 11). DMRB is the established guidance for assessing the environmental impacts of highway schemes, and has been developed by Highways England in collaboration with relevant stakeholders. DMRB has recently undergone an extensive update to capture the requirements of the EIA Regulations 2017.

5.2.2 Where relevant, the environmental assessment will draw on relevant topic guidance and best practice. More details on the methods to be used are provided in each of the aspect chapters (chapters 6 to 15).

Study areas

5.2.3 Various study areas have been used to assess the impact on environmental receptors based on DMRB standards and topic specific guidance. Specific study areas are outlined in the individual aspect chapters.

5.2.4 For the purpose of the EIA, the construction start of works is 2023, the opening year is 2027, and the design year is 2042 (15 years after opening to traffic).

Surveys and assessment

5.2.5 Several surveys have commenced to date to inform the environmental assessment, including:

- extended Phase 1 habitat survey
- otter and water vole surveys
- badger and dormice surveys
- bat (activity and roosts) surveys
- freshwater environment (fish, invertebrates, aquatic plants, white-clawed crayfish) surveys
- great crested newt surveys
- reptile surveys
- wintering birds, breeding birds, and barn owl surveys
- landscape walkover
- air quality monitoring

5.2.6 At the time of writing, most of these surveys are only partially complete due to awaiting land access permissions. These surveys will need to be completed in full in the 2020/2021 survey season. Additional surveys will also be required to inform the EIA, and these have been identified in the aspect chapters as part of their scope and methodology.

5.2.7 In addition to surveys, other predictive techniques will be used to inform the EIA, such as air quality, noise, and flood risk modelling. Further information on the proposed surveys and assessments to be undertaken is provided in the individual aspect chapters.

Future baseline

5.2.8 The baseline conditions used for assessment purposes are the predicted future conditions that would exist in the absence of the Proposed Scheme either (a) at the time that construction is expected to start, for impacts arising from construction, (b) at the time that the Proposed Scheme is expected to open to traffic, for impacts arising from its operation, or (c) the design year, 15 years after opening. The future baseline is considered in each of the environmental aspect chapters, as relevant to the assessment in question.

5.3 General assessment assumptions and limitations

5.3.1 The Proposed Scheme is at an early stage in the scheme development. There are no detailed designs and the construction methodology is not fully defined at this stage. There could therefore be changes to the provisional order limits to accommodate changes in temporary working areas, or changes in permanent footprint associated with the design and/or environmental mitigation areas. The provisional order limits presented in figure 1.1 are considered a 'worst-case' estimate of likely land use requirements, which may reduce as the Proposed Scheme is developed towards DCO submission.

5.3.2 A traffic model was built at PCF Stage 2 which was used to understand the likely impacts on the road network (including on air quality and noise) and to inform the options appraisal. A new traffic model is being built for PCF Stage 3, the output of which will feed into the EIA. Updated traffic modelling outputs from the new model were not available at the time of writing this Environmental Scoping Report.

5.3.3 It is assumed that the existing A12 would remain open during construction. Traffic management would be required for works along the online sections.

5.3.4 It is assumed that the information provided by third-party public sources is accurate at the time of preparing this report. Data sources will be verified and updated throughout the EIA process. References are included to provide details of relevant sources at this stage.

5.3.5 Topic specific assumptions and limitations are included within each aspect chapter. This includes information on any data gaps at this stage in the assessment and how these gaps will be filled over the course of the EIA.

5.3.6 This Environmental Scoping Report was prepared during the global COVID-19 coronavirus pandemic. At the time of writing the report (summer 2020), the UK government was in the process of relaxing the extensive lockdown measures in place in England, however, there is a possibility that restrictions could be re-implemented at a local, regional, or national level in the event that the rate of infection increases. Depending on the development, duration and extent of such future restrictions, some of the site-based/survey work proposed as part of the scope may not be achievable, and traditional methods of public engagement may also be affected. If this is the case, the Proposed Scheme would seek to identify viable and robust alternatives to the approach set out in this Environmental Scoping Report and would work with relevant consultees to agree a pragmatic way forward.

5.4 Mitigation and enhancement

5.4.1 Mitigation measures aim to avoid, reduce and, where possible, remedy significant adverse environmental effects. The purpose of any mitigation measure is to eliminate the effect, or if not possible, to reduce its significance. Mitigation measures for the Proposed Scheme will be developed in accordance with the mitigation hierarchy of avoidance, reduction, restoration and compensation.

5.4.2 For the purposes of the environmental assessment, three types of mitigation are described in this report. These are adapted from the Institute of Environmental Management and Assessment (IEMA) 2015 guidance on environmental assessment:

- Embedded (design) mitigation: intrinsic part of design evolution (e.g. reducing height of an embankment to reduce visual impact), taking into account guidance provided in DMRB GG103 and LD117-119. This will form part of the project description in the Environmental Statement.
- Additional (bespoke) mitigation: requires further activity in order to achieve the anticipated outcome. It will be described in the aspect chapters of the Environmental Statement and secured through the Register of Environmental Actions and Commitments (REAC) and the DCO.
- Standard (best practice) mitigation: this is required regardless of the EIA because it is generally imposed through legislative requirements or standard sector practices (e.g. implementing considerate contractor practices to reduce nuisance from site work). These measures would be captured in a Construction Environmental Management Plan (CEMP).

5.4.3 An Outline Environmental Management Plan (EMP) will be produced in line with DMRB LA 120 Environmental Management Plans, which will contain all measures, including the REAC, to manage environmental effects in construction and operation. This EMP will provide the equivalent to a Code of Construction Practice (CoCP) and therefore the framework for the future production of the more detailed CEMP.

5.4.4 If effects cannot be mitigated, compensatory measures would be considered, for example, to provide replacement habitat.

5.4.5 Mitigation and enhancement measures will be developed further in PCF Stage 3 and will be outlined in the Environmental Statement. Mitigation and enhancement proposals will be developed in consultation with statutory consultees, where appropriate.

5.5 Significance criteria

5.5.1 Appendix C contains a table summarising the criteria used to assess the magnitude of impact (amount of change), which is based on the guidance within DMRB or other topic specific guidance (as specified in each aspect chapter). These criteria have been used to identify the potential impacts that might occur due to the construction and operation of the Proposed Scheme. Impacts may be adverse or beneficial, direct, indirect, secondary or cumulative, temporary or permanent, short, medium or long term. Impacts can affect the environment in a variety of ways.

5.5.2 Significance of effect is derived through a combination of the sensitivity of a receptor affected (value or importance) and the magnitude of the impact. A typical matrix for these two variables is provided in DMRB LA 104 (Highways England, 2019) and is shown visually in inset 5.1.

5.5.3 Certain disciplines do not use a matrix-based approach, because they use calculations to assess effects in numerical terms. This includes noise, air quality and flood risk.

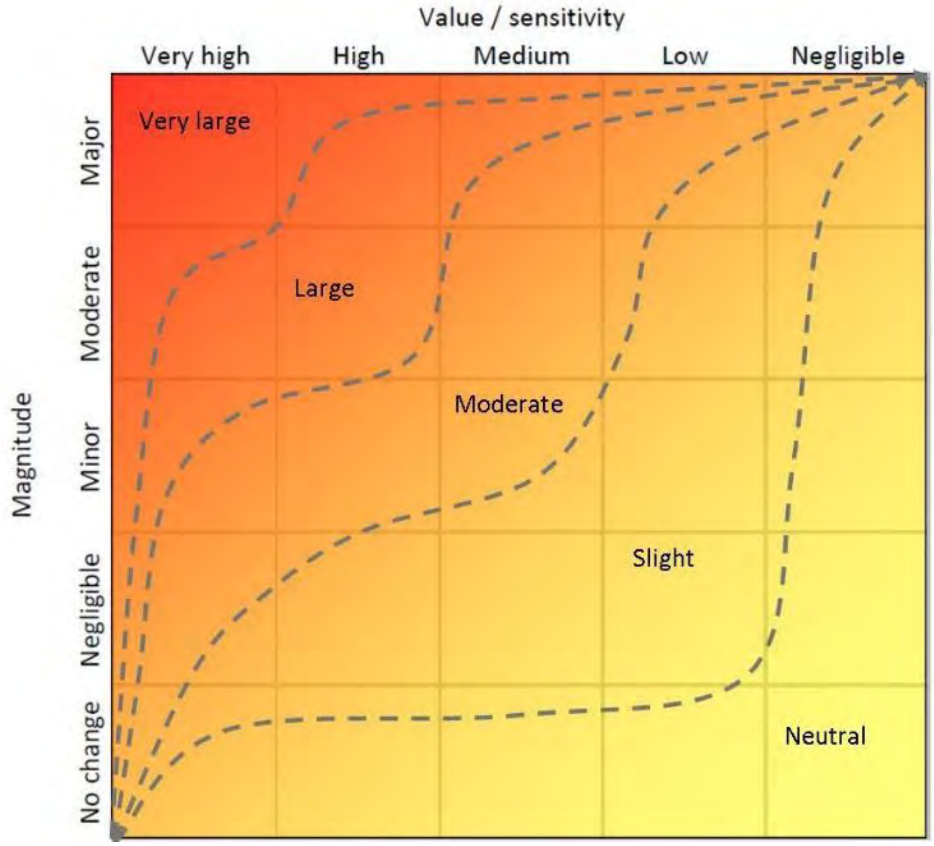
5.5.4 In all cases, professional judgement is applied to the assessment to underpin the outcomes identified through the matrix or calculation assessments. Where professional judgement is used, this is accompanied by text to explain the reasons and justification.

5.5.5 Significance categories are described in table 5.1 (replicated from DMRB LA 104). This describes effects with a very large or a large significance as being 'material' and 'likely to be material' in the decision-making process respectively. Therefore, large and very large effects are considered 'significant' for the purposes of the EIA regulations. Moderate effects are described as potentially being material in the decision-making process. Moderate residual effects are therefore also typically considered as significant.

Table 5.1: Descriptors of the significance of effect categories (taken from DMRB LA 104)

Significance category	Typical descriptors of effect
Very large	Effects at this level are material in the decision-making process.
Large	Effects at this level are likely to be material in the decision-making process.
Moderate	Effects at this level can be considered to be material decision-making factors.
Slight	Effects at this level are not material in the decision-making process.
Neutral	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

Inset 5.1: Matrix for the assessment of significant effects with professional judgement



5.6 Assessment of interrelationships

5.6.1 The EIA will consider the interrelationships between environmental effects (intra-project effects). This is defined as the effects of multiple residual impacts from the Proposed Scheme on a receptor (i.e. 'within scheme' effects associated with combined impacts across more than one environmental aspect).

5.6.2 These interrelationships can generally be grouped into four broad categories: the effects on residential receptors and communities; effects on the historic environment; effects on biodiversity; and effects on the water environment. The interrelationship of effects on these receptors will be covered in the Environmental Statement in the relevant aspect chapter:

- Effects on residents and communities (e.g. the combined effects from air quality, noise, severance, setting) will be covered under the population and health aspect
- Effects on the historic environment (e.g. from noise, vibration, land use change, and changes in setting) will be covered under the cultural heritage aspect
- Effects on biodiversity (e.g. from noise, light, habitat loss and fragmentation) will be covered under the biodiversity aspect
- Effects on water quality (e.g. from physical works, road runoff, accidental spillage, contaminated land) will be covered under the road drainage and the water environment aspect

5.6.3 The significance of effect will be determined in line with the relevant aspect assessment methodology (as set out in chapters 6-15 of this Environmental Scoping Report).

5.6.4 The 'in-combination' effect from climate change (i.e. where climate has the potential to exacerbate or conversely diminish the effect of an existing impact of the Proposed Scheme) will be assessed in the environmental aspect chapters of the Environmental Statement, where relevant, using significance criteria from the respective chapters.

5.7 Cumulative effects

5.7.1 The NNNPS (paragraph 4.16) states that the Environmental Statement should provide information on how the effects of the applicant's proposal would combine and interact with the effects of other development. Chapter 16 sets out the proposed approach to the cumulative effects assessment and is based on the guidance provided in the Planning Inspectorate Advice Note Seventeen (2019).

5.8 Major accidents and disasters

5.8.1 The EIA Regulations require that risks due to accidents and disasters are considered within the EIA. At this stage, a two-stage qualitative assessment has been undertaken using technical judgement to identify whether the Proposed Scheme is at risk from major accidents and disasters. Firstly, a screening matrix was completed detailing a long list of major accidents and disasters that could occur (see Appendix D). Accidents and disasters requiring further consideration were subject to a second more detailed risk assessment. The more detailed risk assessment considered the following:

- the vulnerability of the project to risks of major accidents and disasters
- any consequential changes in the predicted effects of the project on environmental aspects from major accidents and disasters

5.8.2 The risk assessment concluded that there are two residual risks remaining that would need to be addressed through the design of the Proposed Scheme. These are inland floods and mass ground movements.

5.8.3 Inland floods are partly covered under chapter 15 on climate change adaptation, and partly through chapter 14 on road drainage and the water environment in terms of reducing future flood risk. Impacts and mitigation associated with these will be covered in the relevant aspect chapter of the Environmental Statement.

5.8.4 Mass movements and ground hazards, including risks of subsidence and geological faults, are documented within the Preliminary Sources Study Report (Jacobs, 2018). This summarises the potential geohazards and risks associated with the ground conditions that need to be factored into the design process and assessed going forward. These risks are being further assessed through a programme of ground investigation surveys. The results and proposed mitigation will be presented within a Ground Investigation Report and will be used to inform the designs.

5.8.5 The Preliminary Sources Study Report also contains an initial review of potential land contamination that may be present within the study area. Potential sources of contamination include made ground, landfills and industrial areas. The Proposed Scheme could potentially open up pathways between contaminated sources and environmental receptors. These potential impacts are assessed within the relevant aspect chapters such as geology and soils (chapter 10), population and health (chapter 13) and road drainage and the water environment (chapter 14).

5.9 Heat and radiation

5.9.1 The EIA Regulations introduced a requirement to consider the likely significant effects of the Proposed Scheme on heat and radiation.

5.9.2 The construction and operation of the Proposed Scheme would not introduce any source of radiation and would only generate limited amounts of heat from technology. The assessment of heat and radiation is therefore not considered relevant to the Proposed Scheme and has been scoped out of further assessment.

5.10 Transboundary effects

5.10.1 Regulation 32 of the EIA Regulations requires the consideration of any likely significant effects on the environment of another European Economic Area State.

5.10.2 Guidance upon the consideration of transboundary effects is provided in the Planning Inspectorate's Advice Note Twelve: Transboundary Impacts and Process (2018).

5.10.3 A screening matrix is included in Appendix E which provides the consideration of transboundary effects for the Proposed Scheme, taking guidance from Advice Note Twelve.

5.11 Supporting assessments

Habitats Regulations Assessment

5.11.1 A Habitats Regulations Assessment (HRA) stage 1 screening exercise was undertaken at PCF Stage 2 (Jacobs, 2019). The HRA identified possible source-receptor pathways to designated sites, as detailed in chapter 9, biodiversity. However, it concluded that no likely significant effects on any European sites are anticipated, when considered alone or in combination with other plans and projects.

5.11.2 Natural England will be consulted on the conclusions of the screening exercise to confirm that an Appropriate Assessment is not required.

Water Framework Directive

5.11.3 The impact of the Proposed Scheme on Water Framework Directive (WFD) objectives is being assessed in line with the Planning Inspectorate's Advice Note Eighteen, The Water Framework Directive (2017). A Preliminary WFD assessment, including screening and scoping, is provided in Appendix K. A standalone WFD compliance assessment will be prepared as an appendix to the Environmental Statement and the conclusions summarised in the road drainage and water environment chapter of the Environmental Statement.

Flood Risk Assessment

5.11.4 A Flood Risk Assessment will be undertaken and reported within a standalone report which will form an appendix to the Environmental Statement. To avoid duplication, the road drainage and water environment chapter of the Environmental Statement will cross refer to this report and summarise where appropriate.

Health Impact Assessment

5.11.5 The impact of the Proposed Scheme on health will be assessed in the population and health chapter of the Environmental Statement. This in turn will be supported by technical appendices as required. A standalone Health Impact Assessment (separate from the EIA) will not be undertaken.

5.12 Environmental Statement

5.12.1 The results of the EIA will be reported within an Environmental Statement. An outline structure of the Environmental Statement is provided in table 5.2.

Table 5.2: Outline structure of the Environmental Statement

Subject	Description
Non-technical summary (NTS)	A summary of the EIA using non-technical language. The NTS will summarise the scheme description, alternatives considered, the likely significant effects, and the proposed mitigation, monitoring and enhancement requirements.
Chapter 1. Introduction	A brief introduction to the scheme, legislative and policy framework, competent expertise used to undertake the EIA, and the purpose and structure of the Environmental Statement.
Chapter 2. The project	Description of the scheme location, the need for the scheme, scheme objectives, and baseline scenario. A scheme description will be provided comprising information on the site, design, and physical characteristics of the development. The scheme description will describe both the construction and operation of the scheme, as well as long term management and a statement of whether the EIA is to consider decommissioning.
Chapter 3. Assessment of alternatives	Description of the main alternatives considered during the design and development of the scheme, and the justification for the choice of the preferred option, including a comparison of environmental effects.
Chapter 4. Environmental assessment methodology	This chapter will set out the scope of the EIA, including a summary of how this has been influenced by statutory consultation. The general assessment approach will be detailed including the guidance and methodologies to be used, general assessment criteria and terminology to be used, and the approach to mitigation, enhancement, and monitoring.
Chapter 5. Air quality	Chapters 5-14 will assess the potential significant effects from the Proposed Scheme. Each of the specialist chapters will include the following: • competent expert evidence • legislative and policy framework • assessment methodology • assessment assumptions and limitations • study area • baseline conditions • potential impacts • design, mitigation and enhancement measures • assessment of likely significant effects • monitoring requirements
Chapter 6. Cultural heritage	
Chapter 7. Landscape	
Chapter 8. Biodiversity	
Chapter 9. Geology and soils	
Chapter 10. Material assets and waste	
Chapter 11. Noise and vibration	
Chapter 12. Population and health	
Chapter 13. Road drainage and the water environment	
Chapter 14. Climate change	
Chapter 15. Assessment of cumulative effects	This chapter will assess the cumulative effects of other major developments which could overlap with the Proposed Scheme.
Chapter 16. Summary	Summary of the residual effects (highlighting where significant residual effects are predicted), and a summary of mitigation measures and monitoring requirements. This will form the basis of a commitments schedule to be included within the EMP.
Technical appendices and figures (including location, design, and constraints plans).	

6. Air quality

6.1 NNNPS requirements

6.1.1 The National Networks National Policy Statement (NNNPS) sets out the Government's policies to deliver the development of Nationally Significant Infrastructure Projects (NSIP) on the national road and rail networks in England. The Secretary of State (SoS) uses the NNNPS as the primary basis for making decisions on Development Consent Order (DCO) applications.

6.1.2 Key policy from the NNNPS relevant to this aspect is set out below:

- Paragraphs 5.3-5.4 of the NNNPS outline the potential impact of construction or operation of national network projects (i.e. changes in pollutant emissions) on human health as well as protected species and habitats. These paragraphs also outline UK legislation such as local air quality objectives (AQO) as well as EU legislation, such as limit values (LV) for the main pollutants in the Ambient Air Quality Directive (2008/50/EU), which Member States are required to meet by various dates.
- National AQOs are defined in the Air Quality (England) Regulations 2000 and the Air Quality (England) (Amendment) Regulations 2002. The EU Ambient Air Quality Directive (2008/50/EU) forms the basis for UK air quality legislation. EU LVs are transposed into UK law by the Air Quality Standards (England) Regulations 2010. The AQOs for nitrogen oxides (NO_x), nitrogen dioxide (NO_2) and particulate matter with an aerodynamic diameter less than 10 µm (PM_{10}) are shown in table 6.1. Pollutant $PM_{2.5}$ is also listed as the finer fraction of PM_{10} to include much of the combustion-based particulate, responsible for serious respiratory illnesses.

Table 6.1: AQOs for NO_x, NO_2, PM_{10} and $PM_{2.5}$

Pollutant	Concentration	Averaging period
Nitrogen Oxides (NO_x)	30 µg/m^3	Annual mean
Nitrogen Dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-Hour mean
	40 µg/m^3	Annual mean
Particulate Matter (PM_{10})	50 µg/m^3, not to be exceeded more than 35 times a year	24-Hour mean
	40 µg/m^3	Annual mean
Particulate Matter ($PM_{2.5}$)	25 µg/m^3	Annual mean

- Paragraphs 5.6-5.9 state that where the impacts of any project may have a significant effect on air quality, then an assessment must be undertaken as part of the environmental statement. These paragraphs then go on to describe that the environmental statement must include existing air quality levels, forecasts of air quality at the time of project opening and significant effects on air quality, using the Department for Environment, Food and Rural Affairs' (Defra) future national projections of air quality during the modelling process. A judgement on the risks as to whether the project would affect the UK's ability to comply with the Air Quality Directive must also be included.

- Paragraph 5.12 states the SoS must give air quality considerations substantial weight where, after taking into account mitigation, a project would lead to a significant air quality impact in relation to EIA and/or where they lead to a deterioration in air quality in a zone/agglomeration.
- Paragraph 5.13 states that the SoS should refuse consent where, after taking into account mitigation, the air quality impacts of the scheme will result in a pollution climate mapping (PCM) Census ID currently reported as being compliant with the Air Quality Directive becoming non-compliant; or affect the ability of a non-compliant area to achieve compliance within the most recent timescales reported to the European Commission at the time of the decision.
- Paragraphs 5.14-5.15 state that mitigation measures should be included in order to reduce any negative impacts caused by the proposed project. The SoS should then consider whether the mitigation measures put forward by the applicant are sufficient.

6.2 Study area

6.2.1 In line with the Design Manual for Roads and Bridges (DMRB) LA 105 guidance for air quality (Highways England, 2019; hereafter referred to as DMRB LA 105), potential air quality impacts from construction dust will be considered within 200m of all construction activities.

6.2.2 The study area for the operational local air quality assessment will be defined following the screening process outlined within DMRB LA 105, which identifies the Affected Road Network (ARN) based on predicted changes in traffic between the Opening Year Do-Minimum (DM) and Do-Something (DS) scenarios.

6.2.3 Traffic scoping criteria will only be applied to the Traffic Reliability Area (TRA), which is the area covered by the traffic model that the competent expert for traffic has identified as reliable for inclusion in an environmental assessment. For certain locations it may be appropriate to include other roads not in the TRA to better represent local sources of emissions which cannot be assumed from background source concentration maps. The traffic modelling team will be consulted where these instances arise. Roads will be included in the ARN where any of the following criteria are met between the Opening Year DM and DS:

- daily traffic flows change by more than 1,000 by annual average daily traffic (AADT)
- heavy duty vehicle (HDV) flows change by more than 200 AADT
- daily average or peak hour speed bands change
- horizonal road alignment changes by 5m or more

6.2.4 Sensitive receptors within 200m of the ARN will be identified and the study area will then be defined as the ARN plus all roads within 200m of any of these sensitive receptors.

6.2.5 This PCF Stage 3 assessment will apply a different traffic model to that applied at the previous PCF Stage 2. PCF Stage 3 traffic data are not yet available and therefore an ARN cannot be determined at this stage. Prior to modelled traffic data being available, the baseline conditions in this scoping report and potential receiving environment sensitivity have been assessed based on the PCF Stage 2 ARN and on the full PCF Stage 3 TRA. Figure 6.1 shows the extent of the TRA for PCF Stage 3 and the PCF Stage 2 ARN. It is noted that the ARN determined at PCF Stage 3 could vary from the PCF Stage 2 ARN, however, in the absence of any other data this approach is considered to be appropriate. As and when PCF Stage 3 traffic data are available, an ARN will be determined and baseline conditions and receiving environment sensitivity reviewed.

6.3 Baseline conditions

Baseline sources

6.3.1 A review of the baseline air quality conditions in the area around the Proposed Scheme has been undertaken based on information from the following sources:

- Chelmsford City Council 2019 Air Quality Annual Status Report (ASR; Chelmsford City Council, 2019)
- Braintree District Council 2019 Air Quality Annual Status Report (Braintree District Council, 2019)
- Braintree District Council 2018 Air Quality Annual Status Report (Braintree District Council, 2018)[2]
- Maldon District Council 2019 Air Quality Annual Status Report (Maldon District Council, 2019)
- Colchester Borough Council 2019 Air Quality Annual Status Report (Colchester Borough Council, 2019)
- Brentwood Borough Council 2019 Air Quality Annual Status Report (Brentwood Borough Council, 2019)
- Epping Forest District Council 2019 Air Quality Annual Status Report (Epping Forest District Council, 2019)
- Uttlesford District Council 2019 Air Quality Annual Status Report (Uttlesford District Council, 2019)
- Babergh District Council 2019 Air Quality Annual Status Report (Babergh District Council, 2019)
- Harlow Council 2019 Air Quality Annual Status Report (Harlow District Council, 2019)
- Havering Air Quality Annual Status Report for 2018 (Havering London Borough, 2019)
- Defra background maps (Defra, 2019)

[2] The Braintree ASR for 2018 was used to correct an error in the 2019 ASR monitored NO_2 concentrations.

- Defra PCM Census ID projections (Defra, 2020)
- Ordnance Survey Address Base+ (AB+) data
- Ecological open data (Natural England, 2020)
- Maps of the surrounding area

6.3.2 All data used in the baseline assessment are publicly available, with the exception of the Ordnance Survey AB+ data which was purchased to conduct the PCF Stage 2 assessment.

Baseline information

6.3.3 The Proposed Scheme is located within the administrative boundaries of Chelmsford, Braintree, Maldon and Colchester. The TRA for the Proposed Scheme extends over parts of Brentwood, Epping Forest, Uttlesford and Babergh, in addition to running along the Chelmsford/London Borough of Havering boundary on the M25 and the Epping Forest/Harlow boundary on the M11.

Monitoring

6.3.4 The aforementioned local authorities conduct NO_2 air quality monitoring using automatic monitors and diffusion tubes throughout their administrative areas. Table 6.2 shows the monitoring data for sites that are within 50m of the PCF Stage 2 ARN and PCF Stage 3 provisional order limits. Based on their proximity to the Proposed Scheme and PCF Stage 2 affected roads, these monitoring site locations would be most likely to experience any adverse effects from the Proposed Scheme. Figure 6.2 shows the location of these 25 monitoring sites. Of these, four sites measured NO_2 concentrations above the annual mean AQO in 2018 (40µg/m^3, see bold text in table 6.2); three in Braintree and one in Colchester. There is no clear trend in the monitoring results between 2014 and 2018 at these sites, suggesting exceedances of the AQO may persist at these locations for some years to come.

6.3.5 The baseline NO_2 monitoring data indicates that there are concentrations above the annul mean AQO in the vicinity of roads that are likely to be affected by the Proposed Scheme. However, future NO_x emissions are projected to decline, and the majority of monitoring locations are at the roadside instead of relevant exposure locations. Application of the Roadside NO_2 Projection Tool[3] would suggest compliance with AQOs is likely at these locations in 2027.

Table 6.2: Local authority monitoring data from diffusion tubes and automatic sites within 50m of the PCF Stage 2 ARN and PCF Stage 3 provisional order limits

Site ID	Site location	Site type	Local authority	Annual mean monitored NO_2 (µg/m^3)				
				2014	2015	2016	2017	2018
BR3	Foxden A12, Rivenhall	Roadside	Braintree	**52.1**	**47.1**	**46.4**	**51.9**	**46.1**
BR5	Chipping Hill Bridge	Roadside	Braintree	38.8	**40.8**	**45.9**	**45.3**	**40.4**

[3] https://laqm.defra.gov.uk/tools-monitoring-data/roadside-no2-projection-factor.html

Site ID	Site location	Site type	Local authority	Annual mean monitored NO_2 ($\mu g/m^3$)				
				2014	2015	2016	2017	2018
BR7	Stilemans Wood	Roadside	Braintree	33.5	30.5	28.3	31.6	29.2
BR9	Hotel Rivenhall	Roadside	Braintree	**43.6**	**43.9**	**46.3**	**46.1**	**40.7**
BR11	High Street Kelvedon	Roadside	Braintree	27.9	27.3	30.1	27.1	23.1
BR12	The Street Bradwell	Roadside	Braintree	37.3	31.3	31.3	31.5	25.9
CM4*	Baddow Road	Roadside	Chelmsford	-	25.8	29.6	29.5	27.5
CB01	12 Van Diemans Road	Roadside	Chelmsford	30.3	28.4	31.3	32.5	31.7
CB11	20 Brooklands Walk	Urban Background	Chelmsford	23.4	23.4	24.4	28.7	24.5
CB22	95 Baddow Road	Roadside	Chelmsford	32.4	30.3	32.4	32.3	33
CB26	214 Baddow Road	Roadside	Chelmsford	30.7	28.1	29.3	31.2	29.7
CB31	Main Road, Boreham	Roadside	Chelmsford	26.5	24.8	26.7	26	24.4
CB45	32 Van Diemans Road	Urban Background	Chelmsford	29.1	24	28.8	28.1	26.9
CB57	Goldlay House, Parkway	Roadside	Chelmsford	27.4	26.5	28.3	30.6	28.2
CB58	148 Baddow Road	Roadside	Chelmsford	36.8	35.8	36.6	**40.6**	37.2
CB68	Goldlay Avenue	Roadside	Chelmsford	**40.8**	28.7	29.9	31.9	32.3
CB77	Meadgate Avenue	Suburban	Chelmsford	-	24.3	25	27.8	25.5
CB84/CB 85/CB86	Baddow Road AQMS	Roadside	Chelmsford	-	24.3	27.5	29.8	26.4
CBC58	Lucy Lane South Monitor	Suburban	Colchester	29.1	28.6	32.2	27.3	29.9
CBC59	Lucy Lane North, Terala	Suburban	Colchester	33.3	29.7	33	32.9	32.3
CBC78	London Road Marks Tey, Damerosehay	Roadside	Colchester	29.4	24.2	26.9	23.7	25.2
CBC89	London Rd 220 Marks Tey	Roadside	Colchester	28.3	25.9	28.3	26.2	25.7
CBC90	London Rd 170 Marks Tey	Roadside	Colchester	29.1	25.3	28	26.6	27.1
CBC91	Blackberry Rd 2	Roadside	Colchester	23.6	20.5	22.7	22.4	21.7
CBC122+	Lucy Lane North, A12	Roadside	Colchester	-	-	**64.6**	**59.5**	**60.3**

*CM4 is an automatic monitoring site. All others in the table are diffusion tubes.

+Site CBC122 has now been removed owing to accessibility issues. A new site CBC131 was installed as a replacement. The location will be confirmed for the PCF Stage 3 assessment.

6.3.6 Chelmsford City Council undertakes PM_{10} monitoring at three automatic monitoring sites. The sites are located over 200m from the Proposed Scheme and PCF Stage 2 ARN and did not indicate any exceedances of the AQOs in 2018 (Chelmsford City Council, 2019). The local authorities for Braintree, Colchester and Maldon (co-located with the Proposed Scheme) do not undertake PM_{10} monitoring in their administrative areas as outlined in their respective ASRs.

6.3.7 Highways England commissioned a diffusion tube survey at PCF Stage 2 to cover gaps in local authority monitoring data with respect to the Proposed Scheme. A 13 diffusion tube monitoring survey was undertaken across 11 sites (see figure 6.2). The monitoring was undertaken over two periods in 2017 and 2018. Annualised results for the year 2018 were derived from both monitored periods in accordance with the guidance provided in Local Air Quality Management Technical Guidance (LAQM TG(16); Defra, 2018).

6.3.8 Table 6.3 shows the monitored concentrations at locations in proximity to the A12. The monitored NO_2 concentration was found to exceed the level of the annual mean AQO/EU Limit Value at site 10, positioned at the A12 roadside near junction 25 (Marks Tey). Site 10 is not at a PCM reportable location but has AQO relevant exposure locations nearby. These are set back from the road and as such would not be expected to exceed the AQO.

Table 6.3: Highways England monitored annual mean NO_2 concentrations, annualised to year 2018

Site ID	X	Y	LA	Annualised 2018 monitored NO_2 ($\mu g/m^3$)
1	575707	210324	Chelmsford	27.8
2	579507	212002	Braintree	29.6
3	212002	212002	Braintree	35.8
4	584055	216314	Braintree	27.6
5	585646	217244	Maldon	14.7
6	585529	218651	Braintree	15.0
7	587687	218873	Colchester	27.9
8	587781	220289	Braintree	21.1
9	589992	221243	Colchester	17.2
10	591515	223594	Colchester	**41.5**
11, 12 and 13	571645	207182	Chelmsford	31.7

Air quality management areas (AQMA)

6.3.9 There are currently eight AQMAs located within 200m of the TRA, as listed in table 6.4 and shown in figure 6.3.

6.3.10 The London Borough of Havering declared a Borough wide AQMA as a result of exceedances of legal limits for NO_2 and PM_{10}. Monitored concentrations at relevant exposure locations were still exceeding legal limits in 2018. The AQMA borders the TRA at the M25, where the Proposed Scheme may lead to increased traffic. After accounting for a future downward trend in emissions, it is possible that Opening Year annual mean NO_2 concentrations may be compliant at relevant exposure locations in parts of the AQMA, but concentrations may remain higher near to the A12/M25.

6.3.11 In Brentwood, there are two AQMAs that are within 200m of the TRA. There have been no exceedances identified at relevant exposure locations in these AQMAs from 2016 to 2018. Monitoring over the next few years will determine whether the AQMAs can be revoked.

6.3.12 In Chelmsford, there are two AQMAs that still recorded exceedances at relevant exposure locations in 2018. At PCF Stage 2, the ARN intersected with the Chelmsford Army and Navy AQMA.

6.3.13 In Colchester, there are three AQMAs, all of which recorded exceedances in 2018. At PCF Stage 2, the Lucy Lane North AQMA was adjacent to the ARN.

Table 6.4: AQMAs located within 200m of the TRA

AQMA	Local authority	Date of declaration	Level of exceedance (maximum monitored/modelled concentration at a location of relevant exposure)	
			At declaration (µg/m^3)	2018 (µg/m^3)
Havering AQMA	London Borough of Havering	Declared 11/09/2006	n/a	**45.6**
Brentwood AQMA No. 2	Brentwood Borough Council	Declared 10/01/2005	**53.4**	28.2
Brentwood AQMA No. 4	Brentwood Borough Council	Declared 10/01/2005	**76.0**	33.3
Chelmsford Army and Navy AQMA	Chelmsford City Council	Declared 01/12/2005 Amended 01/10/2012	**51.0**	**41.8**
A414 Maldon Road, Dansbury	Chelmsford City Council	Declared 08/10/2018	**47.3**	**44.6**
Area 4 - Lucy Lane North, Stanway	Colchester Borough Council	Declared 01/2021, Amended 02/2013	**55.3**	**47.6**
Area 1 – Central Corridors	Colchester Borough Council	Declared 05/2001, Amended 02/2013	**65.9**	**52.5**
Area 2 - East St and Ipswich Road	Colchester Borough Council	Declared 01/2001, Amended 02/2013	**45.2**	**41.2**

Backgrounds

6.3.14 Defra provide background maps for a range of pollutants for all years from 2017 to 2030, which provide predicted background pollutant concentrations for 1km x 1km grid squares across the UK. Background concentrations represent the average concentration in each grid square, rather than the concentrations at a specific location e.g. immediately adjacent to the A12. Background concentrations based on 2017-projected fleets (Defra, 2019) were analysed as this was the latest available dataset at the time of this scoping exercise. The range of background concentrations for the grid squares that cover the provisional order limits and the wider TRA are detailed in table 6.5. The background concentrations in grid squares covering the provisional order limits and the TRA are below the AQOs for annual mean NO_2, NO_x and PM_{10}.

Table 6.5: Background pollutant concentrations (µg/m^3) in the TRA for year 2018

Location	**NO_2**	**NO_x**	PM_{10}
Provisional order limits	10.4 - 22.3	14 - 32.9	15.6 - 19.3
TRA	8.3 - 23.9	11.1 – 36.0	13.3 - 20.5
	Annual Mean Objective 40 µg/m^3	Annual Mean Objective 30 µg/m^3	Annual Mean Objective 40 µg/m^3

Pollution Climate Mapping Census IDs

6.3.15 The PCM model is a collection of models provided by Defra (Defra, 2020). These were developed to report on compliance with the European Air Quality Directive (EU Directive (2008/50/EC)) and are run by Ricardo Energy & Environment (on behalf of Defra).

6.3.16 In accordance with DMRB LA 105, three PCM Census IDs that correspond with the PCF Stage 2 ARN have been identified; the A12 (ID 802006208), A130 (ID 802058301) and A1124 (ID 802007324). The modelled PCM 2018 NO_2 concentrations at these Census IDs (i.e. roadside receptors) are 38.3µg/m^3, 26.3µg/m^3 and 22.8µg/m^3, respectively; therefore, the modelled concentrations are below the NO_2 EU limit value (40µg/m^3).

6.3.17 There are 39 PCM Census IDs within the wider PCF Stage 3 TRA. Figure 6.3 shows the location of all PCM Census IDs within the Stage 3 TRA. Of these, one Census ID has a modelled PCM NO_2 concentration above 40µg/m^3 in 2018: Census ID 802046211 on the A12 (45.7µg/m^3). However, the PCM model projects that it will become compliant with the EU limit value in 2021, before the Proposed Scheme Opening Year. All other Census IDs in the TRA are below the NO_2 EU limit value in 2018.

Human health receptors

6.3.18 Locations that are sensitive to air quality include residential properties and buildings used by the young, elderly and other susceptible populations, such as schools and hospitals (DMRB LA 105). Figure 6.3 shows the location of all sensitive receptors within 200m of the PCF Stage 2 ARN. This figure indicates that there are a large number of human receptors within 50m of roads triggering traffic screening criteria (based on the PCF Stage 2 ARN). The Opening Year NO_2 concentrations at these receptors were modelled during PCF Stage 2. The highest modelled Opening Year receptor concentration, based on the 'Option 2' design (see chapter 3 for a description of the PCF Stage 2 options), was 35.5 µg/m^3. This implies that an exceedance owing to the Proposed Scheme cannot be ruled out.

6.3.19 There may be other sensitive receptors identified when the ARN is re-defined in the PCF Stage 3 assessment. This is because the TRA coverage will be larger than at PCF Stage 2 owing to the inclusion of other major roads, such as the M25, M11 and A120. The traffic model will also be updated prior to the PCF Stage 3 assessment. Sensitive receptors will be included in the local air quality assessment should they be deemed to be at risk of exceedance. Furthermore, sensitive receptor locations of future planning applications and development allocations for the four local plan areas will be identified. From this, it will be possible to identify receptors with increased risk of exposure in the Opening Year.

Ecological receptors

6.3.20 Nitrogen deposition can damage vegetation directly or affect plant health and productivity. At PCF Stage 2, the Tiptree Heath Site of Special Scientific Interest (SSSI) was found to be within 200m of the ARN and to have nitrogen sensitive features. In accordance with DMRB LA 105, a larger number of site designations will be considered in the PCF Stage 3 assessment. A preliminary desk study indicates that there are 39 SSSIs, six Special Protection Areas (SPA), six Ramsar sites, six Special Areas of Conservation (SAC), 83 areas of ancient woodland and 18 Local Nature Reserves (LNR) within 200m of the TRA. There are no Nature Improvement Areas near the PCF Stage 3 TRA. There are also Local Wildlife Sites (LWS) and veteran trees located within the PCF Stage 3 TRA, which will be included in the PCF Stage 3 assessment, where the qualifying change in traffic criteria are met.

6.3.21 A comprehensive list of relevant designated sites will be known when the PCF Stage 3 ARN is defined, and will be assessed within the EIA. The Proposed Scheme has the potential to alter the nitrogen deposition with respect to critical loads at those sites found to be near the ARN. The outcomes of which will be confirmed in consultation with a competent expert for biodiversity.

Future baseline

6.3.22 The Opening Year (2027) baseline conditions will be established by following the methodology outlined in section 6.7, based on a DM traffic scenario. The DM traffic scenario will be representative of the predicted growth in traffic, accounting for local and regional development. Opening Year vehicle emission estimates will use fleet proportions for 2027 as per the HE speed banded emission tool (Version 2.4) (Highways England, 2020).

6.3.23 Cumulative effects are implicit in the future DM and DS scenarios because committed developments will be included in the traffic model. Cumulative effects in the Construction Year scenario will be considered as part of the cumulative effects assessment.

Value of receptors

6.3.24 In the absence of specific guidance as part the PCF Stage 3 assessment, all sensitive receptors will be considered of equal (high) value.

Receiving environment sensitivity

6.3.25 The baseline conditions described above have been used to define the receiving environment sensitivity with reference to the criteria proposed within Table 2.11a/b of DMRB LA 105. Considering the above, the sensitivity of the receiving environment would be considered on balance to be medium for the following reasons:

- 2018 monitored exceedances of the AQO for NO_2 within the study area
- monitoring concentrations at Lucy Lane North AQMA which indicated exceedance of the AQO for NO_2 in 2018
- concentrations modelled for sensitive receptors at PCF Stage 2 which were near 36 µg/m^3 in the Opening Year
- the potential exceedance of lower critical load thresholds through nitrogen deposition at designated ecological sites identified within 50m of the ARN

6.4 Potential impacts

Construction

6.4.1 Construction activities (i.e. from within the order limits and trackout) can give rise to emissions of dust, which could cause damage to vegetation or annoyance associated with the soiling of surfaces. Construction dust emissions can also elevate airborne particulate matter concentrations at off-site locations, which may affect human health if mitigation measures are not implemented. There is potential for adverse impacts to arise from the deposition of construction dust at sensitive receptors. Therefore, a construction dust assessment will be undertaken to determine the construction dust risk potential, as per DMRB LA 105.

6.4.2 Increases in HDV movements on roads, associated with construction activities, can lead to elevated NO_x and PM_{10} emissions on affected roads. There is potential for adverse impacts to occur at sensitive human health receptors, designated ecological sites and PCM receptors if pollutant concentrations are increased as a result of construction HDV traffic. DMRB LA 105 states that a construction traffic assessment should be completed if the construction duration is longer than 2 years. The construction duration for the Proposed Scheme is currently planned for 2023 to 2027, so would meet this criterion. Therefore, a construction traffic assessment will be completed for the worst-case construction year as per DMRB LA 105 (likely to be 2024).

Operation

6.4.3 There is potential for the Proposed Scheme to adversely influence (i.e. increase) pollutant concentrations at sensitive human health receptors and designated ecological sites. These will be assessed in the PCF Stage 3 local air quality assessment following a detailed methodology. As per DMRB LA 105, a local air quality assessment is required where any of the traffic scoping criteria in section 6.2 are triggered on roads within 200m of sensitive receptors.

6.4.4 In accordance with DMRB LA 105, PCM receptors will be modelled for the EU compliance assessment where any ARN road is located on a PCM Census ID road with qualifying (i.e. reportable) features.

Summary of scope

6.4.5 Table 6.6 summarises the proposed scope for air quality. These matters have been scoped in based on the presence of sensitive receptors and PCM Census IDs in the vicinity of the Proposed Scheme.

Table 6.6: Summary of air quality scope

Matter	Scoped in - construction	Scoped in - operation
Construction dust receptors (human and ecological)	✓	*n/a*
Human health receptors	✓	✓
Designated ecological sites	✓	✓
PCM compliance risk	✓	✓

6.5 Design, mitigation and enhancement measures

Construction

6.5.1 The Construction Environmental Management Plan (CEMP) would adopt best practice measures to control fugitive dust (and hence avoid or reduce potential impacts) in compliance with DMRB LA 105. The contractor would enter into pre-works discussions with affected local authorities to agree the method of works and appropriate dust mitigation measures outlined within the CEMP. Mitigation measures would include the dampening down of surfaces, planning the site layout so that machinery and dust-causing activities occur as far from receptors as possible, erecting screens or barriers around the dust-causing activities or the site boundary, covering stockpiles to prevent entrainment by wind and undertaking regular monitoring. With best practice construction mitigation measures, there are unlikely to be significant air quality effects resulting from construction dust.

Operational

6.5.2 DMRB LA 105 states that "*where the air quality assessment concluded that the project triggered a significant air quality effect and/or affect the UK's reported ability to comply with the Air Quality Directive in the shortest timescales possible, a project air quality action plan (PAQAP) shall be included in the air quality assessment*".

6.5.3 If required, mitigation measures set out in a PAQAP should be viable and be provided with a quantification of the change in concentrations associated with the measure.

6.6 Description of the likely significant effects

6.6.1 In order to determine whether the Proposed Scheme could result in any significant effects, professional judgement has been informed by the following sources of information:

- information presented in section 6.3 regarding baseline conditions
- knowledge gained at PCF Stage 2
- the TRA for PCF Stage 3
- DMRB LA 105 guidance, where appropriate

6.6.2 Based on the above, a range of effects are likely to occur with respect to human, PCM and ecological receptors.

6.6.3 With respect to human receptors, it is considered unlikely that exceedances of AQOs are likely to occur in the Opening Year given the downward trend in emissions from road vehicles as evidenced by the results obtained at PCF Stage 2 where the maximum concentration of 35.5 µg/m^3 was predicted. More specifically, there was one receptor in the DM and three receptors in the DS with NO_2 concentrations greater than 34.0 µg/m^3. However, these results were based on a simple modelling approach and using the output from a different traffic model than is proposed to be used at PCF Stage 3. It should be noted that the base year of the traffic model for PCF Stage 2 was 2016 and this will shift to 2019 for the environmental statement at PCF Stage 3. There is therefore potential for the traffic data which will be considered at PCF Stage 3 to differ to that previously assessed at PCF Stage 2. Furthermore, there is no obvious downward trend in annual mean concentrations reported in table 6.2. Whilst the scheme itself is considered unlikely to cause exceedances of the annual mean NO_2 AQO, given the AQO is currently exceeded in the study area, future trends are uncertain and traffic impacts may be different than assessed previously. A detailed assessment is therefore required at Stage 3 to confirm the scheme will not have a significant impact on air quality at human health receptors.

6.6.4 The risk of the Proposed Scheme affecting compliance with AQOs within AQMAs in proximity to the PCF Stage 3 TRA in the opening year is again considered to be low based on the results obtained at PCF Stage 2. The PCF Stage 2 assessment determined that the AQMA of most concern is the Lucy Lane AQMA, declared by Colchester Borough Council. Based on the maximum reported 2018 monitored concentration in this AQMA (i.e. 60.3 µg/m^3 and distance corrected to 47.7 µg/m^3 to the nearest relevant exposure location), the previous two years of monitoring which also recorded substantial exceedances, and the fact that the relevant exposure location is upwind of the PCF Stage 2 ARN, there is a potential risk, albeit small, of the annual mean NO_2 AQO being exceeded even allowing for the downward trend in road traffic emissions expected by the opening year 2027. It's worth noting that site CBC122 (which recorded 60.3 µg/m^3) has now been relocated away for the roadside owing to accessibility issues. Monitoring data obtained at this new location in 2019 will be used to inform the environmental statement at PCF Stage 3.

6.6.5 Exceedance of AQOs at relevant receptors with respect to construction dust is unlikely to occur if appropriate mitigation is put in place during the construction phase.

6.6.6 The risk of affecting compliance with the EU LVs in the Opening Year at PCM Census IDs in the shortest possible timeframe is considered low based on current PCM compliance reporting for the Opening Year. At this stage, the PCM Census IDs that will be on the PCF Stage 3 ARN are unknown pending receipt of the new traffic data. At PCF Stage 3, and as advised by LA 105, the results of local modelling will be used to assess the risk of compliance as opposed to PCM model outputs. In places, local modelling results have the potential to differ from PCM model projections.

6.6.7 There is a risk that compliance with the EU LVs in the worst-case construction year (i.e. likely to be 2024) at PCM Census IDs may be affected. Most construction traffic accessing the Proposed Scheme will use the A12 corridor. Hence, an ARN is likely to be triggered as a result. Localised modelling will then be undertaken for roadside reportable receptors as well as relevant receptors.

6.6.8 The Proposed Scheme has the potential to adversely affect designated ecological habitats. The number of ecological habitats is not known at this stage but will exceed those assessed at PCF Stage 2. It is unlikely that significant effects associated with construction dust would occur at designated sites, if appropriate mitigation is put in place. However, traffic associated with the construction and operation of the Proposed Scheme have the potential to cause an exceedance of lower critical load thresholds, or for nitrogen deposition rates to exceed 1% of the lower critical load, at some sites, which would trigger the need for further assessment. There is, therefore, a risk that the Proposed Scheme could have significant effects at designated ecological receptors.

6.6.9 Accounting for considerations stated in paragraphs 5.12 and 5.13 of the NNNPS, the air quality risk from the Proposed Scheme in the opening year is considered on balance to be low with respect to meeting AQO's and EU LV's.

6.7 Assessment methodology

6.7.1 The proposed air quality assessment methodology was discussed with local authority environmental health officers during the preparation of this scoping report. The proposed approach for air quality assessment meets the NNNPS policy requirements outlined in section 6.1.

Construction dust

6.7.2 A construction dust assessment will be undertaken in accordance with DMRB LA 105. The dust assessment will consider all sensitive receptors within 200m of all construction activity in order to determine the construction dust risk potential of the project to the receiving environment. The risk potential will be used to inform proposed mitigation measures. In combination with best practice mitigation measures, to be outlined in the CEMP, it is unlikely that there would be significant effects associated with the air quality impacts of construction dust.

Local air quality operational traffic (and construction traffic, where applicable)

6.7.3 The potential impacts of the Proposed Scheme will be assessed in accordance with DMRB LA 105. It is proposed that a detailed level of air quality assessment be undertaken in order to assess the potential for air quality effects associated with the Proposed Scheme. In line with DMRB LA 105, a detailed assessment is normally undertaken where there is potential for exceedances of the AQOs.

6.7.4 The main steps in the operational air quality assessment methodology will be:

- **Study area:** The study area will be defined from the TRA based on changes in modelled traffic between the Opening Year DM and DS, as described in section 6.2. A representative number of sensitive human health receptors will be selected, which will include all receptors with a likelihood of exceeding the air quality threshold. The siting of receptors will be assisted by emissions modelling. Ecological transect locations and PCM compliance receptors will be confirmed.
- **Emissions calculations:** Emission rates for NO_x and PM_{10} will be calculated from speed-banded traffic data inputs using v2.3 of the Highways England emission calculation tool. Emission factors in the tool have been back-casted/forecasted based on Defra-established year 2017 fleets (Defra, 2019). Annualised emissions for the study area will be calculated to understand the cause of any air quality effects.
- **Dispersion modelling:** Annual mean concentrations of NO_x and PM_{10} at receptors will be modelled using the Air Dispersion Model Software (ADMS-Roads) version 5.0 (Cambridge Environmental Research Consultants, 2020).
- **Verification:** Base year modelled road NO_x concentrations will be compared to monitored road NO_x to account for any systematic bias in the air quality dispersion modelling approach, following the methodology described in LAQM TG(16). The verification process will identify whether adjustment(s) to the raw modelled road NO_x concentrations will be required.
- **Post-processing/adjustment:** Verification based adjustment will be applied to the modelled Opening Year concentrations. The LAQM NO_x to NO_2 conversion tool (v8.1; Defra, 2020) will be applied to calculate annual mean NO_2 concentrations at sensitive human health and compliance receptors. Long term trend adjustment factors will be applied to annual mean NO_2 and NO_x concentrations at human health and ecological receptors in accordance with the gap analysis methodology described in DMRB LA 105.
- **PCM**: PCM compliance risk assessment will be conducted separately for those Census IDs coinciding with the PCF Stage 3 ARN.
- **Assessment of significance:** The significance of the environmental impact for individual matters (ecological/human health) will be determined following the DMRB LA 105 criteria outlined in the remainder of this section.

6.7.5 The significance of an environmental impact is a function of the sensitivity of the receptor and the scale or magnitude of the impact. The sensitivity of all receptors, such as dwellings, hospitals or schools, is assumed to be equal (high). The magnitude of change is determined for each receptor based on the difference in pollutant concentration between the Opening Year DM and DS scenarios. The magnitude of change criteria for the assessment are shown in table 6.7 (see also Appendix C).

Table 6.7: Air quality magnitude of change criteria

Magnitude of change	DM to DS change in annual mean NO_2 and PM_{10} ($\mu g/m^3$)
Imperceptible (< 1 % +/- of AQO)	< 0.4$\mu g/m^3$
Small (1-5 % +/- of AQO)	0.4 – 2$\mu g/m^3$
Medium (5-10 % +/- of AQO)	2 – 4$\mu g/m^3$
Large (>10 % +/- of AQO)	> 4$\mu g/m^3$

6.7.6 The number of receptors showing a small, medium or large magnitude of change will be counted where they are above the UK air quality thresholds. DMRB LA 105 provides guidance on the number of receptors in each magnitude of change category that could constitute a significant effect. The significance categories and guideline receptor numbers are summarised below in table 6.8. These are guideline values, based on the considered opinion of Highways England, and are intended to help provide consistency across road scheme assessments. The number of receptors in each guideline band will be used to inform professional judgement on the significant effects of the Proposed Scheme.

Table 6.8: Guideline to the number of receptors constituting a significant effect

Magnitude of change in pollutant concentration	Number of receptors with:	
	Worsening of AQO already above objective or creation of a new exceedance	Improvement of an AQO already above objective or the removal of an existing exceedance
Large	1 to 10	1 to 10
Medium	10 to 30	10 to 30
Small	30 to 60	30 to 60

PCM compliance risk assessment

6.7.7 Highways England's PCM compliance risk assessment test (DMRB LA 105) has been developed to enable decision makers to judge a scheme's likelihood of delaying or preventing compliance with the EU Directive. The desk-based baseline conditions survey (section 6.3) did not identify PCM links of material concern for the Opening year 2027. However, the compliance risk assessment will be undertaken, as per Figure 2.79 of DMRB LA 105, to establish whether the PCF Stage 3 air quality modelling confirms the results of the PCM modelling. A risk to compliance would be identified where:

- there is a modelled Opening Year exceedance of the air quality thresholds for any PCM link; or
- there is a modelled Opening Year exceedance of the air quality thresholds for any PCM link and the change in annual mean NO_2 concentration between the DM and DS is greater than +/- 0.4µg/m^3; and/or
- the project materially impacts on measures within local air quality or national plans for the achievement of compliance.

6.7.8 If a risk to compliance between DM to DS is identified (change in annual mean NO_2 concentration of > 0.4 µg/m^3), then mitigation would need to be proposed in a PAQAP. If the proposed measures in the PAQAP do not reduce the impact of the Proposed Scheme to within 0.4 µg/m^3 on any exceeding PCM links, professional judgement will be applied to determine whether the effects are significant. In determining significance, the following will be considered:

- the qualifying feature being affected e.g. little used or heavily used footpaths, residential properties, schools etc
- the level of change in concentration as a result of the Proposed Scheme and whether there is an overall worsening or improvement
- the number of features being affected, such as the number of PCM links resulting in a deterioration in air quality as a result of the Proposed Scheme

6.8 Assessment assumptions and limitations

6.8.1 The air quality impact assessment will be based on a series of computer models of future conditions. The process will begin with the modelling of future traffic flows, which is subject to its own inherent degree of uncertainty.

6.8.2 These traffic data are used in an emissions model, the emissions data are then fed into a dispersion model, and a total concentration derived to compare future air quality conditions both with and without the Proposed Scheme. The air quality models will draw on a number of other trends and parameters that must be projected into the future. The modelling process will include atmospheric dispersion modelling, which provides an estimate of concentrations arising from input emissions and historical meteorological data.

6.8.3 As with any computer model that seeks to predict future conditions, there is uncertainty in the predictions made. Elements of impact prediction such as the specific concentration of a given pollutant at a given property, or whether an exceedance of AQOs or EU LVs would or would not occur at a specific location, are not precise and are always subject to a margin of error. However, the assessment process is considered to be based on the most reasonable, robust and representative methodologies, taking advice from published guidance.

6.8.4 Sensitive receptors will be determined using Ordnance Survey AB+ dataset. There may in some cases be properties, such as those recently built, which are not yet present within these data sources.

7. Cultural heritage

7.1 NNNPS requirements

7.1.1 The National Networks National Policy Statement (NNNPS) sets out the Government's policies to deliver the development of Nationally Significant Infrastructure Projects (NSIP) on the national road and rail networks in England. The Secretary of State (SoS) uses the NNNPS as the primary basis for making decisions on Development Consent Order (DCO) applications.

7.1.2 Key policy from the NNNPS relevant to this aspect includes:

- Paragraph 5.120 states that the construction and operation of national networks infrastructure has the potential to result in adverse impacts on the historic environment.
- Paragraph 5.122 defines heritage assets as those elements of the historic environment that hold value to this and future generations because of their historic, archaeological, architectural or artistic interest. The sum of the heritage interests that a heritage asset holds is referred to as its significance (heritage value). Significance derives not only from a heritage asset's physical presence, but also from its setting.
- Paragraph 5.124 requires that non-designated heritage assets of archaeological interest that are demonstrably of equivalent significance to scheduled monuments should be considered subject to the policies for designated heritage assets.
- Paragraph 5.127 states that the applicant should describe the significance of any heritage assets affected, including any contribution made by their setting. The level of detail should be proportionate to the asset's importance and no more than is sufficient to understand the potential impact of the proposal on their significance. As a minimum, the relevant Historic Environment Record should have been consulted and the heritage assets assessed using appropriate expertise. Where a site on which development is proposed includes or has the potential to include heritage assets with archaeological interest, the applicant should include an appropriate desk-based assessment and, where necessary, a field evaluation.
- Paragraph 5.129 requires that in considering the impact of a proposed development on any heritage asset, the SoS should take into account the particular nature of the significance of the heritage asset.
- Paragraph 5.130 states that the SoS should take into account the desirability of sustaining and, where appropriate, enhancing the significance of heritage assets, the contribution of their settings and the positive contribution that their conservation can make to sustainable communities, including their economic vitality.
- Paragraph 5.131 states that substantial harm to or loss of grade II listed buildings and grade II registered parks and gardens should be exceptional and that substantial harm to, or loss of, scheduled monuments, grade I and II* listed buildings and grade I and II* registered parks and gardens should be wholly exceptional.

- Paragraph 5.132 states that any harmful impact on the significance of a designated heritage asset should be weighed against the public benefit of development, recognising that the greater the harm to the significance of the heritage asset, the greater the justification that will be needed for any loss.

7.2 Study area

7.2.1 The Design Manual for Roads and Bridges (DMRB) LA 106 Cultural Heritage Assessment (hereafter referred to as DMRB LA 106) (Highways England, 2019) guidance indicates that a study area for new roads "*shall include the footprint of the scheme plus any land outside that footprint which includes any heritage assets which could be physically affected*" and that should include "*the settings of any designated or other cultural heritage resource in the footprint of the scheme or within the zone of visual influence or potentially affected by noise*".

7.2.2 For the purposes of this scoping report, a study area extending 300m from the provisional order limits in all directions has been used to develop the initial baseline and identify designated and non-designated assets that may be physically affected by the Proposed Scheme or where their immediate settings may be affected. This study area is also used to characterise the potential for unknown archaeological remains within the footprint of the Proposed Scheme which would also have the potential to be directly affected. The size of the study area is informed by guidance on scoping given within DMRB and with accepted best practice, is considered appropriate due to the nature of the proposed works and sensitivity of the receiving environment.

7.2.3 Designated heritage assets data within a study area extending up to 1km from the provisional order limits in all directions have been collated and considered to ensure that designated assets have been identified to a sufficient distance to anticipate or identify any potential effects arising from changes within an asset's setting. It is recognised that significant effects on the value of heritage assets arising from changes to setting are unlikely beyond 1km.

7.2.4 The study area for the cultural heritage assessment is shown on figures 7.1 and 7.2.

7.3 Baseline conditions

Baseline sources

7.3.1 For the purposes of this report, cultural heritage comprises three matters, defined as:

- Archaeological remains: the material remains of human activity from the earliest periods of human evolution to the present. These could be buried traces of human activities, sites visible above ground, or moveable artefacts.
- Historic buildings: architectural, designed or other structures with a significant historical value. These could include structures that have no aesthetic appeal or structures not usually thought of as buildings, such as milestones or bridges. Conservation areas are considered within the historic building matter.
- Historic landscapes: the current landscape, whose character is the consequence of the action and interaction of natural and human factors.

7.3.2 To inform the baseline for the study area the following sources of information were consulted:

- The National Heritage List for England for information on designated heritage assets (scheduled monuments, listed buildings, registered parks and gardens, registered battlefields, World Heritage Sites, and protected wrecks).
- Heritage assets recorded on the Essex Historic Environment Record (HER) were provided by Essex County Council in May 2018.
- Information on conservation areas from Braintree District Council and Colchester Borough Council websites.
- A desk based assessment (DBA) has been completed which sets out the known assets within the study area (Jacobs, 2018).
- A Palaeolithic DBA (Wenban-Smith, 2020).
- Phase 1 geophysical (magnetometer) survey from junction 19 (Boreham) to junction 23 (Kelvedon South) undertaken between 6 December 2019 and 6 March 2020 (Headland Archaeology, 2020).

7.3.3 Phase 2 of the geophysical survey, from junction 23 to junction 25 (Marks Tey), is currently proposed to be undertaken post-harvest 2020.

Baseline information

7.3.4 There are a number of cultural heritage assets which have the potential to be impacted upon as a result of the Proposed Scheme. These assets include a range of known archaeological sites of Prehistoric, Roman and Medieval date. This includes settlement sites to the east of Chelmsford and nationally important Prehistoric finds, such as the long mortuary enclosure scheduled monument at Rivenhall, which sits within a landscape surrounded by other lower value assets and considered as one ritual landscape.

7.3.5 The Proposed Scheme also has the potential to affect the setting of nationally important high value buildings and parks and gardens such as Boreham House, Hatfield Place and Braxted Park and Gardens.

7.3.6 The area along the A12 has, in places, been extensively archaeologically investigated. Essex is a rich county archaeologically and the study area contains a range of high and medium value cultural heritage assets representing half a million years of occupation and settlement in this part of Essex.

7.3.7 There is high potential for the presence of unknown archaeological remains throughout the study area. In particular, the area around junction 19 (Boreham), the fringes of Witham and Kelvedon, the section between Feering and Marks Tey, and the area between Colemans Farm and Rivenhall End have high potential for the presence of unknown buried archaeological remains. Additionally, the area has high potential for Palaeolithic remains, in particular artefacts and palaeoenvironmental remains from Hoxnian lake and Blackwater Terrace deposits near Witham and at Marks Tey.

7.3.8 All cultural heritage assets within the study area are identified in figures 7.1 and 7.2 and a summary provided below. A summary gazetteer of all assets is provided in Appendix F:

- 417 listed buildings within the 1km study area and 77 of these within the 300m study area (two grade I, eight grade II* and 67 grade II)
- six scheduled monuments within the 1km study area and two of these are within the 300m study area
- five registered parks and gardens within the 1km study area and two of these are within the 300m study area (both grade II)
- eight conservation areas within the 1km study area and three of these are within the 300m study area

7.3.9 There are no world heritage sites, registered battlefields or protected military remains within 1km of the Proposed Scheme.

7.3.10 There are 15 historic landscape types (HLT) within the 1km study area (two medium value, six low value, and seven negligible value).

7.3.11 There are 375 areas of identified non-designated archaeological remains within the 300m study area and high potential for unknown non-designated below ground archaeological remains.

Future baseline

7.3.12 Future development, such as proposed additional phases of the Beaulieu Park Development, the Channels Development and Chelmsford North East Bypass (north-east of Chelmsford and within the western extent of the study area) may lead to changes to the baseline environment. The A120 Braintree to A12 scheme, which would tie in with the A12 south-west of Kelvedon, would also potentially lead to changes to the baseline environment (however, this is not yet a committed development). Development of Colemans Farm Quarry, south-west of Rivenhall End and in the vicinity of junction 22, may also lead to changes to the baseline environment.

Value of receptors

7.3.13 A preliminary assessment of the value of cultural heritage assets within the study area has been undertaken using professional judgement and guidance contained within DMRB LA 104 Environmental Assessment and Monitoring (Highways England, 2019) on a scale of negligible, low, medium, high and very high. The National Planning Policy Framework (NPPF) (DCLG, 2019) and Good Practice Advice Note 3 (GPAN 3): The Setting of Heritage Assets 2nd Edition (Historic England, 2017) have also been considered when assessing value.

7.3.14 All cultural heritage assets within the baseline have been assigned a value based on criteria in DMRB LA 104 and using professional judgement and the criteria in Appendix C. Table 7.1 summarises examples identified within the 300m study area.

Table 7.1: Value of receptors in the study area for cultural heritage

Value/ sensitivity	Description	Examples within the study area
Very high	Assets of very high importance and rarity, international scale and very limited potential for substitution.	None within study area
High	Assets of high importance and rarity, national scale, and limited potential for substitution.	• Grade I listed building Boreham House, grade II* listed buildings (Hatfield Place, The Crown Public House, Hatfield, Hole Farmhouse, Bridgefoot House, and The Barn south of Marks Tey Hall) • Grade II* registered park and garden at Braxted Park and grade II listed buildings including Prested Hall, Doggets Hammer Farm, Flipses and Easthorpe Green Farmhouse • Rivenhall Long Mortuary Enclosure, a scheduled monument
Medium	Assets of medium or high importance and rarity, regional scale, limited potential for substitution.	• Grade II registered parks and gardens (Boreham House, New Hall and Hatfield Priory), four conservation areas (Boreham Roman Road, Witham Town Centre, Kelvedon, and Feering) • Archaeological remains including two potential long barrows, hengiform monument and two cropmark sites with a range of identified features, a Roman Cemetery, two Anglo Saxon Cemeteries, palaeo-environmental deposits, and a moated site
Low	Assets of low or medium importance and rarity, local scale.	• Non-designated historic buildings such as agricultural buildings, industrial buildings and dwellings • Archaeological remains including possible ring ditches, enclosures or trackways identified through aerial photographs • Industrial sites such as the Kelvedon – Tiptree – Tollesbury light railway and former brickworks or tile kilns • Potential Roman roads • Defence structures, a WWII tank trap and a Cold War nuclear monitoring post • Gardens • Site of a deer park • Partially excavated archaeological sites recorded during development.
Negligible	Assets of very low importance and rarity, local scale.	• Non-designated archaeological remains such as field boundaries, undated cropmark features • Sites of non-designated archaeological assets that have now been removed • Findspots

7.4 Potential impacts

Construction

7.4.1 Potential impacts to cultural heritage assets during construction can be divided into physical impacts and impacts arising from changes in an asset's setting (if the setting is relevant to understanding and appreciating the heritage value of the asset).

7.4.2 Potential physical impacts on heritage assets which may occur during construction of the Proposed Scheme comprise:

- Partial or complete removal of archaeological remains or historic landscape elements (such as hedgerows and sections of protected lanes) within the footprint of the Proposed Scheme through groundworks associated with construction. This could include widening of the existing highway boundary or the creation of new offline sections, in addition to any service trenches and drainage features, topsoil stripping for compounds, the excavation of borrow pits and attenuation ponds and landscaping features.
- Impacts on archaeological remains within the footprint of the Proposed Scheme through their compression during construction, through the movement of machinery or within site compound or spoil storage areas.
- Impacts on archaeological remains through changes to groundwater levels caused by engineering activities associated with the Proposed Scheme.
- Impacts to historic buildings through subsidence due to groundwater dewatering. These impacts are assessed in chapter 14, road drainage and the water environment.

7.4.3 Potential impacts where the Proposed Scheme may affect the contribution made by setting to an assets value (if the setting is relevant to understanding and appreciating the heritage value of the asset) which may occur during construction comprise:

- The physical removal of, damage to, or severance of associated archaeological remains which form the setting of a heritage asset.
- The alteration to the setting of archaeological remains and historic buildings through the removal of vegetation or associated above-ground elements during construction.
- Temporary changes in the way in which sound and noise currently contribute to the heritage value of assets and changes to the setting of archaeological remains, historic buildings, or HLTs where that setting is relevant to understanding and appreciating its heritage value, during construction activities such as groundworks, placement of site compounds, and from increased construction traffic. This is not a reference to absolute noise levels or sound, or the noise or vibration impacts on the health and quality of life of people who live in or visit the area, which are assessed in chapter 12, noise and vibration.

7.4.4 In line with the scoping assessment questions presented in DMRB LA 106 Section 3.2, an initial assessment of potential impacts indicates that:

- No physical impacts are predicted on any listed buildings.

- There is the potential for construction activities to have a temporary impact on the value of historic buildings and HLT (where the setting is relevant to understanding and appreciating the heritage value of the asset) due to increases in the way in which sound and noise currently contribute to the heritage value of assets, and from dust.
- There is a high potential for archaeological remains to be present within the footprint of the Proposed Scheme that may be physically affected/removed by construction of the Proposed Scheme.
- There are HLT located within the footprint of the Proposed Scheme that may be physically affected.

7.4.5 Based on the above, impacts to archaeological remains, historic buildings, and HLT during construction are scoped in for further assessment.

Operation

7.4.6 Potential impacts to cultural heritage assets during operation can be divided into physical impacts and where the Proposed Scheme may affect the contribution made by setting to an assets value (if the setting is relevant to understanding and appreciating its' heritage value).

7.4.7 Potential physical impacts on heritage assets which may occur during operation of the Proposed Scheme comprise:

- removal of, or damage to, archaeological remains during maintenance works
- damage to archaeological remains, historic buildings, or HLT through pollutants

7.4.8 Potential impacts to the value of cultural heritage assets where the Proposed Scheme would alter the setting and its contribution to an assets value (if the setting is relevant to understanding and appreciating its heritage value) during operation comprise:

- Alterations to the setting of historic buildings where new infrastructure is present in key views towards, through and across an asset.
- Alterations to an asset's setting due to increases in the way in which sound and noise currently contribute to the heritage value of assets (this is not a reference to absolute noise levels or sound, or the noise or vibration impacts on the health and quality of life of people who live in or visit the area, which are assessed in chapter 12, noise and vibration) and light currently contribute to the heritage value of assets caused by the Proposed Scheme (visual intrusion is assessed in chapter 8, landscape).
- Severance of identifiable interrelationships due to the new length of road causing physical divisions between previously related cultural heritage assets.

7.4.9 In line with the scoping assessment questions presented in DMRB LA 106 Section 3.2, an initial assessment of potential impacts indicates that:

- There is limited potential for significant physical impacts to historic buildings and archaeological remains during operation.

- The value of historic buildings (where setting is relevant to the appreciation and understanding of that heritage value) has the potential to be impacted due to alteration to setting through increases in the way sound, noise and light currently contribute to the heritage value of assets during operation (visual intrusion is assessed in chapter 8, landscape).
- While archaeological remains have the potential for impacts to setting, the initial assessment of the archaeological remains within the study area is that their value is primarily derived from their physical remains and any intrusion on their setting during operation would have limited to no impact on our understanding and appreciation of these cultural heritage assets.

7.4.10 Based on the above, impacts to archaeological remains and historic buildings during operation are scoped in for further assessment. Historic landscapes would only be sensitive to the potential for increases in the way in which sound and noise currently contribute to their heritage value.

7.4.11 Using the criteria for the assessment of impact set out in Appendix C this would not be on a scale that would result in significant effects. Due to the current sound and noise environment, which includes the A12, changes are predicted to be no greater than minor adverse magnitude on HLT's of medium, low or negligible value, resulting in slight adverse effects or less. Based on this, impacts on HLT during operation are scoped out.

Summary of scope

7.4.12 Table 7.2 summarises the proposed scope for cultural heritage. As mentioned in section 7.4, there are interrelationships between cultural heritage and other environmental aspects, particularly noise and vibration (chapter 12), and landscape (chapter 8). The combined effect on the setting of cultural heritage assets from these aspects will be assessed within the cultural heritage assessment.

Table 7.2: Summary of cultural heritage scope

Matter	Scoped in - construction	Scoped in - operation
Archaeological remains	✓	✓
Historic buildings	✓	✓
Historic landscape	✓	×

7.5 Design, mitigation and enhancement measures

7.5.1 Design mitigation would include landscape design to avoid sensitive assets and viewpoints. For example, providing banks or screening planting between the road and a historic asset to soften the visual intrusion.

7.5.2 Additional mitigation is likely to include a programme of archaeological investigation and recording, prior to commencement of construction. This programme of works will be informed by the ongoing programme of geophysical and trial trenching surveys (see section 7.7).

7.5.3 Enhancement measures could include reinstatement of significant historic place names to mark historic routes or roads and reflect the wider historic landscape elements, and provision of interpretation boards at key sites.

7.6 Description of the likely significant effects

7.6.1 Potential types of impacts to heritage assets are described in section 7.4 above.

Construction

7.6.2 Archaeological remains, historic buildings and historic landscapes have been considered using the methodology outlined in section 7.7. This has assessed the potential for a physical impact likely to be on a scale that may result in significant effects. These impacts may extend to previously identified or unknown archaeological remains and wider historic landscapes. Assessment indicates that there would be no direct impact on the fabric of historic buildings within the study area. Potential impacts likely to be on a scale that may result in significant effects have been predicted on the setting of heritage assets.

Operation

7.6.3 Archaeological remains, historic buildings and historic landscapes have been considered using the methodology outlined in section 7.7. This has predicted the potential for a physical impact likely to be on a scale that may result in significant effects. These impacts may extend to previously identified or unknown archaeological remains but not to historic buildings or historic landscapes. Potential impacts likely to be on a scale that may result in significant effects have been predicted on the setting of heritage assets.

7.6.4 Likely significant effects are predicted on the setting of high value grade II listed building Doggets Hammer Farm located within 300m of the route between junction 24 (Kelvedon North) and junction 25 (Marks Tey). Also, within this section are the high value, grade II listed Flipses and Easthorpe Green Farmhouse which are 300m from the Proposed Scheme. Other likely significant effects on the setting of assets include:

- the expanded junction 19 (Boreham) would affect the entrance of the medium value grade II registered park and garden and listed building Boreham Hall
- the offline section of new road close to junction 24 would affect the entrance of the high value, grade II listed building Prested Hall
- junction 25 has the potential to affect the entrance of two high value, grade II listed buildings and one high value, grade II* listed building at Marks Tey Hall

7.6.5 There would be a potential significant effect on Doggets Hammer Farm due to severance of the asset from the surrounding rural agricultural landscape which forms its setting, and makes a positive contribution to its heritage value. Impacts on assets adjacent to junction 19, junction 24, and junction 25 would also experience potentially significant effects on value through alterations to setting due to the severance of the assets' entranceways which make a positive contribution to their heritage value.

7.6.6 Design changes around the Rivenhall Long Mortuary Enclosure scheduled monument (see chapter 3) have reduced the severity of the impact on the asset's setting arising from previous design options. Although some setting impact would remain, this is unlikely to constitute a significant effect.

7.6.7 There would be potential significant effects on non-designated archaeological remains between junction 22 (Colemans Interchange) and junction 23 (Kelvedon South) due to their removal during construction of the offline section.

7.7 Assessment methodology

7.7.1 All further assessment will be undertaken in accordance with the relevant sections of DMRB LA 106 with consideration of guidance such as the NPPF and The Setting of Heritage Assets (Historic England, 2017). The assessment of value (sensitivity) of assets and the magnitude of impact will be undertaken based on the assessment criteria in Appendix C. The significance of effects will be assessed in accordance with DMRB LA 104 (see chapter 5, assessment methodology).

7.7.2 The study areas used in further detailed assessment may be amended in consideration of a final Zone of Theoretical Visibility (ZTV), once available, to allow the full extent of potential impacts on the setting of cultural heritage assets to be fully assessed. Further information on the ZTV is included in chapter 8, landscape.

7.7.3 The current programme of archaeological evaluation will continue with a second stage of geophysical survey followed by a programme of archaeological trial trenching undertaken within the Proposed Scheme footprint. This will establish the nature, extent and survival of known and unknown subsurface archaeological remains and geoarchaeological potential.

7.7.4 The DBA (Jacobs, 2018) in conjunction with results from archaeological geophysical survey and trial trench evaluation (subject to programme confirmation) will inform the assessment of potential impacts on cultural heritage assets that will be undertaken within the cultural heritage chapter of the Environmental Statement.

7.7.5 The above methodology meets the NNNPS policy requirements outlined in section 7.1.

7.8 Assessment assumptions and limitations

7.8.1 This scoping assessment has undertaken a preliminary evaluation of value and potential for impacts commensurate for this stage of work. The assessed value and potential for impact on cultural heritage assets may change through fieldwork activities such as walkover surveys, site inspections, archaeological geophysical survey and trial trench evaluation.

7.8.2 Changes to the design of the Proposed Scheme and the introduction of construction elements beyond the footprint of the Proposed Scheme (such as construction compounds, borrow pits, etc.) have the potential to change both the cultural heritage baseline and the assessment of potential impacts.

7.8.3 No site visits have been undertaken for the production of this scoping report. A site walkover survey will be undertaken as part of the assessment to inform the cultural heritage chapter of the Environmental Statement.

8. Landscape

8.1 NNNPS requirements

8.1.1 The National Networks National Policy Statement (NNNPS) sets out the Government's policies to deliver the development of Nationally Significant Infrastructure Projects (NSIP) on the national road and rail networks in England. The Secretary of State (SoS) uses the NNNPS as the primary basis for making decisions on Development Consent Order (DCO) applications.

8.1.2 Key policy from the NNNPS relevant to this aspect includes:

- Paragraph 5.144 of the NNNPS states that where the development is subject to EIA, the applicant should undertake an assessment of any likely significant landscape and visual impacts in the environmental impact assessment and describe these in the environmental assessment. A number of guides have been produced to assist in addressing landscape issues. The landscape and visual assessment should include reference to any landscape character assessment and associated studies, as a means of assessing landscape impacts relevant to the proposed project. The applicant's assessment should also take account of any relevant policies based on these assessments in local development documents in England.
- Paragraph 5.145 states that the applicant's assessment should include any significant effects during construction of the project and/or the significant effects of the completed development and its operation on landscape components and landscape character (including historic landscape characterisation).
- Paragraph 5.146 states that the assessment should include the visibility and conspicuousness of the project during construction and of the presence and operation of the project and potential impacts on views and visual amenity. This should include any noise and light pollution effects, including effects on local amenity, tranquillity and nature conservation.
- Paragraph 5.149 states that landscape effects depend on the nature of the existing landscape likely to be affected and the nature of the effect likely to occur. Both of these factors need to be considered in judging the impact of a project on landscape. Projects need to be designed carefully, taking account of the potential impact on the landscape. Having regard to siting, operational and other relevant constraints, the aim should be to avoid or minimise harm to the landscape, providing reasonable mitigation where possible and appropriate.

8.2 Study area

8.2.1 The study area for the scoping stage, and for the forthcoming EIA, incorporates a buffer of approximately 2km from the proposed alignment, and a minimum of 1km from the draft order limits (illustrated on figure 8.1). This is based on the zone of theoretical visibility (ZTV), baseline context and field survey carried out to date. The ZTV illustrates the extent of theoretical visibility, which extends in some areas to several km from the Proposed Scheme. However, the ZTV is based upon a bare earth ground model and therefore only takes account of the visual screening provided by existing topography. The ZTV does not take account of surface features, such as buildings and vegetation, which could also provide screening. Landscape and visual effects beyond 1km distance are unlikely to be significant due to distance and intervening blocking features. Therefore, the study area is considered an appropriate extent to ascertain the wider landscape context surrounding the Proposed Scheme and to focus on the likely significant landscape and visual effects.

8.2.2 This approach is in accordance with the Design Manual for Roads and Bridges (DMRB), LA 107 Landscape and Visual Effects (Highways England, revision 2, 2020) (hereafter referred to as DMRB LA 107).

8.3 Baseline conditions

Baseline sources

8.3.1 The baseline conditions have been established through a review of existing desktop studies. The following sources have been used to inform the baseline:

- Braintree, Brentwood, Chelmsford, Maldon and Uttlesford Landscape Character Assessments (Chris Blandford Associates, 2006)
- Colchester Borough Landscape Character Assessment (Chris Blandford Associates, 2005)
- England's Light Pollution and Dark Skies (Campaign to Protect Rural England, 2019)
- Tranquillity Map England (Campaign to Protect Rural England, 2007)
- MAGIC Map application (Defra, 2020)
- Ancient Tree Inventory (Woodland Trust, 2020)

8.3.2 A site visit was carried out by two Chartered landscape architects in February 2017. The objectives of the site visit were to become familiarised with the study area, and to determine the scope of the landscape and visual impact assessment (LVIA) during winter when trees were not in leaf and the views most open.

Baseline information

8.3.3 Key constraints relevant to landscape and visual effects are illustrated on figure 8.1. There are no nationally designated areas of outstanding natural beauty (AONB) or national parks within the study area.

Landscape constraints

8.3.4 A local landscape designation, i.e. an area of landscape predominantly defined by landscape distinctiveness, is identified within the Chelmsford Local Plan (Chelmsford City Council, 2020) as 'Green Wedge' under Strategic Policy S11 The Role of the Countryside. The policy states that *"The Green Wedge has an identified intrinsic character and beauty and is a multi-faceted distinctive landscape providing important open green networks, which have been instrumental in shaping the City's growth, character and appearance… Development which materially harms the role, function and intrinsic character and beauty of the Green Wedge will not be approved".* The Green Wedge falls within a localised part of the study area, to the east of Chelmsford and west of the A12.

8.3.5 Blocks of ancient woodland located within the study area include Toppinghoehallwood, northeast of Boreham; Sparkey, Mope and Chantry Woods, east of Witham; and Kelvedon Hall Wood, south of Kelvedon. Trees with tree preservation order (TPO) status within the study area include some of the trees within the grounds of Boreham House, some of the trees within Hatfield Peverel, Witham and Kelvedon, and scattered specimens within rural areas such as north east of Rivenhall end at Durwards Hall. In addition, there are veteran, ancient and notable trees (as defined by the Woodland Trust) within the study area, including three veteran elms located south west of Witham along the B1389, south of Easthorpe Road and along the A12 south of Marks Tey.

8.3.6 Pockets of registered common land are also distributed within the study area. The Blackwater Rail Trail Country Park runs south from Witham, passing beneath the existing A12. A network of public rights of way (PRoW) runs throughout the landscape, crossing the existing A12 in places.

8.3.7 Heritage features help inform the sensitivity of the landscape and are relevant to the assessment of landscape and visual effects. As such, a brief summary of key cultural heritage assets relevant to the landscape assessment are described in this section (for a full description of the cultural heritage baseline, refer to chapter 7, cultural heritage).

8.3.8 Four registered parks and gardens are located within the study area. These are Boreham House and New Hall Boreham (both grade II), which are both close to the A12 at the western extent of the study area and within 100m of the Proposed Scheme; Hatfield Priory (grade II) south of Hatfield Peverel and approximately 700m south of the Proposed Scheme; and Braxted Park (grade II*) east of Rivenhall End and approximately 800m south-east of the Proposed Scheme. The southern extent of Terling Place registered park and garden (grade II) also lies within the study area, north-east of Hatfield Peverel and approximately 1.8km from the Proposed Scheme.

8.3.9 There are numerous conservation areas within the study area, including the Chelmer and Blackwater Navigation, and parts of Boreham, Witham, Kelvedon and Feering. There are several scheduled monuments within the study area, including the site of a long mortuary enclosure at Rivenhall End. Listed buildings are particularly concentrated within the historic core of settlements such as Boreham, Hatfield Peverel, Witham, Little Braxted, Kelvedon, Inworth and Feering. Several isolated listed buildings lie throughout the rural landscape surrounding the existing A12. Some of these, such as Prested Hall and Marks Tey Hall (both grade II listed), to the south of the existing A12 at the eastern extent of the study area, lie within large associated grounds and are accessed by long and distinctive driveways.

Landscape character

8.3.10 The study area falls within national character area (NCA) 86 South Suffolk and North Essex Clayland (Natural England, 2014). The landscape contains a complex network of ancient woods and parklands, species-rich hedgerows, and meadows with streams and rivers. There is a distinct feeling of enclosure within the NCA. To the east, the study area falls within NCA 111 Northern Thames Basin (Natural England, 2013). This is described as an ancient, wooded, arable landscape with a distinct sense of enclosure. Further key characteristics for these NCAs are presented in Appendix G.1.

8.3.11 At a regional scale, landscape character has been assessed within the Essex Landscape Character Assessment (Chris Blandford Associates, 2003). The study area falls within seven landscape character areas (LCA), presented within Appendix G.1 with the key characteristics and published sensitivity to major transportation developments and improvements.

8.3.12 At a local scale, the landscape within Chelmsford, Braintree and Maldon has been assessed within Braintree, Brentwood, Chelmsford, Maldon and Uttlesford Landscape Character Assessment (Chris Blandford Associates, 2006). At the eastern extent of the study area, around Marks Tey, the local landscape is assessed within Colchester Borough Landscape Character Assessment (Chris Blandford Associates 2005). The landscape character areas that fall within the study area, along with published guidance for these areas and published sensitivity to change, are presented in Appendix G.1 and illustrated on figure 8.2.

Perceptual qualities

8.3.13 The Campaign to Protect Rural England (CPRE) has undertaken a study of tranquillity in England and has mapped and published the results. CPRE highlight new roads as one of the greatest threats to remaining levels of tranquillity. The Tranquillity Map for England (CPRE, 2007) identifies tranquillity zones based on sources of noise and visual intrusion and the zones over which intrusion may be felt. Within the study area, Chelmsford urban area is indicated to be one of the least tranquil areas, whilst the rural parts of the study area are indicated to be more tranquil.

8.3.14 The CPRE mapping of England's light pollution and dark skies illustrates the influence of light pollution on the night skies within the study area. The study area is affected by night time light pollution, especially associated with the urban areas of Chelmsford and Whitham, as well as the A12 corridor. The night skies within more rural parts of the study area between key settlements are generally darker. However, there are no dark skies located within the study area, that is night skies with lighting levels of less than a quarter pixel.

Visibility and potential visual receptors

8.3.15 The landscape within the study area is generally low-lying and relatively flat, with very gentle undulations. While there are open views across agricultural fields, hedgerows, tree belts and woodlands restrict the distance of such views. Built development also limits the distance of views from within settlements. As such, the range of available views are generally local or middle-distance.

8.3.16 Potential visual receptors within the study area include:

- residents within properties on the peripheries of settlements including Boreham, Hatfield Peverel, Witham, Rivenhall End, Kelvedon, Feering, Messing, Easthorpe, Marks Tey, Copford Green and Copford
- residents within properties scattered throughout the rural landscape
- users of PRoW including long distance paths
- users of public open space, such as the Blackwater Rail Trail Country Park in Witham, Whetmead Local Nature Reserve (east of Whitham) and Brockwell Meadows Local Nature Reserve (Kelvedon)
- users of private open space, such as registered parks and gardens and golf courses
- people at their places of work, such as on the peripheries of Chelmsford and Witham
- travellers on the local road network, including the A12

Future baseline

8.3.17 Future development, such as proposed additional phases of the Beaulieu Park Development, the Channels Development, and Chelmsford North East Bypass (north-east of Chelmsford and within the western extent of the study area) may lead to changes to the baseline environment. The A120 Braintree to A12 scheme, which would tie in with the A12 south-west of Kelvedon, would also potentially lead to changes to the baseline environment (however, this is not yet a committed development). Development of Colemans Farm Quarry, south-west of Rivenhall End and in the vicinity of junction 22 (Colemans Interchange), may also lead to changes to the baseline environment. A proposed country park at Hanson's Bulls Lodge Quarry, north-east of Chelmsford, defined within the Chelmsford Local Plan (Chelmsford City Council, 2020), Strategic Growth Site Policy 6 – North East Chelmsford, is situated approximately 1.7km from the Proposed Scheme.

8.3.18 Proposed developments will be included in the consideration of cumulative effects. The future baseline of the LVIA will not include proposed developments (refer to section 8.8) but will include major committed development with full planning consent and where construction is underway at the time of assessment.

Value of receptors

8.3.19 DMRB LA 107 considers landscape and visual 'sensitivity' which incorporates judgements on 'value'. Landscape and visual sensitivity are established by assessing the value attached to a receptor and its susceptibility to the particular form of change likely to result from the individual development. The determination of sensitivity of landscape and visual receptors has been broadly based on the methodology set out within DMRB LA 107, as summarised in tables 8.1 and 8.2.

Table 8.1: Sensitivity of landscape receptors in the study area

Landscape sensitivity (susceptibility and value) of receptor/resource	Typical descriptions (from DMRB LA 107)	Examples within the study area
Very high	Landscapes of very high international/national importance and rarity or value with no or very limited ability to accommodate change without substantial loss/gain (i.e. national parks, internationally acclaimed landscapes - UNESCO World Heritage Sites).	None
High	Landscapes of high national importance containing distinctive features/elements with limited ability to accommodate change without incurring substantial loss/gain (i.e. designated areas, areas of strong sense of place - registered parks and gardens, country parks).	New Hall Boreham registered park and garden Boreham House registered park and garden Hatfield Priory registered park and garden Braxted Park registered park and garden Terling Place registered park and garden Blackwater Rail Trail County Park Proposed country park at Hanson's Bulls Lodge Quarry, north-east of Chelmsford

Landscape sensitivity (susceptibility and value) of receptor/resource	Typical descriptions (from DMRB LA 107)	Examples within the study area
Medium	Landscapes of local or regional recognition of importance able to accommodate some change (i.e. features worthy of conservation, some sense of place or value through use/perception)	Local landscape character areas: A2 Wooded Roman River Valley A5 Colne River Valley Slopes A7 Lower Chelmer River Valley A9 Blackwater River Valley Landscape sub area A9A B3 Southern Colchester Farmland B2 Easthorpe Farmland Plateau B4 Great Tey Farmland Plateau B17 Terling Farmland Plateau B18 Silver End Farmland Plateau B19 Langley Green Farmland Plateau B21 Boreham Farmland Plateau F1 Messing Wooded Farmland F3 Totham Wooded Farmland Medium sensitivity reflects that there is no national or local recognition of these landscapes, with the exception of heritage assets, and the ability to accommodate the nature of the Proposed Scheme to some extent due to presence of the existing A12 and other existing development within the landscape.
Low	Local landscape areas or receptors of low to medium importance with ability to accommodate change (i.e. non-designated or designated areas of local recognition or areas of little sense of place).	Landscape sub area B2A Low sensitivity reflects there is no national or local recognition of this landscape, with the exception of heritage assets (listed buildings), and the ability to accommodate the nature of the Proposed Scheme in the context of the existing A12 and other existing development within the landscape including Marks Tey, Copford and the railway line.
Negligible	Landscapes of very low importance and rarity able to accommodate change.	None

Table 8.2: Sensitivity of visual receptors in the study area

Visual sensitivity (susceptibility and value) of receptor/resource	Typical descriptions (from DMRB LA 107)	Examples within the study area
Very high	• Static views from and of major tourist attractions • Views from and of very important national/international landscapes, cultural/historical sites (e.g. National Parks, UNESCO World Heritage sites) • Receptors engaged in specific activities for enjoyment of dark skies	None
High	• Views by users of nationally important PRoW / recreational trails (e.g. national trails, long distance footpaths) • Views by users of public open spaces for enjoyment of the countryside (e.g. country parks) • Static views from dense residential areas, longer transient views from designated public open space, recreational areas • Views from and of rare designated landscapes of national importance	Views from residential properties, users of PRoW (including long distance paths and promoted cycle routes), public open space such as Blackwater Rail Trail County Park, the proposed country park at Hanson's Bulls Lodge Quarry, north-east of Chelmsford, local nature reserves, and registered parks and gardens are considered to have high sensitivity. This reflects their high susceptibility to the nature of the Proposed Scheme and the high value of their views. Visitors to Prested Hall (listed building, wedding venue and hotel) are considered to have high sensitivity given their proximity to the Proposed Scheme, their high susceptibility to the nature of the Proposed Scheme and the high value of their views.
Medium	• Static views from less populated residential areas, schools and other institutional buildings and their outdoor areas • Views by outdoor workers • Transient views from local/regional areas such as public open space, scenic roads, railways or waterways, users of local/regional designated tourist routes of moderate importance • Views from and of landscapes of regional importance	Views of users of locally identified open space allocations associated with schools and other institutional buildings, such as school playing fields and playgrounds are considered to have medium sensitivity. This reflects their medium susceptibility to the nature of the Proposed Scheme due to the generally urban context of these spaces and/or the medium value of their views due to the recreational amenity value of these spaces. Transient views by travellers on rural roads formally recognised by planning policy to be of landscape value, such as those defined as having 'protected lane' status where this is partially underpinned by landscape value. This reflects their medium susceptibility to the nature of the Proposed Scheme and the medium value of their views, due to the landscape and historic value attached to these lanes.

Visual sensitivity (susceptibility and value) of receptor/resource	Typical descriptions (from DMRB LA 107)	Examples within the study area
Low	• Views by users of main roads or passengers in public transport on main arterial routes • Views by indoor workers • Views by users of recreational/formal sports facilities where the landscape is secondary to enjoyment of the sport • Views by users of local public open spaces of limited importance with limited variety or distinctiveness	Transient views by travellers on the A12 as well as minor roads within the local road network, are considered to have low sensitivity to the Proposed Scheme. This reflects their low susceptibility to the nature of the Proposed Scheme due to the relatively fleeting views from roads, and their low to medium value of views. Views of users of locally identified open space allocations such as sports facilities are considered to have low sensitivity, reflecting their low susceptibility to the nature of the Proposed Scheme and low value of views, due to their urban context and/or views being secondary to enjoyment of the sports. Views of indoor workers are considered to have low sensitivity, reflecting their low susceptibility to the nature of the Proposed Scheme and low value of views, due to views being secondary to their purpose at work.
Negligible	• Quick transient views such as from fast moving vehicles • Views from industrial area, land awaiting re-development • Views from landscapes of no importance with no variety or distinctiveness	Transient views by railway travellers have negligible sensitivity, reflecting their negligible susceptibility to the nature of the Proposed Scheme and negligible value of views, due to views being transient and partly in the context of urban areas and the existing A12. Views of indoor workers and visitors to commercial and industrial areas on the eastern periphery of Chelmsford (west of junction 19 – Boreham Interchange) and on the eastern edge of Witham (south and west of junction 21 – Witham South Interchange) have negligible sensitivity, reflecting their negligible susceptibility to the nature of the Proposed Scheme and negligible value of views, due to their urban context and views being secondary to the purpose of work/visiting commercial and industrial areas.

8.4 Potential impacts

Construction

8.4.1 The potential temporary landscape and visual impacts during construction are likely to be associated with:

- movement of construction plant
- excavation and earthworks across extensive areas in association with borrow pit construction
- contractors' compounds

- vehicle haul routes
- any temporary lighting needed for the works
- stockpiled soil and materials
- loss of vegetation

8.4.2 During the construction period there would potentially be adverse effects on landscape character which would be extensive and are likely to be significant in places, particularly along the offline sections, compound locations and at major junction locations. Local landscape character areas from where there would be limited or no intervisibility with the Proposed Scheme and which would be unlikely to be affected, such as small fragments of landscape character areas that lie on the outer edges of the study area, are scoped out during construction and operation. These areas are identified in Appendix G.1.

8.4.3 Surrounding visual receptors would experience adverse visual effects. Many of these visual effects are likely to be significant, particularly from the residential peripheries of surrounding nearby settlements and PRoW that run close to, or cross, the Proposed Scheme.

8.4.4 Landscape and visual effects during construction would potentially be significant and are therefore scoped in for further assessment.

Operation

8.4.5 The Proposed Scheme has the potential to increase the prominence of major highway infrastructure within the landscape, particularly as extensive established vegetation that helps to integrate the existing A12 into the landscape is likely to be removed along the online sections. The scale of the infrastructure, including major new and improved junctions, and the elevated position of some elements would be at odds with the scale and character of the surrounding landscape. The offline bypasses and major junctions are likely to have particularly adverse effects on landscape character and quality, with a loss of vegetation, disruption to field pattern and reduced tranquillity. Borrow pits would also potentially cause vegetation loss, changes to land use and landscape character.

8.4.6 There would be visual effects of significance for a high number of visual receptors, in particular for residents within properties on the peripheries of surrounding nearby settlements and for users of PRoW that run close to, or cross, the Proposed Scheme.

8.4.7 Proposed lane widening on the existing A12 would in places result in the loss of mature vegetation that currently screens views to the road. There are a number of properties that front the A12 along the online section that would face substantial changes as the road widening comes closer to them and also removes screening vegetation. Surrounding and more isolated properties are also likely to experience significant adverse visual effects, such as where the offline bypasses would run in close proximity.

8.4.8 Lighting proposals are likely to create adverse visual effects, which could apply to both daytime and night-time. Signage and gantries would also further exacerbate the prominence of the highway infrastructure, particularly in open landscapes and where the road is at grade or on embankment.

8.4.9 Landscape and visual effects during operation would potentially be significant and are therefore scoped in for further assessment.

Summary of scope

8.4.10 Table 8.3 summarises the proposed scope for landscape.

Table 8.3: Summary of landscape scope

Matter	Scoped in - construction	Scoped in - operation
Effects on local landscape character that would potentially be directly or indirectly affected (refer to Appendix G.1)	✓	✓
Visual effects	✓	✓

8.5 Design, mitigation and enhancement measures

8.5.1 The preliminary landscape design would be developed to integrate the road into the local context, avoid the need for additional mitigation and seek enhancement opportunities where possible, in line with DMRB LD 117 Landscape Design (Highways England, 2020).

8.5.2 Mitigation is likely to include, but would not be limited to:

- junction design to reduce the effects on landform; retain vegetation, field pattern, and landscape features; and reduce the effects on views
- careful design of major structures, signage and gantries to limit visual intrusion
- refinement of the design of earthworks to create natural gradients and slopes that achieve better integration with the surrounding landform, where space and material are available
- use of sensitive lighting design such as the use of horizontally mounted flat glass lanterns
- dense native tree and shrub planting on and adjacent to highway earthworks to create woodlands, copses and shelterbelts in order to break up the scale of the road, screen structures, traffic and lighting and help integrate the Proposed Scheme into the existing landscape pattern
- use of planting to link into existing field boundary vegetation to provide screening and integration into the local pattern and character, as well as connection of existing wildlife corridors
- use of locally indigenous native and non-native plants as appropriate to reflect the distinctive local character, such as the replication of willow plantation on valley floors, and parkland and avenue near registered parks and gardens

- retention of views to local landmarks through breaks in the planting to help create a sense of place for vehicle travellers, where possible

8.6 Description of the likely significant effects

8.6.1 Landscape and visual effects during construction would be caused by construction activity, including movement of plant and loss of vegetation. Landscape and visual effects during operation would result from the increased extent of highway infrastructure, with major junctions, lighting, signage and gantries. Significant landscape and visual effects during construction and during operation, particularly in the short term before mitigation planting becomes established, are likely.

8.6.2 Some residual landscape and visual effects during operation are likely to remain significant in the long term despite mitigation. For example, the rural character of the landscape would be permanently affected by the offline bypasses, and views from some highly sensitive receptors are likely to be permanently affected, close at hand and impossible to screen effectively.

8.7 Assessment methodology

8.7.1 The proposed assessment will be proportionate, focusing on significant adverse effects within the 2km study area. Effects on receptors that are not considered likely to be significant will be summarised concisely but will not be set out in detail.

8.7.2 The assessment methodology for the LVIA will be based upon DMRB LA 107, which sets out the requirements for assessing and reporting the landscape and visual effects of highway projects. The development of DMRB LA 107 has been influenced by the Guidelines for Landscape and Visual Impact Assessment, Third Edition (GLVIA3) (Landscape Institute and Institute of Environmental Management and Assessment, 2013), which is therefore also relevant to the proposed methodology. The methodology is also in accordance with the requirements of the DMRB, LA 104 Environmental Assessment and Monitoring (Highways England, 2019). Photography and photomontages will be in accordance with the Visual Representation of Development Proposals Technical Guidance Note 06/19 (Landscape Institute, 2019).

8.7.3 It is proposed to base the assessment of landscape effects on the local landscape character areas defined within Braintree, Brentwood, Chelmsford, Maldon and Uttlesford Landscape Character Assessment (Chris Blandford Associates, 2006) and Colchester Borough Landscape Character Assessment (Chris Blandford Associates 2005) within the 2km study area. The assessment of impacts on landscape components, such as trees and woodland, and perceptual and aesthetic aspects will be considered within the assessment of impacts on landscape character. The assessment of impacts on historic environment features in the study area, such as registered parks and gardens and conservation areas, will be addressed in the cultural heritage aspect (see chapter 7, cultural heritage). Historic landscape characterisation will also be considered within the cultural heritage aspect.

8.7.4 The British Standard 5837:2012 Trees in Relation to Design, Demolition and Construction – Recommendations (BSI, 2012) sets out the need to assess the effects of a development on trees. Impacts on trees would be informed by an arboricultural assessment. A targeted approach to the arboricultural assessment will be undertaken by arboriculturists in order to record information about ancient, notable, veteran and TPO trees within the study area (Proposed Scheme boundary + 15m buffer). Agreement has been sought on the methodology and targeted approach to the arboricultural assessment through consultation with local planning authorities. The draft arboricultural survey strategy is presented in Appendix H. By providing tree constraints information, the results of the arboricultural survey will be used along with other baseline data to inform the design and the LVIA.

8.7.5 It is proposed to base the assessment of visual effects on a selection of representative viewpoints representing different receptor groups within the study area. Indicative representative viewpoints have been selected within a digitally generated ZTV based on the centre line of the Proposed Scheme. Proposed indicative representative viewpoint and photomontage locations, along with supporting justification, are presented in Appendix G.2 and illustrated on figure 8.3 in the context of the ZTV. Discussion of potential representative viewpoints and photomontage locations has been sought through consultation with local planning authorities (response outstanding at the time of writing). Potential refinements to the Proposed Scheme route design may result in changes to the horizontal and vertical alignment. In response to this, the ZTV mapping will be re-run and viewpoint locations refined for the Preliminary Environmental Information Report (PEIR) and the final viewpoints agreed with local planning authorities for inclusion in the Environmental Statement.

8.7.6 The criteria that will be used for the assessment of landscape and visual effects are based upon those in DMRB LA 107 and are set out in Appendix C.

8.7.7 As defined in DMRB LA 107 and in accordance with GLVIA3, the magnitude of effects *"combines judgements about size and scale of effect, extent of area it occurs over, whether reversible or irreversible and whether short or long term in duration".* The criteria for determining the magnitude of landscape and visual effects are set out in Appendix C.

8.7.8 The assessment of magnitude of landscape and visual effects will consider impacts at the following timeframes, in accordance with DMRB LA 107:

- Construction Phase: Considers construction activities, temporary works (including compounds) and construction traffic during the construction period. Assessments for each landscape and visual receptor during the construction period will be made at a time during construction when impacts are likely to be most significant for the individual receptor.
- Operation Year 1: Considers impacts on a winter's day during year 1 following completion of all construction, when planted mitigation would not yet have taken effect. Both the completed project and the traffic using it would be considered.
- Operation Year 15: Considers the impacts on a summer's day in the fifteenth year after opening, when planted mitigation would have taken effect. Both the completed project and the traffic using it would be considered.

8.7.9 Day and night time changes for landscape and visual receptors are considered against the baseline situation, that is the situation if the Proposed Scheme would not proceed. However, it is not considered that assessment of effects on the night skies in their own right is required due to the surrounding landscape context. This is because there are no dark skies identified by CPRE within the study area, and there are no international dark sky reserves or areas of outstanding natural beauty within the study area.

8.7.10 The significance of effects will be determined by combining judgements on the sensitivity of landscape and visual receptors, with the magnitude of landscape and visual effects. In accordance with DMRB LA 107, the matrix in chapter 5 (inset 5.1), which is consistent with the matrix within DMRB LA 104, will be used to assist professional judgement when determining the significance of landscape and visual effects. An overall statement of landscape and visual significance will be included in accordance with DMRB LA 107.

8.7.11 In accordance with DMRB LA 107, the magnitude of impact and significance of effect will be assessed taking into consideration the proposed mitigation.

8.7.12 The data sources identified under 'baseline sources' (section 8.3) will be used to inform the assessment.

8.7.13 The proposed methodology for assessing landscape and visual effects, which is based on DMRB LA 107, meets the NNNPS policy requirements outlined in section 8.1.

8.8 Assessment assumptions and limitations

8.8.1 For simplicity, the term 'landscape' will be used throughout the LVIA to describe areas of landscape and townscape, in line with DMRB LA 107 which states that the "*LVIA process does not differentiate between 'landscape' and 'townscape', as it is applicable to any landscape - urban, rural or a combination of both...".* Therefore, the assessment methodology for impacts on landscape and townscape does not differ.

8.8.2 Access to receptors and viewpoints to be assessed will be restricted to publicly accessible areas. Descriptions of baseline views and the assessment of changes to views from private and inaccessible viewpoints, including upper storey views from properties, will therefore be made using the professional judgement of Chartered landscape architects, based on an assessment from a nearby representative viewpoint (e.g. adjoining PRoW or highway).

8.8.3 Visual effects tend to diminish with distance. Where a receptor, such as the user of a PRoW, could view the Proposed Scheme from a range of distances, the assessment of visual effects likely to be experienced is generally based on the worst-case situation. In most cases, subject to other factors such as the presence of screening elements, this is likely to be when the receptor is at the nearest point to the Proposed Scheme.

8.8.4 Future development, as described under future baseline (section 8.3), may lead to changes to the baseline environment.

8.8.5 Proposed developments will be included in the consideration of cumulative effects. The future baseline of the LVIA will not include proposed developments. This is because proposed developments are not guaranteed to be built and the date at which potential future development would be completed is often unknown. Details are often in outline so that the design, form and layout of future development is unknown, which makes it impossible to accurately incorporate within the assessment of landscape and visual effects. Major committed development with full planning consent and where construction is underway at the time of assessment will, however, be considered in the LVIA.

8.8.6 The screening or filtering effect of existing vegetation outside the Proposed Scheme boundary will be taken into account within the assessment in its current condition. Growth or other changes to this vegetation would potentially affect impacts caused by the Proposed Scheme, but the management and retention of such vegetation is outside the control of Highways England.

8.8.7 A winter familiarisation site visit was undertaken in February 2017 which has informed this scoping report. However, due to the current project programme there has not been the opportunity to revisit the study area during winter to inform this scoping report. Further surveys in winter and summer will be carried out to inform the LVIA.

9. Biodiversity

9.1 NNNPS requirements

9.1.1 The National Networks National Policy Statement (NNNPS) sets out the Government's policies to deliver the development of Nationally Significant Infrastructure Projects (NSIP) on the national road and rail networks in England. The Secretary of State (SoS) uses the NNNPS as the primary basis for making decisions on Development Consent Order (DCO) applications.

9.1.2 Key policy from the NNNPS relevant to this aspect, taking into account the ecology constraints described in section 9.3, includes:

- Paragraph 5.22 of the NNNPS states that the applicant's assessment should describe any likely significant effects on internationally, nationally and locally designated sites of ecological conservation importance; protected species; habitats (including irreplaceable habitats such as ancient woodland and veteran trees); and other species identified as being of principal importance for the conservation of biodiversity.
- Paragraph 5.23 states that the applicant should describe how the project plans to conserve and enhance biodiversity conservation interests.
- Paragraph 5.25 states that development should avoid significant harm to biodiversity conservation interests, including through appropriate mitigation and consideration of alternatives.
- Paragraph 5.32 states that development should not result in the loss or deterioration of irreplaceable habitats including ancient woodland and veteran trees.
- Paragraph 5.35 states that other habitats and species identified as being of principal importance should be protected from adverse effects of development.
- Paragraph 5.36 states that appropriate mitigation measures are considered an integral part of a proposed development and the applicant should include these in their assessment, including identifying how these measures will be secured. The applicant should demonstrate that:
  - they will seek to ensure that activities will be confined to the minimum areas required for works during construction
  - best practice will be followed to ensure that risk of disturbance or damage to species or habitats is minimised during construction and operation
  - developments and landscaping will be designed to provide green corridors and minimise habitat fragmentation
  - opportunities will be taken to enhance existing habitats and create new habitats within the site landscaping proposals
- Changes in air quality, light pollution, noise, and the water environment due to project construction or operation should be assessed for their potentially adverse impacts on wildlife, biodiversity and nature conservation.

9.2 Study area

9.2.1 The study area for biodiversity relates to the main areas of construction activity, including construction compounds, haul roads and borrow pits, but excludes survey of (and buffers around) those sections within the existing highway boundary at either end of the Proposed Scheme where only installation of new signage is proposed, as the impacts of these activities would be restricted to the footprint of the works and these parts of the site cannot be safely surveyed at this time. Pre-construction surveys of these areas will be undertaken with traffic management in place.

9.2.2 The survey areas for individual biodiversity resources are provided in Appendix I with the zone of influence of each detailed in section 9.4.

Designated sites and habitats

9.2.3 The study area for Ramsar and European designated sites for nature conservation follows that of the Design Manual for Roads and Bridges (DMRB) LA 115 Habitats Regulations Assessment (Highways England, 2020). This includes where the Proposed Scheme:

- is within 2km of a Ramsar or European site or functionally linked land
- is within 30km of a Special Area for Conservation (SAC), where bats are noted as one of the qualifying interests
- crosses or lies adjacent to, upstream of, or downstream of, a watercourse which is designated in part or wholly as a Ramsar or European site
- has a potential hydrological or hydrogeological linkage to a Ramsar or European site containing a groundwater dependent terrestrial ecosystem
- has an affected road network (ARN) within 200m of a Ramsar or European site

9.2.4 Consideration is also given where there is a greater distance between the Proposed Scheme and Ramsar/European sites, but a pathway to effect exists. For example, flight paths or feeding or roosting areas of birds that may be found using habitats outside the boundaries of a Special Protection Area (SPA). The sites under consideration were limited to those within 20km where wildfowl and waders are a qualifying feature. Gull species typically range further than this and are considered at greater distances.

9.2.5 The study area for national statutory designated sites (Sites of Special Scientific Interest (SSSI) and National Nature Reserves (NNR)) and non-statutory designated sites (Local Nature Reserves (LNR)) is defined as 2km from the Proposed Scheme. Local, non-statutory, designated sites (Local Wildlife Sites (LWS) and Local Road Verges (LRV)) have a 1km study area from the Proposed Scheme.

9.2.6 A desk-based study of a 1km wide study area centred on the Proposed Scheme was used to identify ancient woodland and habitats of principal importance in England, referred to as 'priority habitats' in this report. A field survey of habitats was undertaken to ground truth these provisional classifications for an area of 600m around the Proposed Scheme. At the same time, any habitats that conformed to the criteria of Annex I habitat (habitats listed on Annex I of European Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora ('the Habitats Directive)) were also noted.

Other habitats

9.2.7 Aerial photography and Ordinance Survey (OS) maps have been viewed within a 1km study area around the Proposed Scheme (Jacobs, 2020). The field survey area for habitats is based on a 600m survey area around this same combined extent. Highly urbanised areas were excluded from the study area.

Air quality impact assessment

9.2.8 Assessment of the potential air quality impacts on sensitive designated sites and habitats within 200m of the ARN will be undertaken in accordance with DMRB LA 105 (Highways England, 2019) (see chapter 6).

Protected and notable species

9.2.9 The desk-based study area for protected and notable species comprises an area of 2km around the Proposed Scheme, extending to 5km for bat species. Additional aquatic ecological records (fish, macroinvertebrates, macrophytes and phytobenthos data) were obtained where watercourses are directly crossed by or within 500m of the Proposed Scheme.

9.2.10 Field survey areas for species-specific surveys vary depending on the sensitivities and legal protection of the receptor, using best practice species-specific guidance wherever possible. Field surveys began in 2016 and have continued through 2020. Appendix I provides detail on the survey methodology and programme.

9.3 Baseline conditions

Baseline sources

9.3.1 The following baseline sources have been used during the data gathering:

- Essex Wildlife Trust Biological Records Centre (EWTBRC) provided data records in 2017 which were updated in 2020 for protected and designated species, invasive species, non-statutory LWS and special road verges
- Essex Field Club (EFC) provided data records in 2017 which were updated in 2020 for notable and protected species
- The Ancient Woodland Inventory (Natural England, 2020) was reviewed to identify ancient woodland habitats
- The Barn Owl Conservation Network (BOCN) were contacted for their barn owl breeding records in 2017

- Essex Badger Group were contacted for their records in 2017
- Essex Bat Group were contacted for their records in 2017
- Environment Agency monitoring data[4] for aquatic ecological features were reviewed in 2020
- Aerial photography and OS maps were reviewed between 2016 and the present day
- International and national statutory designated sites, priority habitats and granted European Protected Species Licences were identified on the Multi-Agency Geographic Information for the Countryside (MAGIC) website (Defra, 2020)
- A Phase 1 habitat survey was undertaken between 2016 and 2020
- Results of various detailed species and habitat surveys (reports in preparation and some surveys ongoing) conducted by Jacobs between 2016 and 2020 which included extended survey areas related to earlier stages of the Proposed Scheme

Designated sites and habitats

9.3.2 There are no confirmed or potential SPA, SAC, or Ramsar sites located within the 2km study area (figure 9.1) and no SAC designated for bats within the 30km study area. Table 9.1 lists three sites beyond 2km from the Proposed Scheme that are linked via a watercourse to it, and six sites where there is possible interaction of the Proposed Scheme with ranging bird species of designated sites. Qualifying features of each site are also provided in table 9.1.

[4] available on www.data.gov.uk

Table 9.1: Ramsar and European sites within the study area

Site	Qualifying features	Approximate distance and direction from Proposed Scheme
Potential watercourse connection between Proposed Scheme and Ramsar/European site		
Blackwater Estuary (Mid-Essex Coast Phase 4) SPA/Ramsar	SPA species: • Black-tailed godwit (*Limosa limosa islandica*), Non-breeding • Dark-bellied brent goose (*Branta bernicla bernicla*), Non-breeding • Dunlin (*Calidris alpina alpina*), Non-breeding • Grey plover (*Pluvialis squatarola*), Non-breeding • Hen harrier (*Circus cyaneus*), Non-breeding • Little tern (*Sternula albifrons*), Breeding • Pochard (*Aythya ferina*), Breeding • Ringed plover (*Charadrius hiaticula*), Breeding • Waterbird assemblage, Non-breeding Ramsar criterion: 1. extent and diversity of saltmarsh habitat present 2. invertebrate fauna 3. full and representative sequences of saltmarsh plant communities 5. assemblages of international importance - waterfowl 6. species/populations occurring at levels of international importance: dark-bellied brent goose; grey plover; dunlin; and black-tailed godwit.	5.6km southeast – connected via the Boreham Brook and River Ter which are crossed by the Proposed Scheme and feed into the Blackwater Tidal Reaches; and the Domsey Brook and River Blackwater which are crossed by the Proposed Scheme and feed into the River Chelmer. Both empty into the Blackwater Estuary.

Site	Qualifying features	Approximate distance and direction from Proposed Scheme
Essex Estuaries SAC	Annex I habitats that are a primary reason for selection of this site: • 1130 Estuaries • 1140 Mudflats and sandflats not covered by seawater at low tide • 1310 Salicornia and other annuals colonizing mud and sand • 1320 Spartina swards (*Spartinion maritimae*) • 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) • 1420 Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*) Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • 1110 Sandbanks which are slightly covered by sea water all the time Annex I habitats present but not a qualifying feature (i.e. non-significant presence): • 1220 Perennial vegetation of stony banks • 2120 Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes")	5.6km southeast – connected via the Boreham Brook and River Ter which are crossed by the Proposed Scheme and feed into the Blackwater Tidal Reaches; and the Domsey Brook and River Blackwater which are crossed by the Proposed Scheme and feed into the River Chelmer. Both empty into the Blackwater Estuary.
Colne Estuary (Mid-Essex Coast Phase 2) SPA/Ramsar	SPA species: • Dark-bellied brent goose (*Branta bernicla bernicla*), Non-breeding • Hen harrier (*Circus cyaneus*), Non-breeding • Little tern (*Sternula albifrons*), Breeding • Pochard (*Aythya ferina*), Breeding • Redshank (*Tringa totanus*), Non-breeding • Ringed plover (*Charadrius hiaticula*), Breeding • Waterbird assemblage, Non-breeding Ramsar criterion: 1. extent and diversity of saltmarsh habitat present 2. invertebrate fauna and plant species 3. full and representative sequences of saltmarsh plant communities 5. assemblages of international importance - waterfowl 6. species/populations occurring at levels of international importance: dark-bellied brent goose and redshank (*Tringa totanus*).	10.5km east – connected via the Roman River which is crossed by the Proposed Scheme and feeds into Colne Tidal Reaches and ultimately the Colne Estuary.

Site	Qualifying features	Approximate distance and direction from Proposed Scheme
Potential mobile species (qualifying wintering and breeding bird species) connection between Proposed Scheme and Ramsar/European site		
Blackwater Estuary (Mid-Essex Coast Phase 4)	See above	5.6km southeast
Abberton Reservoir SPA and Ramsar	SPA species: • Coot (*Fulica atra*) – Non-breeding • Cormorant (*Phalacrocorax carbo*) - Breeding • Gadwall (*Anas Strepera*) - Non-breeding • Goldeneye (*Bucephala clangula*) - Non-breeding • Great crested grebe (*Podiceps cristatus*) - Non-breeding • Mute swan (*Cygnus olor*) - Non-breeding • Pochard (*Aythya ferina*) - Non-breeding • Shoveler (*Anas clypeata*) - Non-breeding • Teal (*Anas crecca*) - Non-breeding • Tufted duck (*Aythya fuligula*) - Non-breeding • Waterbird assemblage • Wigeon (*Anas penelope*) - Non-breeding Ramsar criterion: 5. assemblages of international importance – waterfowl 6. species/populations occurring at levels of international importance: gadwall; shoveler; and wigeon.	6.0km southeast
Colne Estuary (Mid-Essex Coast Phase 2) SPA/Ramsar	See above	10.5km east

Site	Qualifying features	Approximate distance and direction from Proposed Scheme
Crouch and Roach Estuaries (Mid-Essex Coast Phase 3) SPA and Ramsar	SPA species: • Dark-bellied brent goose (*Branta bernicla bernicla*), Non-breeding • Waterbird assemblage, Non-breeding Ramsar criterion: 2. assemblage of rare, vulnerable or endangered plant and invertebrate species 5. assemblages of international importance – waterfowl 6. species/populations occurring at levels of international importance: dark-bellied brent goose.	10.9km southeast
Dengie (Mid-Essex Coast Phase 1) SPA and Ramsar	SPA species: • Dark-bellied brent goose (*Branta bernicla bernicla*), Non-breeding • Grey plover (*Pluvialis squatarola*), Non-breeding • Hen harrier (*Circus cyaneus*), Non-breeding • Knot (*Calidris canutus*), Non-breeding • Waterbird assemblage, Non-breeding Ramsar criterion: 1. extent and diversity of saltmarsh habitat present 2. invertebrate fauna and plant species 3. full and representative sequences of saltmarsh plant communities 5. assemblages of international importance – waterfowl 6. species/populations occurring at levels of international importance: dark-bellied brent goose; grey plover; and knot.	15.2km southeast
Outer Thames Estuary SPA	SPA species: • Common tern (*Sterna hirundo*), Breeding • Little tern (*Sternula albifrons*), Breeding • Red-throated diver (*Gavia stellata*), Non-breeding	15.6km east

Site	Qualifying features	Approximate distance and direction from Proposed Scheme
Stour and Orwell Estuaries SPA and Ramsar	SPA species: • Avocet (*Recurvirostra avosetta*), Breeding • Black-tailed godwit (*Limosa islandica*), Non-breeding • Dark-bellied brent goose (*Branta bernicla bernicla*), Non-breeding • Dunlin (*Calidris alpina alpina*), Non-breeding • Grey plover (*Pluvialis squatarola*), Non-breeding • Knot (*Calidris canutus*), Non-breeding • Pintail (*Anas acuta*), Non-breeding • Redshank (*Tringa totanus*), Non-breeding • Waterbird assemblage, Non-breeding Ramsar criterion: 2. invertebrate fauna and plant species 5. assemblages of international importance – waterfowl 6. species/populations occurring at levels of international importance: redshank; dark-bellied goose; pintail; grey plover; knot; dunlin; black-tailed godwit; redshank.	15.9km northeast

Site	Qualifying features	Approximate distance and direction from Proposed Scheme
Alde-Ore Estuary SPA and Ramsar	SPA species: • Avocet (*Recurvirostra avosetta*), Breeding • Avocet (*Recurvirostra avosetta*), Non-breeding • Lesser black-backed gull (*Larus fuscus*), Breeding • Little tern (*Sternula albifrons*), Breeding • Marsh harrier (*Circus aeruginosus*), Breeding • Redshank (*Tringa totanus*), Non-breeding • Ruff (*Calidris pugnax*), Non-breeding • Sandwich tern (*Thalasseus sandvicensis*), Breeding Ramsar criterion: 2. invertebrate fauna and plant species 3. notable assemblage of breeding and wintering wetland birds 6. species/populations occurring at levels of international importance: lesser black-backed gull; avocet; redshank; mute swan (*Cygnus olor*).	44.6km northeast

9.3.3 There are no NNR within 2km of the Proposed Scheme. Marks Tey Brickpit SSSI is located approximately 150m northwest of junction 25. Marks Tey Brickpit SSSI is designated for geological reasons and is not considered further in this chapter. Two LNRs are located within 2km of the Proposed Scheme (see table 9.2 and figure 9.1). The Proposed Scheme encroaches approximately 15m across the western boundary of the Whetmead LNR between junctions 21 and 22; and Brockwell Meadows LNR is located approximately 230m west of the Proposed Scheme in Kelvedon.

Table 9.2: Local Nature Reserves within 2km of the Proposed Scheme

Site	Interest/designated features	Approximate distance and direction from the Proposed Scheme
Whetmead LNR	Previous landfill site now comprising unimproved grassland and lagoons. Supports a range of more common butterflies and dragonflies, and seed-eating birds.	Within footprint, located between junction 21 and junction 22.
Brockwell Meadows LNR	Associated with the River Blackwater comprising a water meadow, woodland, a pond and hedgerows.	230m west, located immediately adjacent to Kelvedon between junction 23 and junction 24.

9.3.4 There are 30 LWS within 1km of the Proposed Scheme (table 9.3 and figure 9.1). The closest of these are Long Wood Complex LWS, River Chelmer LWS, Titbeech Wood LWS and Whetmead LWS which are all immediately adjacent to (i.e. within 10 metres of) the Proposed Scheme. Whetmead LWS and Brockwell Meadows LWS both overlap the LNRs of the same name. Marks Tey Brick Pit LWS also overlaps with Marks Tey Brick Pit SSSI.

9.3.5 There is one LRV, SV-BTE5, within 1km of the Proposed Scheme, located approximately 750m to the south east.

Table 9.3: Local Wildlife Sites within 1km of the Proposed Scheme

Site	Interest/designated features																	Approx. distance from the Proposed Scheme (m)
	HC1 – Ancient Woodland	HC2 – Lowland Mixed Deciduous Woodland on Non-ancient Sites	HC3 – Other Priority Habitat Woodland Types on Non-ancient Sites	HC5 – Woody Scrub	HC9 – Lowland Meadow	HC10 – River Floodplain	HC11 – Other Neutral Grasslands	HC13 – Heathland and Acid Grassland	HC14 – Lowland Fen Vegetation	HC15 - Reedbeds	HC20 – Complex Riverine Habitats	HC22 – Tidal Transition zones	HC23 – Saltmarsh and Mudflats	HC26 – Maritime Cliffs and Slopes	HC27 – Post-industrial Sites	HC28 – Small Component Mosaics	HC29 – Habitat Extension Mosaics	
Blackwater Rail Trail Ma25	-	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	770
Boreham Road Gravel Pits Ch113	-	x	-	-	-	-	-	-	-	-	-	-	-	-	-	x	-	132
Braxted Park Ma44	-	x	x	-	-	-	-	-	x	-	-	-	-	-	-	-	-	750
Brockwell Meadows Bra229	-	-	-	-	-	-	-	-	x	-	x	-	-	-	-	-	x	150
Bulls Lodge Lagoons Ch176	-	-	-	-	-	-	-	-	-	x	-	-	-	-	-	x	-	250
Chantry Wood Ma37	-	x	-	-	-	-	-	x	-	-	-	-	-	-	-	-	-	950
Coggeshall Hall Farm Bra225	-	-	-	-	-	-	-	-	x	-	x	-	-	-	-	-	x	700
Domsey Brook Pasture Co20	-	-	-	-	-	x	-	-	-	-	-	-	-	-	-	-	-	995
Feering Marsh Bra234	-	-	-	-	-	-	-	-	x	x	-	-	-	-	-	-	-	420

Site	Interest/designated features																	Approx. distance from the Proposed Scheme (m)
	HC1 – Ancient Woodland	HC2 – Lowland Mixed Deciduous Woodland on Non-ancient Sites	HC3 – Other Priority Habitat Woodland Types on Non-ancient Sites	HC5 – Woody Scrub	HC9 – Lowland Meadow	HC10 – River Floodplain	HC11 – Other Neutral Grasslands	HC13 – Heathland and Acid Grassland	HC14 – Lowland Fen Vegetation	HC15 - Reedbeds	HC20 – Complex Riverine Habitats	HC22 – Tidal Transition zones	HC23 – Saltmarsh and Mudflats	HC26 – Maritime Cliffs and Slopes	HC27 – Post-industrial Sites	HC28 – Small Component Mosaics	HC29 – Habitat Extension Mosaics	
Hatfield Peverel Special Roadside Verge Bra152	-	-	-	-	-	-	-	x	-	-	-	-	-	-	-	-	-	750
Hoo Hall Meadow Bra188	-	-	-	-	-	-	-	-	x	-	-	-	-	-	-	-	-	480
Inworth Wood Co6	x	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	490
Keeper's Cottage Wood Co51	x	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	790
Kelvedon Hall Wood Ma52	-	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	610
Long Wood Complex Bra114	-	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10
Lost Wood Bra94	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	975
Marks Tey Brick Pit Co31	-	x	x	-	-	-	-	-	-	-	-	-	-	-	x	-	-	640
Moor Gardens Bra164	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	790

Site	Interest/designated features																	Approx. distance from the Proposed Scheme (m)
	HC1 – Ancient Woodland	HC2 – Lowland Mixed Deciduous Woodland on Non-ancient Sites	HC3 – Other Priority Habitat Woodland Types on Non-ancient Sites	HC5 – Woody Scrub	HC9 – Lowland Meadow	HC10 – River Floodplain	HC11 – Other Neutral Grasslands	HC13 – Heathland and Acid Grassland	HC14 – Lowland Fen Vegetation	HC15 - Reedbeds	HC20 – Complex Riverine Habitats	HC22 – Tidal Transition zones	HC23 – Saltmarsh and Mudflats	HC26 – Maritime Cliffs and Slopes	HC27 – Post-industrial Sites	HC28 – Small Component Mosaics	HC29 – Habitat Extension Mosaics	
Mope Wood Complex Ma30	x	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	930
New Wood Co3	x	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	950
Perry's Wood Co5	x	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	980
Pits Wood Co44	-	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	740
River Chelmer Ch109	-	-	-	-	-	-	-	-	-	-	x	-	-	-	-	-	-	10
Riverview Meadows Bra174	-	-	x	-	-	x	-	-	x	-	x	-	-	-	-	-	-	90
Sparkey Wood Ma23	x	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	330
The Grove Ch107	-	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	130
Titbeech Wood Bra118	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10
Toppinghoe hall Wood (part of) Ch120	x	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	580

Site	Interest/designated features																	Approx. distance from the Proposed Scheme (m)
	HC1 – Ancient Woodland	HC2 – Lowland Mixed Deciduous Woodland on Non-ancient Sites	HC3 – Other Priority Habitat Woodland Types on Non-ancient Sites	HC5 – Woody Scrub	HC9 – Lowland Meadow	HC10 – River Floodplain	HC11 – Other Neutral Grasslands	HC13 – Heathland and Acid Grassland	HC14 – Lowland Fen Vegetation	HC15 - Reedbeds	HC20 – Complex Riverine Habitats	HC22 – Tidal Transition zones	HC23 – Saltmarsh and Mudflats	HC26 – Maritime Cliffs and Slopes	HC27 – Post-industrial Sites	HC28 – Small Component Mosaics	HC29 – Habitat Extension Mosaics	
Toppinghoe hall Wood Bra87	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	980
Whetmead LNR Bra183	-	-	-	-	-	-	-	-	-	x	-	-	-	-	-	x	-	0

9.3.6 There are eight Ancient Woodland Inventory sites located within the 1km study area (figure 9.2). These include both ancient semi-natural woodland and ancient replanted woodland habitat types. The closest Ancient Woodland Inventory site is approximately 220m from the Proposed Scheme. Many of these are also designated as LWS. Some woodland stands containing very old features are not included in the Ancient Woodland Inventory (Natural England, 2020) but following field survey (Jacobs 2020) and desk based study, could also be considered to be ancient. This includes: The Grove and Porter's Grove; Bishop's Wood; Brewhouse Wood; Church Hills; Long Wood; Spitman's Garden; Sandpit Wood; Job's Wood; Whitegate Grove; and Jubb's Row (see Jacobs, 2020).

9.3.7 The desk-based study identified a variety of priority habitats within 1km of the Proposed Scheme. However, the confidence in these classifications ranges between 'low' and 'medium' (Defra, 2020). Field survey confirmed the presence of the following priority habitats within the field study area (Jacobs 2020):

- arable field margins
- lowland mixed deciduous woodland
- eutrophic standing waters
- wet woodland
- hedgerows
- open mosaic habitats on formerly developed land

- ponds
- rivers
- wood-pasture and parkland

9.3.8 Two areas of wet woodland priority habitat, one located along the River Ter and one along the River Blackwater, were also classified as Annex I habitat '91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)' (see figure 9.2).

Other habitats

9.3.9 The Phase 1 habitat survey (Jacobs, 2020) found the survey area to be a predominantly farmed landscape, with most land given over to arable cultivation. Arable areas contrasted with land use in the river floodplains, largely used for forestry. Other land uses within the surveyed area were localised, comprising pasture land, residential, industrial and amenity areas in built-up areas, and quarries.

9.3.10 Grassland habitats identified were, in the main, either improved grassland or cultivated/disturbed land. Species-poor neutral grassland was found associated with field edges and road verges. Of more ecological interest were small and isolated areas of species-rich neutral grassland, unimproved neutral grassland (likely to have been sown) and marshy grassland associated with watercourses.

9.3.11 There were several rivers and numerous smaller streams within the surveyed area. Most of the survey area is divided between the catchments of the Chelmer, which extends across the survey area between Chelmsford and Witham, and the Blackwater, from Witham to Marks Tey. The north-eastern end of the survey area, where the Roman River flows through Copford, falls within the catchment of the Colne. Numerous bodies of standing water were also identified.

9.3.12 Woodland stands were concentrated between Boreham and Witham with most of the larger stands of semi-natural woodland appearing to be long-established, though some were clearly more recent and associated with human activity, such as around former quarries, roads and railways. Extensive areas of plantation woodland were identified, largely found on river floodplains and used for the cultivation of willow, mainly cricket-bat willow *Salix alba var. caerulea*. Plantation woodland elsewhere most frequently comprised small stands, such as along the A12 and around some larger residential properties in rural areas. Stands of scrub were common across the survey area.

9.3.13 Field boundaries, lanes and tracks supported an extensive and complex network of ditches and hedgerows across arable areas. A small number of hedgerows had been recently planted, but the majority were old landscape features.

Protected and notable species

9.3.14 The desk study identified records for a range of protected and notable species within 2km of the Proposed Scheme.These include: badger *Meles meles*; bats; birds (including Schedule 1 species such as barn owl *Tyto alba*, hobby *Falco subbuteo*, kingfisher *Alcedo atthis* and red kite *Milvus milvus*); great crested newt *Triturus cristatus*; reptiles (grass snake *Natrix natrix*, slow worm *Anguis fragilis* and common lizard *Zootoca vivipara*); otter *Lutra lutra*; water vole *Arvicola amphibius*; and white-clawed crayfish *Austropotamobius pallipes*.

9.3.15 EWTBRC and EFC also provided records for Species of Principal Importance (SPI) within the study area (e.g. brown hare *Lepus europaeus*, common toad *Bufo bufo,* polecat *Mustela putorius* and hedgehog *Erinaceus europaeus*).

9.3.16 The Environment Agency and EWTBRC provided records of protected and notable fish species, including brown trout *Salmo trutta*, bullhead *Cottus gobio* and European eel *Anguilla anguilla* within the 1km study area. The EWTBRC, EWT and Environment Agency also provided records of a range of notable invertebrate and plant species, as well as invasive plants and animals listed on Schedule 9 of the Wildlife and Countryside Act 1981 as amended.

9.3.17 The Phase 1 habitat survey (Jacobs, 2020) identified a range of habitat features that would be suitable for the following protected and notable species or groups of species: amphibians; badger; bats; breeding and wintering birds; dormice; fish; freshwater invertebrates including white-clawed crayfish; otter; reptiles; terrestrial invertebrates; water vole; and vascular plants. The presence of all these, with the exception of dormouse and white-clawed crayfish, has been confirmed by field surveys, first started in 2017 and repeated/continued in 2020.

9.3.18 Notable vascular plants were also identified during the Phase 1 survey (Jacobs, 2020). Several populations of the nationally scarce lesser calamint *Clinopodium calamintha*, the near threatened field scabious *Knautia arvensis* recorded from poor semi-improved grassland along road verges and edges of fields, and the near threatened common cudweed *Filago vulgaris,* was ‘occasional’ (on the DAFORN scale) in arable field margins and open, disturbed vegetation.

9.3.19 Field surveys undertaken in 2017/18 (reporting in preparation) recorded the presence of a number of protected and notable species including badgers and badger setts; bats and bat roosts; breeding birds including barn owls; fish; freshwater invertebrates; GCN; otter; reptiles; terrestrial invertebrates; and water voles.

9.3.20 At the time of writing, 2020 surveys are ongoing and data sets are insufficiently complete to feed into this scoping report. However, notable results to date include the presence of badger setts, barn owl roosts, bat roosts and water vole burrows.

9.3.21 Appendix I details the survey methodology used for each species group. Where published survey guidance has been updated since 2017, the updated guidance has been used to undertake field work in 2019/2020. Where there is deviation from published survey guidance, this is detailed. An example of this is that the survey effort for potential bat roosts has been amended from that recommended in the Bat Conservation Trust Guidelines (Collins ed. 2016), but is in line with methodology previously agreed with Natural England for another similar Highways England project, the A14 Cambridge to Huntingdon scheme (Highways Agency, 2014).

Invasive species

9.3.22 The desk study also identified a number of records of invasive non-native plant species including Japanese knotweed *Fallopia japonica* as well as two records of invasive non-native animals American mink *Neovision vision* and Turkish crayfish *Astacus leptodactylus*.

9.3.23 A number of invasive non-native plant species (INNS) including giant hogweed *Heracleum mantegazzianum*, giant rhubarb *Gunnera manicata*, Himalayan balsam *Impatiens glandulifera*, Japanese knotweed, montbretia *Crocosmia x crocosmiiflora*, New Zealand Pygmyweed *Crassula helmsii* and Variegated yellow archangel *Lamiastrum galeobdolon subsp. Argentatum* have also been confirmed within the study area.

Future baseline

9.3.24 It would be expected that as the landscape is predominantly arable and the quality of the agricultural land is good to very good (see chapter 10), it would continue to be managed in this way in a steady state. Increasing development and housing in the area is likely to put more pressure on the remaining natural habitats which may affect the local population and distribution of species. Any effect from climate change would be unlikely to significantly alter the land use, and therefore the habitats, prior to construction of the Proposed Scheme. Long term impacts from climate change could alter the species composition and types of habitats in and around the site, and therefore types and diversity of fauna. However, it is not anticipated the combined impact of the Proposed Scheme and climate change would be any different to the impact of climate change in isolation (i.e. without the Proposed Scheme) as the habitats that would be created as part of mitigation proposals will be the same types as those found in the local area at the current time.

9.3.25 The exception to this is Coleman's Farm Quarry which is currently operational. The planning consent for the quarry includes restoration of the site. For the purpose of the EIA, the restored site will be considered in the baseline (as per the restoration plans approved by the Local Authority at the time of DCO submission).

Value of receptors

9.3.26 The value of each receptor was determined based on a geographical scale, following the 'resource importance' approach described in DMRB LA 108 – Biodiversity (Highways England, 2020), which is replicated in Appendix C. The list of receptors and the respective importance provided in table 9.4 should be treated as provisional and may change based on the outcome of detailed surveys, assessments and consultation during development of the Proposed Scheme.

9.3.27 Invasive non-native animal and plant species do not have an intrinsic value and are considered of negligible value in this assessment of value/importance.

Table 9.4: Value of receptors in the study area for biodiversity

Value/ sensitivity	Examples within the study area	Justification
Designated sites and habitats		
International or European	Abberton Reservoir SPA & Ramsar, Alde-Ore SPA & Ramsar, Blackwater Estuary SPA & Ramsar, Colne Estuary SPA & Ramsar, Crouch and Roach Estuaries SPA & Ramsar, Dengie SPA & Ramsar, Outer Thames Estuary SPA, Stour and Orwell Estuaries SPA & Ramsar, Essex Estuaries SAC.	Has been selected as internationally important through expert consensus according to European criteria.
UK or National	Ancient Woodland Inventory site, veteran trees and additional ancient woodland habitats identified through field survey.	• Irreplaceable habitat. • Has been selected as nationally important through expert consensus according to national criteria.
Regional	No features present within the study area at this level of importance.	n/a
County	Whetmead LNR, Brockwell Meadows LNR, all 30 LWS designated sites and one LRV within 1km.	Has been selected for county designation by consensus according to county wildlife site criteria.
	Priority habitat and Annex I habitat: wet woodland.	The habitat is rare in Essex (JNCC, 2020), is listed as Near Threatened on the red list of European habitats (European Commission, 2016) and is an Annex I habitat (been selected as internationally important through expert consensus according to European criteria).
Local	Priority habitat: arable field margins, eutrophic standing waters; hedgerows; lowland mixed deciduous woodland; open mosaic habitats on previously developed land; wet woodland; ponds; rivers; and wood-pasture and parkland.	Generally not particularly high-quality examples of their types. Not designated at county level or above. However, they still provide important habitat and habitat corridors for wildlife at the site level.
Species		
International or European	No features present within the study area at this level of importance.	n/a
UK or National	White-clawed crayfish.	Due to their known rarity in the UK and declining populations.
Regional	No features present within the study area at this level of importance.	n/a
County	Breeding bird assemblage and wintering bird assemblage.	Significant declining population trends of farmland assemblages.
	Bat species assemblages including barbastelle bat *Barbastella barbastellus*; Nathusius' pipistrelle *Pipistrellus nathusii*; *Myotis* sp. bats.	Known rarity or lack of information on the population numbers of some bat species. *Myotis* bats are included due to the presence of whiskered bat *Myotis mystacinus* which is rare in the county.

Value/ sensitivity	Examples within the study area	Justification
	• Great crested newt • European eel • Otter • Water vole • Terrestrial invertebrate assemblages • (Nationally scarce) lesser calamint *Clinopodium calamintha*	Widespread distribution in the county, but restricted habitat use, and in the case of terrestrial invertebrates, potential for species or assemblages of County value as assessed by Essex's invertebrate weighting tool.
Local	Common lizard; slow worm; grass snake; badger; freshwater fish; terrestrial invertebrates; freshwater invertebrates (excluding white-clawed crayfish); fresh water macrophytes; terrestrial invertebrate assemblages; (near threatened) field scabious *Knautia arvensis;* (near threatened) common cudweed *Filago vulgaris;* any additional species listed as Priority species on Section 41 the NERC Act 2006 with potential presence in the study area.	Widespread and relatively abundant in this region. The populations within the study area are likely to make a very limited contribution to the species' conservation status.

9.4 Potential impacts

9.4.1 The potential impacts from the Proposed Scheme, and the zone of influence (ZOI) within which receptors might experience effects, are listed in table 9.5.

9.4.2 Table 9.5 shows the typical pathways to an effect and the ZOI over which the effect is felt (based on standard guidance where available) and the ecological features identified in the baseline that are present within a ZOI.

Impact pathways - construction

9.4.3 The Proposed Scheme would require the temporary and permanent loss of terrestrial and aquatic habitats, including priority habitats, and habitats likely to be used by or to support protected and notable species including notable vascular plants. Habitat fragmentation would potentially result from the severance of linear habitat features such as hedgerows, lines of trees and riparian corridors. This could potentially affect protected or notable species that rely upon such habitats for foraging, commuting or dispersing.

9.4.4 During the construction phase, the following activities could potentially result in mortality and injury of species receptors: site clearance, earthworks, works affecting watercourses, and other temporary works e.g. entrapment in excavations. Significant effects could arise if protected or notable species are present within the footprint of the Proposed Scheme, especially if they could not avoid the works.

9.4.5 Disturbance to important receptors could result from changes in noise, light, vibration or visual stimuli. During construction, disturbance could arise from the following activities: fencing, earthworks, compound set up, construction, and reinstatement.

9.4.6 Air quality changes could occur through dust and changes in pollutant levels caused by emissions from construction plant and machinery, with resulting effects on sensitive habitats. Chapter 6 provides additional detail on air quality. Modelling assessment is required to assess the impact of nitrogen oxide (NOx) deposition on sensitive habitats. This is described in chapter 6.

9.4.7 There is potential for hydrological change to cause significant effects during construction where works would directly or indirectly affect watercourses. Hydrological changes are detailed in chapter 14, road drainage and the water environment, and include changes to both water quality and quantity within nearby watercourses. Changes in hydrology, fluvial geomorphology and hydrogeology are important to terrestrial and freshwater ecology due to the following factors:

- water quantity has an important role in structuring the flora and fauna communities in watercourses, ponds and wetlands
- sediment and other pollutant releases have the potential to adversely affect sensitive ecological receptors
- ecological receptors can be sensitive to alterations of runoff regimes changing the quality of surface and groundwater

9.4.8 Any introduction or spread of INNS would potentially cause significant adverse effects to sensitive habitats. This is because of the dominance that these species can have over native species. During the construction works, topsoil and subsoil potentially containing plant INNS would be disturbed. Such soil or seed and ‘propagules’ could be spread during construction activities, including excavation and machinery movements. Works within water can also introduce and spread animal INNS.

Impact pathways - operation

9.4.9 The offline sections of the Proposed Scheme would fragment habitats south of the existing A12 between Rivenhall End and Marks Tey. Given the predominantly arable landscape, the severance of existing wildlife corridors along the Proposed Scheme (such as watercourses, field margins, hedgerows and tree lines) could have significant effects on species in the area as the new highway would act as a barrier across the landscape.

9.4.10 Severance leads to isolation both within and between populations and from specific resources separated spatially and temporally. The effects of this include reduced foraging success, increased competition, genetic isolation and inbreeding, which can lead to local extinctions.

9.4.11 Mortality in the operation phase relates to the fact that animals may be attempting to cross a wide road, used by fast traffic, which bisects many miles of the landscape. Unlike the risk of construction direct mortality, which is of a temporary nature, the risk of direct morality through operation of the Proposed Scheme is effectively permanent.

9.4.12 Sources of disturbance in the operational phase relate to road noise and lighting. Noise has the potential to impact upon local populations of breeding birds, potentially reducing the suitability of habitat close to the road and therefore reducing the availability of bird habitat in the vicinity of the site.

9.4.13 Impacts from operational road lighting are most likely to affect bat species along the Proposed Scheme (although it could also affect birds, invertebrates and certain mammals e.g. otter and badger). The effects of road lighting are complex but include roost disturbance and abandonment; severance (for light-shy species such as brown long-eared bat); loss of foraging habitats for light-shy species due to light-spill; a decline in airborne invertebrate prey available to light-shy species (as insects are attracted to lights); and increased traffic collisions for bat species such as pipistrelle that will actively forage on insects attracted to lighting. Habitats where the impact of lighting can be particularly severe include along river corridors, woodland edge and hedgerows.

9.4.14 The key receptors that may be sensitive to changes in vehicle emissions are the designated sites noted for their floristic importance, sensitive priority habitats and ancient woodland habitats, and any species that depend on this. Elevated NOx concentration is generally considered to be the main threat to vegetation from vehicle emissions, but normally only within close proximity to the road.

9.4.15 Operational effects to watercourses are possible in relation to surface water road drainage and unexpected pollution events. The Water Framework Directive (WFD) assessment will aim to determine the effects of the Proposed Scheme on ecological quality, identifying any potential impacts that could cause deterioration in the assigned status of a water body or prevent a water body from meeting its WFD objectives. WFD assessment is covered in chapter 14, road drainage and the water environment.

Table 9.5: Summary of impact pathways, zones of influence and relevant ecological receptors

Impact pathway	Zone of influence and rationale	Receptor potentially sensitive to the impact pathway
Construction phase		
Habitat loss/gain, fragmentation or modification	Habitat loss/gain would be restricted to areas cleared to make way for highways construction (including borrow pits), temporary compounds or temporary access roads. Temporary/permanent loss and fragmentation of watercourses may occur with installation/modifications to culverts and bridge crossings.	• Whetmead LNR/LWS • Priority habitats • Veteran trees. • Habitats supporting protected / notable species: bats; badger; breeding and wintering birds; fish; freshwater invertebrates including white-clawed crayfish; great crested newt; otter; reptiles; terrestrial invertebrates; water vole; priority species (amphibians, brown hare, hedgehog etc.); notable vascular plants
Mortality and injury of species	Physical interaction between species and project infrastructure, machinery or activities would be limited to areas within the footprint of the Proposed Scheme and areas immediately outside the scheme footprint due to construction traffic approaching or leaving the site.	• Bats; badger; breeding and wintering birds; fish; freshwater invertebrates including white-clawed crayfish; great crested newt; otter; reptiles; terrestrial invertebrates; water vole; and priority species (amphibians, brown hare, hedgehog etc.)
Species disturbance (from changes to noise, vibration, visual and light stimuli)	The area subject to noise disturbance varies based on the activity being undertaken and the sensitivity of the individual receptor. All potentially sensitive receptors within the area likely to be exposed to noise level changes will be considered. Consideration will be given to the effects of visual disturbance for all potentially sensitive receptors. The zone of influence for visual disturbance is extremely difficult to quantify and varies with each receptor and type of stimuli. This assessment will be informed using professional judgement in consultation with statutory advisors; however, the baseline study area fully encompasses all likely zones of influence.	• SPAs and Ramsar sites designated for breeding or wintering birds • Bats (within roosts only [noise and vibration] and/or in foraging/commuting areas [light]); badger (within setts only); breeding and wintering birds; fish; otter; and water vole

Impact pathway	Zone of influence and rationale	Receptor potentially sensitive to the impact pathway
Air quality changes (resulting in habitat loss/modification)	The effect of air emissions including dust from construction traffic and plant are considered within 200m.	• LNR • LWS • Ancient Woodland Inventory sites and other ancient woodland habitats • Priority habitats • Notable vascular plants
Hydrological changes to surface and groundwater (resulting in mortality/injury of species and/or habitat loss/modification and/or impacts to prey species)	All sensitive receptors with hydrological connection to an affected waterbody.	• SPAs and Ramsar sites with hydrological connectivity • LNR • LWS • Ancient Woodland Inventory sites and other ancient woodland habitats • Annex I habitat: wet woodland • Priority habitats • Fish; freshwater invertebrates including white-clawed crayfish; fresh water macrophytes; great crested newt; otter; water vole; and notable vascular plants
Introduction and spread of invasive non-native species (INNS) (resulting in habitat loss/modification)	Effects associated with INNS would only likely be experienced within the immediate vicinity of areas where machinery movements, soil stripping, storage and habitat reinstatement would be undertaken. However, there is potential for wider effects to occur where works would be within and in the vicinity of flowing watercourses.	• LNR • LWS • Ancient Woodland Inventory sites and other ancient woodland habitats • Priority habitats
Operational phase		
Habitat fragmentation	In offline areas, retained habitats either side of the works, once connected, would be fragmented.	• Bats; badger; breeding and wintering birds; great crested newt; reptiles; terrestrial invertebrates; aquatic invertebrates (including white-clawed crayfish); fish; otter; water vole and priority species (amphibians, brown hare, hedgehog etc.)
Mortality and injury of species	Traffic collisions within active highway.	• Bats; badger; great crested newt; barn owl; otter; reptiles; and priority species (amphibians, brown hare, hedgehog etc.)

Impact pathway	Zone of influence and rationale	Receptor potentially sensitive to the impact pathway
Species disturbance (from changes to noise and light stimuli)	The area subject to operational road noise and lighting disturbance is dependent on the sensitivity of the individual receptor.	• SPAs and Ramsar sites designated for breeding or wintering birds • Bats (within roosts only [noise] and and/or in foraging/commuting areas [light]); badger (within setts only); breeding and wintering birds; fish; otter; water vole; and priority species
Air quality changes (resulting in habitat loss/modification)	The effect of air emissions from operational traffic are considered within 200m of the Affected Road Network	• LNR • LWS • Ancient Woodland Inventory sites and other ancient woodland habitats • Priority habitats • Notable vascular plants
Hydrological changes (resulting in mortality/injury of species and/or habitat loss/modification)	All sensitive receptors with hydrological connection to an affected waterbody.	• SPAs and Ramsar sites with hydrological connectivity • LNR • LWS • Ancient Woodland Inventory sites and other ancient woodland habitats • Annex I habitat: wet woodland • Priority habitats • Fish; freshwater invertebrates including white-clawed crayfish; fresh water macrophytes; great crested newt; otter; water vole; notable vascular plants

Impact pathways – receptors

9.4.16 The SPA, SAC and Ramsar sites identified within the ZOI are currently scoped into the assessment. The draft HRA has concluded 'no likely significant effects', however until this document is finalised following completion of design work for the scheme, it is proposed to include the sites in the scope of the assessment.

9.4.17 There are no ecological SSSI or NNR within 2km of the Proposed Scheme, therefore SSSI and NNR are scoped out of further assessment.

9.4.18 Direct habitat loss is likely at Whetmead LNR/LWS, in a number of priority habitats. Additional LWS and priority habitats within the ARN will also undergo specialist assessment for potential NOx deposition impacts. As such, significant impacts are possible and are scoped into further assessment. Notable vascular plants have been recorded in locations which may also be impacted by habitat loss.

9.4.19 Impact pathways of relevance have been identified for badger which are widespread within the survey area. There is potential for impacts to the setts and foraging habitat of this species, and a risk of increased mortality during operation of the scheme. This receptor is therefore scoped in for further assessment.

9.4.20 Bat roosts and commuting and foraging habitats across the Proposed Scheme extent are likely to be lost and / or fragmented. Due to the diversity of bats present, including nationally rare species, it is unlikely that best practice mitigation alone would be sufficient to avoid significant impact. Therefore, bats are scoped in for further assessment.

9.4.21 There is potential for significant effects on the populations of breeding and wintering birds (including schedule 1 species such as barn owl). Potential impacts include loss of nesting and foraging habitat, disturbance during operation and construction and increased mortality during operation of the Proposed Scheme. Therefore, breeding and wintering birds are scoped in for further assessment.

9.4.22 Dormouse have yet to be identified within the study area during field survey. Desk study identified historic dormouse presence south of the existing road near Witham, however, more recent records suggest that the nearest dormouse presence is over 2km from the Proposed Scheme. This suggests that dormouse are likely to be absent from the study area and are therefore scoped out of further assessment.

9.4.23 Impact pathways of relevance to freshwater fauna (including fish, macroinvertebrates and white clawed crayfish), otter and water vole have been identified in relation to habitat loss and fragmentation and noise and vibration in the construction phase. As the outline construction methodology and design details for watercourse crossings are not yet available, these ecological features are precautionarily scoped in for further assessment of the construction phase. Otter and water vole are also scoped in for the operational phase due to potential traffic collision and habitat severance impacts.

9.4.24 GCN are known to be present within the survey area and impact pathways relating to habitat loss/fragmentation, mortality and injury of individuals, and hydrological change of habitats have been identified. The District Level Licencing (DLL) approach to mitigation, led by Natural England, will be implemented for the Proposed Scheme to avoid significant effects on GCN. However, it is proposed to scope GCN into the assessment to demonstrate that there would be no significant effects on this species.

9.4.25 Common reptile species are widespread, especially along the verges of the road network. It is highly unlikely that significant effects would result from habitat loss and potential mortality as a legally compliant mitigation strategy for this species can be easily designed and implemented. However, at this time the mitigation strategy for this species has not been developed and therefore it is proposed to scope reptiles into the assessment.

9.4.26 There is potential for invertebrates to be impacted by the Proposed Scheme. The degree of impact and the importance of any species that may be present are not known but will be informed by a detailed desk study and field surveys. Until the field surveys have been completed it is not possible to accurately assess the value of the site for invertebrates, nor the scale of potential impacts. Therefore, terrestrial invertebrates are scoped into the assessment.

9.4.27 The desk-study confirmed presence or likely presence of a number of Species of Principal Importance or 'priority species' such as brown hare, common toad, hedgehog, harvest mouse, polecat and water shrew and several species of invertebrate. These notable species will be present within the landscape at various densities depending on their specific habitat requirements and the quality of the habitat present. However, the majority of habitats recorded within the footprint of the Proposed Scheme are abundant within the local landscape and priority species would also benefit from the mitigation strategies which would be implemented for the protected and notable species scoped in for further assessment. However, until the designs of this mitigation are developed, priority species are scoped into the assessment.

9.4.28 Given the negligible value assigned to INNS, invasive species are scoped out of further assessment, however, they will be considered in relation to legislative compliance.

9.4.29 Species scoped in for further assessment at this stage may be scoped out in future if the value assigned to them is reduced following additional surveys and data collection. Receptors will only be scoped out following consultation and agreement with statutory bodies.

Summary of scope

9.4.30 Table 9.6 summarises the proposed scope for biodiversity. As mentioned in section 9.4, there are interrelationships between biodiversity and other environmental aspects, particularly noise and vibration (chapter 12), and light pollution (chapter 8), and the water environment (chapter 14). The combined effect on biodiversity receptors from these aspects will be assessed within the biodiversity assessment.

Table 9.6: Summary of biodiversity scope

Matter	Scoped in - construction	Scoped in - operation
European designated sites (SAC, SPA and Ramsar)	✓	✓
SSSI and NNR	×	×
Local Nature Reserves	✓	✓
Local Wildlife Sites	✓	✓
Ancient Woodland Inventory sites and ancient woodland habitat	✓	✓
Priority habitats	✓	✓
Notable vascular plants	✓	✓
Badger	✓	✓
Bats	✓	✓
Birds – breeding, wintering and schedule 1 species (including barn owl)	✓	✓
Dormouse	×	×
Freshwater fauna (fish, macro-invertebrates and white-clawed crayfish)	✓	✓
Great crested newt	✓	✓
Otter	✓	✓
Reptiles	✓	✓
Terrestrial invertebrates	✓	✓
Water vole	✓	✓
Priority species	✓	✓
INNS – plants and animals	×	×

9.5 Design, mitigation and enhancement measures

9.5.1 Embedded mitigation has included avoiding important ecological receptors such as reducing the scheme footprint along the River Ter corridor by utilising the existing bridge. Further mitigation is likely to include:

- avoiding other valuable and priority habitats including those important connective habitats (i.e. hedgerows, watercourses and tree lines)
- improving the permeability of the Proposed Scheme for wildlife by providing new routes, or improving existing routes, for movement of species across the new road e.g. by including underpasses and mammal ledges
- landscape planting to reduce noise and lighting impacts and to provide guide planting to maintain connectivity and encourage use of new/existing crossing structures, and further planting to provide a range of habitats to benefit local fauna

- the design of linear habitats such as hedgerows and lines of trees should aim to increase connectivity along the scheme, linking with retained woodland and hedgerows where possible
- retention of woodland/hedgerows identified for placement of bat and bird boxes
- vegetation clearance and structure demolition method statements in accordance with legislative and licencing conditions, if required (protected species licences from Natural England are likely to be required for bats, badger and water vole)
- general protective and control measures to be detalied in Environmental Management Plans, risk assessments and method statements during the construction phase
- species translocation may be required where impact avoidance is not possible
- appropriate design of river realignments with input from a qualified ecologist and geomorphologist to provide more environmental gain
- implementation of an Invasive Species Management Plan for plant and animal species in the terrestrial and aquatic environment

9.5.2 The Proposed Scheme, as part of the wider Highways England Delivery Plan, would aim to achieve no net loss of biodiversity (with an aspiration to provide a net gain), in line with the requirements of the National Planning Policy Framework (NPPF) and NNNPS.

9.5.3 A Protected Species Compliance Report will be provided with the assessment to document the mitigation that would be put in place to comply with legal requirements for protected species that may be impacted but that would not be significantly affected in EIA terms.

9.6 Description of the likely residual effects

9.6.1 Much of the Proposed Scheme is road widening with offline sections located, in the main, in arable and improved grassland habitats of limited biodiversity importance. With the implementation of design and mitigation measures and adherence to legal compliance it is highly unlikely that the Proposed Scheme would result in residual significant effects on ecological receptors.

9.7 Assessment methodology

Biodiversity

9.7.1 It is anticipated that due to the potential for significant effects on biodiversity receptors, a detailed assessment is required to identify the necessary mitigation to avoid any significant effects. The biodiversity assessment will be undertaken in accordance with DMRB guidance methodology, specifically LA 104 Environmental Assessment and Monitoring (Highways England, 2019) and LA 108 Biodiversity (Highways England, 2020) which meets the NNNPS policy requirements set out in section 9.1. The assessment will be based on the information collated from desk-based resources detailed in section 9.3 and the ongoing field surveys, detailed in Appendix I. Assessment criteria for determining value (in terms of geographical importance) and magnitude of impact are provided in Appendix C. The significance matrix to be used in the assessment is shown in table 9.7.

Table 9.7: Significance matrix – Biodiversity (taken from DMRB LA 108)

Resource value (importance)		Level of impact				
		No change	Negligible	Minor	Moderate	Major
	International or European Importance	Neutral	Slight	Moderate or large	Large or very large	Very large
	UK or National Importance	Neutral	Slight	Slight or moderate	Moderate or large	Large or very large
	Regional Importance	Neutral	Neutral or slight	Slight	Moderate	Moderate or large
	County Importance	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or moderate
	Local Importance	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight

9.7.2 The impact assessment work to be undertaken for the Proposed Scheme and reported in the Environmental Statement will be proportionate, focusing on potential significant adverse effects within the ZOI.

9.7.3 The requirements of protected and controlled species legislation will be detailed in a separate report to allow the Environmental Statement chapter to focus on potential significant effects, in terms of EIA, only. It is anticipated that protected species licences are likely to be required for bats, badger and water vole. Draft licences will be prepared and agreed with Natural England for these species alongside the EIA. Full submission of licences to Natural England would be required following the grant of the DCO.

9.7.4 Assessment of the potential air quality impacts on sensitive designated sites and habitats within 200m of the ARN will be undertaken in accordance with DMRB LA 105 (Highways England, 2019).

Habitats Regulations Assessment (HRA)

9.7.5 HRA is a recognised step-by-step process to determine the likely significant effects and (where appropriate) assess adverse impacts on the integrity of European (Natura 2000) sites. Where likely significant effects are identified, the assessment examines alternative solutions and provides justification for imperative reasons of over-riding public interest (IROPI).

9.7.6 HRA Stage 1 (Screening) identifies the likely significant effects of a project upon the integrity of a European Site, either alone or in combination with other plans and projects and considers whether the impacts are likely to be significant.

9.7.7 A draft Stage 1 assessment (in preparation) has been undertaken in accordance with DMRB LA 115 (Highways England, 2020) to determine whether the Proposed Scheme would have any likely significant effects on the European sites listed in table 9.1. The assessment concludes that no likely significant effects on any European sites are anticipated, when considered alone or in combination with other plans and projects.

9.8 Assessment assumptions and limitations

9.8.1 Where possible, nationally recognised standard survey methodologies will be used to reduce limitations for ecological evaluation and impact assessment.

9.8.2 Specific limitations relevant to each survey, such as land access constraints, will be detailed in the relevant survey result factual reports. The survey specific constraints are unlikely to represent a limitation that would compromise the ecological impact assessment, especially when taking account of the Proposed Scheme's embedded mitigation in design and best practice measures.

10. Geology and soils

10.1 NNNPS requirements

10.1.1 The National Networks National Policy Statement (NNNPS) sets out the Government's policies to deliver the development of Nationally Significant Infrastructure Projects (NSIP) on the national road and rail networks in England. The Secretary of State (SoS) uses the NNNPS as the primary basis for making decisions on Development Consent Order (DCO) applications.

10.1.2 Key policy from the NNNPS relevant to this aspect includes:

- Paragraph 5.168 of the NNNPS states that applicants should take into account the economic and other benefits of the best and most versatile (BMV) agricultural land (defined as land in grades 1, 2 and 3a of the Agricultural Land Classification (ALC) system). Where significant development of agricultural land is demonstrated to be necessary, applicants should seek to use areas of poorer quality land in preference to that of a higher quality. Applicants should also identify any effects, and seek to minimise impacts, on soil quality, taking into account any mitigation measures proposed. Where possible, developments should be on previously developed (brownfield) sites provided that it is not of high environmental value.
- Paragraph 5.176 states that the decision-maker should take into account the economic and other benefits of the best and most versatile agricultural land. The decision-maker should give little weight to the loss of agricultural land in grades 3b, 4 and 5, (as defined in the ALC system) except in areas (such as uplands) where particular agricultural practices may themselves contribute to the quality and character of the environmental or the local economy.
- Paragraph 5.168 states that for developments on previously developed land, applicants should ensure that they have considered the risk posed by land contamination and how it is proposed to address this. The policy recommends the adoption of the Model Procedures for Management of Land Contamination (CLR11) which sets out procedures for risk assessment, deciding on remedial options and implementing remediation. The Environment Agency published an update to this document in May 2020 entitled Land Contamination: Risk Management.
- Paragraph 5.22 states that where the project is subject to EIA the applicant should ensure that the Environmental Statement clearly sets out any likely significant effects on internationally, nationally and locally designated sites of ecological or geological conservation importance (including those outside England).
- Paragraph 5.23 states that the applicant should show how the project has taken advantage of opportunities to conserve and enhance biodiversity and geological conservation interests.
- Paragraph 5.25 states that as a general principle, and subject to the specific policies, development should avoid significant harm to biodiversity and geological conservation interests, including through mitigation and consideration of reasonable alternatives.

10.2 Study area

10.2.1 This chapter assesses the potential effects which may be realised during the construction and operational phases of the Proposed Scheme on the baseline geology and soil environment. This chapter considers:

- effects on bedrock geology and superficial deposits, including geological designations and sensitive / valuable non-designated features
- effects on soil resources
- effects from contamination on human health, surface water and groundwater

10.2.2 For surface waters and groundwater quality, this chapter only considers the effects from land contamination. Detailed assessment of potential effects of the Proposed Scheme on water environment is given in chapter 14.

10.2.3 In the absence of a defined study area in the Design Manual for Roads and Bridges (DMRB) for geology and soils, a buffer of 250m around the provisional order limits has been used to establish baseline conditions and identify potential impacts on receptors. This is primarily based on Guidance for the Safe Development of Housing on Land Affected by Contamination (National House Building Council et al. 2008) and is a conservative but sensible approach in the context of the proposed development, considering the distance over which contamination can migrate. The study area and key geological and land contamination constraints are shown in figure 10.1.

10.2.4 The Proposed Scheme also includes the assessment of 11 potential borrow pit locations identified along the scheme. A Preliminary Sources Study Report (PSSR) (HAGDMS No.31435) for the borrow pits, which provides an interpretation of the ground conditions expected at each of the locations, was undertaken in November 2019. This was followed by a ground investigation (GI) commissioned as part of the Proposed Scheme Phase I GI works to enable the selection of the most suitable borrow pits. These will be shortlisted prior to statutory consultation.

10.3 Baseline conditions

Baseline sources

10.3.1 Information on geology and ground conditions is based on site-specific data and information obtained from the British Geological Society (BGS), Envirocheck report (ref. 87509587_1_1, dated 25-May-2016) and Enviro Insight and Geo Insight reports, dated July 2018, from Groundsure Ltd.

10.3.2 The data gathered on baseline ground conditions are sourced primarily from the Preliminary Sources Study Report (PSSR) (Version P01, HAGDMS number 29472, dated June 2017) which includes information from the Envirocheck report, site walkover report, and regulatory authorities' consultations undertaken in 2017. An addendum PSSR (HAGDMS No. 30459) was also undertaken in 2018 which contains supplementary information between junction 24 and 25. This report includes information from the Groundsure report.

10.3.3 The following sources have been used to establish baseline conditions:

- An Envirocheck report (ref. 87509587_1_1, dated 25 May 2016) for the A12 between junctions 19 and 25
- Groundsure report (Groundsure reference: Enviro-A12-A_250, dated 19 July 2018, HAGDMS No. 30508) specifically for junction 24 to junction 25
- Online British Geological Survey's Geology of Britain Viewer and relevant historic borehole scans (BGS, 2019)
- GeoEssex website (2020) - this website provides information on sites designated either as Sites of Special Scientific Interest (SSSI) or as local geological sites (LGS) within the study area
- The MAGIC Map application (Defra, 2020)
- The Environment Agency's Water Framework Directive Assessment Essex and South Suffolk SMP2 (Environment Agency, 2010)
- LandIS Soilscapes (Cranfield University, 2020)
- Essex Minerals Local Plan (Essex County Council, 2014)
- Provisional ALC (Natural England, 2020)
- ALC Grades – Post 1988 Survey (Natural England, 2020)
- Zetica's Regional Unexploded Bomb Risk Map for Essex (Zetica, no date)
- Zetica Unexploded Ordnance (UXO) Desk Study and Risk Assessment for the A12 Scheme (Zetica Doc. No. P7265-17-R1/Revision B dated January 2018)

Baseline information

Geology

10.3.4 The study area is underlain by a bedrock geology consisting of London Clay, part of the Thames Group (clay with some silts and sands). The London Clay Formation is expected to be underlain by the undifferentiated Paleogene Lambeth Group and Thanet Formation (both consisting of silts, sands and gravel) and the Cretaceous Chalk. The Thanet Sand Formation is thought to outcrop above the London Clay to the south west of Kelvedon. The London Clay is anticipated to be up to 125m thick in places, with the chalk at a minimum depth of 50m below ground level. Existing borehole data supports the depths for both the London Clay and Chalk.

10.3.5 London Clay is often a pyritic deposit; the presence of sulphates and other aggressive components within the natural ground may come into contact with buildings and highways structures resulting in potential damage.

10.3.6 The superficial geology comprises Head deposits (clay, silt and sand), glaciofluvial deposits (sand and gravel), Lowestoft Formation (formed of Diamicton), Brickearth and localised alluvium (clay, silt and sand) and River Terrace Deposits (sand and gravel). There are also localised deposits of glaciolacustrine materials (sand and gravel) and Kesgrave Catchment Subgroup (sand and gravel).

10.3.7 Areas of made ground, worked ground and infilled ground are expected within the study area associated with historical land uses. This includes infilled historical mineral sites identified in several places along the scheme, and the dismantled Witham and Kelvedon branch railway lines decommissioned in the 1970s, both crossing the current line of the A12.

10.3.8 Further details on the geology and existing borehole records can be found within the PSSR. Additional ground investigation will be required in order to confirm the geochemical, geological and hydrogeological conditions within the parts of the study area not previously subject to intrusive investigation.

10.3.9 There is one designated geological SSSI - Marks Tey Brickpit - located 150m north-west of junction 25, which is designated due to its geological features. Marks Tey Brickpit SSSI has uniquely important Pleistocene sediments, which have yielded a continuous pollen record at a seasonal resolution through the entire Hoxnian Interglacial. No other site in the British Isles has so far produced a comparable vegetational record for this or any other interglacial.

10.3.10 Based on the GeoEssex database, there are no local geological sites within 250m of the Proposed Scheme. There are no other designated sites within 250m of the study area, including regionally important geological/geomorphological sites (RIGS) which is a non-statutory designated site for geology.

Soils

10.3.11 The economic resource value of soil is primarily measured by its ability to support agricultural uses. This is quantified by its ALC grade, with six grades defined within the ALC for England and Wales: Revised criteria for Grading the Quality of Agricultural Land (Ministry of Agriculture, Fisheries and Food, 1988), as follows:

- grade 1 (excellent quality)
- grade 2 (very good quality)
- subgrade 3a (good quality)
- subgrade 3b (moderate quality)
- grade 4 (poor quality)
- grade 5 (very poor quality)

10.3.12 BMV agricultural land equates to grades 1, 2 and subgrade 3a of the ALC system and is the most flexible land in terms of the range of crops that can be grown, the level and consistency of yield and the cost of obtaining yield.

10.3.13 Provisional ALC data for the study area show the area to be dominated by grade 2 and undifferentiated grade 3 soils, with a small area of grade 4 at the southern end. Post-1988 ALC data are only available for small areas and mostly show grade 1, grade 2 and subgrade 3a to be present. As such, where grade 3 land is mapped by the provisional ALC data, it is assumed at this stage that subgrade 3a land is likely to be present.

10.3.14 Soils may also be of importance in supporting sites of ecological importance; thus a high-level review of soil types has been undertaken. Soilscapes identifies the following soil types within the study area:

- soilscape 6 – freely draining slightly acid loamy soils
- soilscape 8 – slightly acid loamy and clayey soils with impeded drainage
- soilscape 8 – slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils
- soilscape 9 – lime-rich loamy and clayey soils with impeded drainage

10.3.15 None of these soil types is inherently particularly sensitive, but soils supporting sites of ecological importance identified within chapter 9, biodiversity, will be considered within the Environmental Statement in line with DMRB LA 109. Baseline information for these sites will not be repeated in this chapter.

Mining, quarrying and mineral resources

10.3.16 Most of the study area is classed as a mineral safeguarding area (MSA) due to the underlying sand and gravel resources in the region. Planning permission (ESS/39/14/BTE) was approved in June 2016 for a quarry near to junction 22 at Colemans Farm. The site has permission to extract an estimated 2.5 million tonnes of sand and gravel. It also includes the provision of a new access from Little Braxted Lane and the installation and operation of primary processing plant, ancillary facilities comprising washing and bagging plant, silt lagoons, weighbridge, offices and workshop. The life of the permission is 17 years and will progress in 10 phases of extraction with restoration to be one of Essex's flagship biodiversity sites. Detailed information on mineral resources present along the study area and the potential effects of the Proposed Scheme on mineral resources are assessed within chapter 11, material assets and wastes.

Historical mineral extraction sites (potentially infilled)

10.3.17 Based on the Envirocheck report of the study area, BGS recorded a number of historical mineral extraction sites within 250m of the existing A12 scheme including brickfields, gravel pits, sand pits and quarries. Some of the sites have been redeveloped and others appear to be infilled with unknown materials and are therefore considered as potential sources of land contamination in this chapter. The sites are summarised in table 10.1 below.

Table 10.1: Potentially infilled historical mineral extraction sites within 250m

Historical mineral extraction sites	Location (approximate)	Distance from Scheme	Current land use
Junction 19 – 20			
Boreham House gravel pit	TL 74109 09589	20m north	Agricultural.
Historical Hogwells brickfield	TL 76706 10934	On route and extends 140m to the south of the scheme	Residential properties shown on the footprint.

Historical mineral extraction sites	Location (approximate)	Distance from Scheme	Current land use
Historical brick works at Hatfield Peverel	TL 79755 12218	8m north	Residential (southern section). Northern section is undeveloped.
Historical sand and gravel pit at Hatfield Peverel	TL 80093 12084	150m south	Landscaped as a lake.
Junction 23 - 24			
Historical gravel pit (Ewell Hall)	TL 86451 17764	120m south	Undeveloped.
Historical brickfield (Brick Kiln / Park farms)	TL 87602 18967	On route	Existing A12 built on this site. Brickfield extends from the A12 to approximately 200m south of the road.
Historical sand pit (Threshelfords Farm)	TL 87546 19393	180m north	Redeveloped into Threshelfords business park.

Landfills

10.3.18 There are records of historical landfills in the study area. These are:

- A series of phased landfills, located on the southern edge of Witham between junctions 22 and 23, immediately to the east of the A12 consisting of industrial, commercial and household waste deposited between 1964 and 1990. The current A12 road was built on the landfill.
- Blackwater Lane landfill, to the south of Witham sewage works near junction 22, immediately west of the A12. This was a household waste site known to have accepted waste between 1958 and 1964.
- Maldon Road landfill, in the Witham industrial area between junctions 22 and 23, 190m north of the current A12. This accepted commercial, household and liquid sludge wastes and was operational between 1963 and 1964.
- Three landfills within the old Collier's Quarry to the north of Marks Tey near junction 25. These accepted industrial and commercial waste deposited between 1970 and 1988.
- London Road landfill, between Marks Tey and Copford, near junction 25, 20m south of the current A12. This accepted inert waste. No operational dates are provided.
- Foundry Lane landfill which is to the east of London Road Landfill between the A12 and B1407 near junction 25, 240m north of current A12. This accepted inert, industrial and household waste between 1958 and 1980.

Potential sources of contamination

10.3.19 The study area is predominantly in a rural setting consisting of mostly BMV agricultural land use. Most of the industrial activity is focussed in Chelmsford and Witham. The A12 originally followed the path of the old Roman Road, with the road being constructed on its current route in the 1960s. In addition to the landfill sites and potentially infilled former brick pits and quarries noted in the above sections, there are further potentially significant land uses in the study area including:

- Railway infrastructure including the Witham and Kelvedon branch lines shown on the late 19th century maps and decommissioned sometime in the 1970s, both crossing the current line of the A12.
- Sewage works including an existing sewage works at Witham which extends on both sides of the current A12, including parts of Whetmead Local Nature Reserve (LNR); an existing sewage works 300m south of Rivenhall End; and a former sewage works, which is now a pumping station, near the confluence of the River Blackwater and Domsey Brook.
- Rifle ranges dating back to the late 19th and early 20th centuries including one to the north east of Boreham, 250m north of the A12, and one near junction 22, 250m south of A12.
- A malt house and gasometer adjacent to Marks Tey station approximately 50m north of the current route (early 19th century; gasometer demolished by 1900, Malthouse converted to warehouse in the 1960s and demolished with construction of the A12).
- Current and former industrial areas, including: Witham industrial area located between the A12 and the Witham Branch line, which included an ‘industrial gas works’; Springfield industrial estate, constructed in the 1970s and still present immediately west of junction 19 (Boreham); a depot immediately south west of Hatfield Peverel Station which was built in the 1960s; works of unknown purpose constructed in Boreham in the 1970s, 250m south east of the current A12; and a gas governor built adjacent to Little Braxted Lane.
- Fuel stations including those immediately adjacent to the A12 at junctions 19, 21, at Rivenhall End, junction 23 and junction 25.
- Two grade 2 ‘significant’ pollution incidents have occurred within 250m of the current A12. One was located 200m north west of junction 22 and was of alcohols/aldehydes/other organics to water and occurred in 1997. The other was of oils and fuels to water 150m west of the A12, on Stepfield road in Witham between junctions 22 and 23 and occurred in 2014.
- Potential sources of land contamination listed above are shown in figure 10.1 in Appendix A.

Surface water and groundwater

10.3.20 There is the potential that contaminants from contaminated land and landfills may impact on groundwater and surface water. Information on surface water and groundwater receptors are covered in chapter 14, road drainage and the water environment. To avoid duplication, this section does not describe the water environment baseline as chapter 14 provides a full description of the baseline conditions.

10.3.21 Monitoring of surface water courses likely to be impacted by the Proposed Scheme was undertaken in 2018 to obtain baseline water quality information prior to the proposed scheme development works. The results of the monitoring are provided in Jacobs report titled A12 Junction 19 to 25 Surface Water Monitoring Factual Report (B229H130-001). Similarly, groundwater quality monitoring is currently being undertaken as part of the ground investigation works to enable assessment of the potential impact of the scheme on groundwater. Results of this monitoring will be provided in the Ground Investigation Report (GIR). The information will be fed into the Preliminary Environmental Information Report (PEIR) and Environmental Statement.

Future baseline

Geology

10.3.22 Due to the extensive mineral extractions in the study area and potential for new extraction licenses to be approved in the future, it is likely that the current superficial sand and gravel deposits would be removed in some areas and backfilled with engineering fill. This would potentially create new sources or pathways for contamination. The bedrock geology is unlikely to change.

Surface water and groundwater

10.3.23 Any future land use changes, for example a new oil depot or garage introduced in the study area, would potentially impact baseline soil condition, groundwater and surface water quality in the area. Existing ground conditions would generally improve (particularly groundwater and surface water quality) in areas where existing / historical land contamination sources identified along the route are remediated.

Value of receptors

10.3.24 An overview of the criteria used to determine the value (sensitivity) of geology and soil receptors is based on the criteria set out in Table 3.11 of DMRB LA 109 and provided in Appendix C. Table 10.2 summarises the value of the receptors identified within the study area. The value / sensitivity of surface water and groundwater receptors have been determined based on the criteria set out in DMRB LA 113 (see chapter 14).

Table 10.2: Value (sensitivity) of receptors in the study area for geology and soils

Value / sensitivity	Aspect	Description	Examples within the study area
Very high	Geology	International designated sites of geological value (e.g. UNESCO World Heritage Sites).	None identified within the study area.
	Human health	Very sensitive land use such as residential or allotments.	Residential properties in close proximity to the landfills at Witham and junction 25.
	Soil	ALC grades 1 and 2. Soils directly supporting an EU designated site (e.g. Special Area of Conservation or Special Protection Area).	ALC grade 2 was identified within the study area based on provisional data and the limited post-1988 data; a small area of grade 1 land is also identified.
	Groundwater quality	Groundwater that locally supports a groundwater dependent terrestrial ecosystem (GWDTE). Inner source protection zone (SPZ1). Principal aquifer.	Groundwater discharging to Whetmead LNR. SPZ1 associated with Inworth Road groundwater abstraction - Anglian Water public potable water abstraction.
	Surface water quality	Watercourse having a Water Framework Directive (WFD) classification shown in a River Basin Management Plan (RBMP) with a Q95≥1.0m^3/s.	None within the study area.
High	Geology	Rare and of national importance with little potential for replacement (e.g. geological SSSI).	Marks Tey Brick Pit SSSI near junction 25.
	Human health	High sensitivity land use such as public open space.	Such as the playfield located 20m south of the scheme at junction 25 (former London Road Landfill), Recreation grounds (e.g. Marks Tey and Beaulieu Park Recreation Ground); Village Greens and local areas of recreational value; sports grounds (e.g. golf courses open to the public).
	Soil	ALC subgrade 3a. Soils directly supporting a UK designated site (e.g. SSSI).	ALC subgrade 3a was identified within the study area within the limited post-1988 data and undifferentiated grade 3 land is mapped for much of the study area.
	Groundwater quality	Principal or secondary A aquifer providing locally important resource or supporting a river ecosystem.	River terrace deposits and Kesgrave Catchment Subgroup.
	Surface water quality	Watercourse having a WFD classification shown in RBMP with a Q95<1.0m^3/s.	River Chelmer, Boreham Tributary, River Ter, River Blackwater, River Brain, Domsey Brook, Roman River.

Value / sensitivity	Aspect	Description	Examples within the study area
Medium	Geology	Regionally Important Geological Sites with limited potential for replacement (e.g. RIGS).	None in the study area.
	Human health	Medium sensitivity land use such as commercial or industrial.	Users of commercial properties and industrial areas located throughout the study area.
	Soil	ALC grade 3b. Soils supporting non-statutory designated sites (e.g. LNR).	Undifferentiated grade 3 soils are mapped across much of the study area in the provisional data such that subgrade 3b land may be present.
	Groundwater quality	Aquifer providing water for agricultural or industrial use with limited connection to surface water. Unlicensed private water supply.	Licensed abstractions used for agricultural purposes identified in the study area. To be identified via data request to the Local Authorities.
	Surface water quality	Watercourse not having a WFD classification shown in RBMP and a Q95>0.001m^3/s.	Rivenhall Brook, unnamed watercourses and drains, ponds, lakes and reservoirs.
Low	Geology	Geology of local importance / interest with potential for replacement (e.g. non designated geological exposures, former quarries / mining sites).	Historical mineral extraction sites.
	Human health	Low sensitivity land use such as highways and rail.	Great Eastern Main Line railway line runs parallel to the Proposed Scheme. It is located approximately 30m north of the Proposed Scheme between junction 19 and junction 20A.
	Soil	ALC grades 4 and 5. Soils supporting non-designated notable or priority habitats.	A small area of grade 4 land is mapped by the provisional data at the southern end of the study area.
	Groundwater quality	Unproductive strata.	London Clay.
	Surface water quality	A highly modified watercourse that has been changed by channel modification or other anthropogenic pressures. The watercourse exhibits no morphological diversity and has a uniform channel, showing no evidence of active fluvial processes and not likely to be affected by modification.	Colemans Farm Ditch, Greys Mill Ditch, all unnamed watercourses, all ponds and lakes.
Negligible	Geology	No geological exposures, little / no local interest.	None within the study area.
	Human health	Undeveloped surplus land / no sensitive land use proposed.	Undeveloped field.

Value / sensitivity	Aspect	Description	Examples within the study area
	Soil	Previously developed land formerly in 'hard uses' with little potential return to agriculture.	A number of areas within the study area have been previously developed.
	Groundwater quality	Not applicable.	Not applicable.
	Surface water quality	Not applicable.	Not applicable.

10.4 Potential impacts

Construction

Geology

10.4.1 Effects to the Marks Tey Brickpit SSSI are unlikely, as this lies outside of the footprint of the Proposed Scheme. There could be linkages between the site and sources of contamination exposed during construction, such as from dust or leachate, but this could be avoided through standard best practice methods and is unlikely to be significant. Marks Tey SSSI is therefore scoped out of the assessment.

Soils

10.4.2 Soils would be affected in two ways during construction, via:

- physical removal or permanent sealing of agricultural land
- degradation during stripping, handling and storage, through mechanisms such as compaction and smearing.

10.4.3 It is assumed for the purposes of assessment at this stage that all the soils identified within the Proposed Scheme footprint would be affected, such that soils of very high to low quality are likely to be impacted.

10.4.4 It is anticipated that >20ha of agricultural land would be sealed by development, or otherwise lost to agricultural production by, for instance, the creation of borrow pits. As such, a major magnitude of impact is likely resulting in very high to moderate adverse effects during construction due to the loss of agricultural land.

10.4.5 However, the permanent sealing or wastage of topsoil would be avoided as far as practicable via stripping and sustainable reuse elsewhere, as per the embedded mitigation measures. In addition, by following best practice soil management measures, degradation during stripping, handling and storage would either be avoided, or would only be temporary in nature. Therefore, a minor magnitude of impact is predicted for soils in relation to degradation, resulting in likely slight adverse effects for the soil receptors during construction.

10.4.6 Soils will be scoped in for the construction phase of the project.

Human health

10.4.7 Made ground, infill materials, and natural soils underlying the scheme may have been potentially contaminated by the historical and current land use activities identified along the Proposed Scheme including historic landfill sites, infilled mineral extraction pits, petrol stations and industrial areas. Disturbance of potentially contaminated soils may cause an increase in leaching of soils and mobilising of contaminants along new or existing surface or sub-surface pollution pathways. These could create new pathways to construction workers and adjacent land users around the Proposed Scheme.

10.4.8 There is potential for ground gases associated with the existing historical landfills at Witham and junction 25 to migrate to residential properties in close proximity to the Proposed Scheme. However, as the Proposed Scheme has not been fully designed, it is not known at this stage if it would encroach on the landfill boundary.

10.4.9 No ground investigation soil chemical data were available at the time of writing this report, therefore, screening of the soil chemical analysis data against acceptable soil guideline values for human health risk assessment has not been undertaken. However, the impact on human health from exposure to contaminants exposed during the Proposed Scheme development works is considered likely to be minor to moderate based on information available from the desk study. There is a short-term risk to the health of construction workers exposed to potentially harmful contaminants close to the landfill sites.

10.4.10 Risks during construction are typically mitigated by applying good working practice set out in the Construction Environmental Management Plan, and the Health and Safety Plan as appropriate. Assuming appropriate good working practices are implemented during construction, the predicted significance of effects is likely to be slight. If the Proposed Scheme were to encroach on the identified historical landfill boundary, or there was a risk of ground gas migration to residential properties, then the significance of effect would likely be moderate. Therefore, human health has been scoped in for the construction phase.

Groundwater and surface water

10.4.11 Disturbance of potentially contaminated soils from landfills along the Proposed Scheme may cause an increase in leaching of soils and mobilising of contaminants along new or existing surface or sub-surface pollution pathways. This may lead to the quality of surface waters and groundwater aquifers being impacted through runoff, infiltration and sub-surface movement. In the absence of site-specific ground investigation data and baseline groundwater monitoring data, the predicted significance of effects on controlled waters is likely to be moderate.

10.4.12 Risks during construction are typically mitigated by applying good working practice set out in a Construction Environmental Management Plan or Health and Safety Plan and can help to reduce likelihood of pollution incidents occurring. Assuming appropriate good working practices are undertaken during construction, the predicted significance of effects is likely to be slight. Therefore, groundwater and surface water likely to be affected by contaminated land has been scoped in for the construction phase.

Operation

Geology

10.4.13 No additional impacts are predicted on geology during the operational phase. Operational effects on geology are therefore scoped out of further assessment.

Soils

10.4.14 No additional impacts are predicted on soils during the operational phase. The permanent loss of agricultural land occurring during construction would persist during operation but is not considered as an additional effect. Temporary effects arising during construction on soil quality in relation to degradation during handling may extend into operation but should not be persistent assuming that the best practice mitigation measures in section 10.5 are applied. Operational effects on soils are therefore scoped out of further assessment.

Human health

10.4.15 It is understood that on completion of the construction phase, the Proposed Scheme would comprise mainly hardstanding.

10.4.16 Contamination within the Proposed Scheme area would have been removed during construction reducing the potential for contact with contaminated soil. Furthermore, implementing appropriate site-specific risk assessments and method statements would reduce exposure. This is likely to have a negligible magnitude of impact, resulting in a slight effect on human health. Therefore, human health for site users has been scoped out but scoped in for maintenance workers and residential properties located near landfill sites due to the possibility of them being affected by ground gas during the operational phase.

Groundwater and surface water

10.4.17 During the operational stage, potential contaminated land linkages would have been broken due to the construction of the road therefore no additional impacts are predicted in relation to water receptors. Operational effects on surface water and groundwater from contaminated land are therefore scoped out of further assessment.

10.4.18 There is the potential for pollution incidents as a result of fuel and chemical leaks or spills on the new highway by road users. These are covered in chapter 14 and are not addressed further in the geology and soils chapter.

Summary of scope

10.4.19 Table 10.3 summarises the proposed scope for geology and soils.

Table 10.3: Summary of geology and soils scope

Matter		Scoped in - construction	Scoped in - operation
Geology	SSSI	×	×
Soils		✓	×
Human health	Site users/general public	✓	×
	Construction/maintenance workers	✓	✓
	Residential properties near landfill sites	✓	✓
Groundwater and surface water from contaminated land		✓	×

10.5 Design, mitigation and enhancement measures

10.5.1 The following mitigation measures would be put in place for the receptors that have been identified as being potentially impacted by the Proposed Scheme or would potentially impact the scheme. Mitigation measures would include both embedded mitigation and additional mitigation measures.

10.5.2 Embedded mitigation would include design measures which may include the use of:

- Consolidated development footprints to reduce the loss of agricultural land
- Stripping of topsoil as a minimum from the footprints of all permanent development (hardstanding and materials placement), followed by sustainable reuse within the Proposed Scheme or elsewhere wherever practicable
- Construction Environmental Management Plan (CEMP) to be developed prior to the start of construction works
- Materials Management Plan (MMP) for reuse of materials under the CL:AIRE Code of Practice to be developed prior to the start of construction works
- Completion of a soil resource survey and development and implementation of a soil resource plan prior to construction start of works, consistent with Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (Defra, 2009)
- Ground investigation (GI) - Phase 3 of GI to be completed early 2021
- Risk assessments and method statements to be completed as part of the construction process

10.5.3 An outline Environmental Management Plan will be prepared for the EIA and DCO submission (refer to chapter 5).

10.5.4 Additional mitigation measures may also be developed to address specific identified impacts. At this stage, the requirement for specific mitigation measures in respect of soils and geology cannot be meaningfully identified, particularly in relation to impacts from ground contamination. Measures could include, for example:

- remedial treatment (in-situ and/or ex-situ) of targeted areas, particularly where the route is aligned or located adjacent to landfill sites
- working methods incorporated during the works to mitigate against gas build up in voids, and to mitigate the negative effect of land contamination on potential receptors

10.5.5 Remediation is usually informed by ground investigations and detailed risk assessment. Remediation costs and risk mitigation solutions would be more complex if the route is aligned through the existing landfill boundaries. The design will avoid these areas if possible.

10.5.6 The waste hierarchy principle will be used at every stage of the project, as appropriate and proportionate, to identify enhancement opportunities with respect to the reuse of suitable excavated soils and materials on the scheme development.

10.5.7 It is anticipated that in order to promote sustainable reuse of soil and other geological arisings within the Proposed Scheme, a MMP would be prepared prior to construction, which would detail the proposed use of the arisings. It is anticipated that this will follow the protocols within the CL:AIRE Definition of Waste (2011) guidance so that excavated materials are reused appropriately and sustainably. This is covered in the material assets and waste aspect (chapter 11).

10.6 Description of the likely significant effects

10.6.1 At this stage, it is not practicable to meaningfully describe the likely nature of any significant or residual effects in respect to geology and soils, particularly in relation to impacts from ground contamination due to lack of site-specific ground investigation data and environmental monitoring data. However, it is anticipated that, with mitigation measures of the type discussed in section 10.5, the residual effects are unlikely to be significant, with the exception of the loss of agricultural land.

10.7 Assessment methodology

10.7.1 The assessment of the potential effects on the geology and soil characteristics, including land quality, will consider the following legislation, regulations, planning policies and guidance:

- Environmental Protection Act 1990, Part IIA
- Environmental Permitting (England and Wales) Regulations 2016
- Water Framework Directive (Council Directive 2000/60/EC); implemented in England by The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017
- Wildlife and Countryside Act 1981, as amended
- National Planning Policy Framework (NPPF)
- National Policy Statement (NPS National Networks) (Department for Transport, 2014)
- DMRB LA 104 – Environmental Assessment and Monitoring (Highways England, 2019)

- DMRB LA 109 – Geology and Soils (Highways England, 2019)
- DMRB LA 113 – Road drainage and the Water Environment (Highways England, 2020)

10.7.2 The criteria that will be used to assess the value (sensitivity) of receptors and magnitude if impacts are based upon those in DMRB LA 109 and are set out in Appendix C.

10.7.3 The significance of effects will be determined by combining judgements on the sensitivity of geology and soils receptors, with the magnitude of impacts. In accordance with DMRB LA 109, the matrix in chapter 5 (inset 5.1), which is consistent with the matrix within DMRB LA 104, will be used to assist professional judgement when determining the significance of effects.

10.7.4 A desk study has been completed for the Proposed Scheme. It is proposed that information gained from an intrusive site investigation and period of environmental monitoring will be used in the assessment for geology and soils. Data will be gathered on the chemical quality of soil and groundwater which will be used to inform further stages of assessment.

10.7.5 A land contamination risk assessment will be undertaken in accordance with the Contaminated Land Report 11 (CLR11). CLR11 sets out the procedure for the investigation and assessment of potentially contaminated land. This guidance was updated in 2020; the updated online guidance is called Land Contamination Risk Management (LCRM). A Conceptual Site Model (CSM) (based on CLR 11) was developed as part of the initial desk-based assessment of the scheme. The CSM (included in the PSSR) supports the identification and assessment of pollutant linkages using the source-pathway-receptor model. Development of the CSM forms the main part of preliminary risk assessment and the model is subsequently refined or revised as more information becomes available (for example ground investigation data).

10.7.6 Data gathered from the GI and environmental monitoring will be analysed and the CSM and preliminary risk assessment presented in the desk study will be updated. Potential risks to human health will be assessed by screening soil contaminant concentrations against relevant soil screening criteria (e.g. category 4 screening levels) recommended in DMRB LA 109 for assessment of risk to human health from land contamination. Similarly, potential risks to controlled waters will be assessed by screening monitoring data against relevant guideline screening values. Where exceedances of screening levels are established, further risk assessment and/or additional mitigation works will be recommended and incorporated into the design.

10.7.7 Additional technical consultation with various statutory and non-statutory bodies and external sources will be undertaken to obtain the latest information on baseline conditions, particularly landfills, private water supplies (PWS) and licensed water abstractions.

10.7.8 Additional monitoring of watercourses likely to be impacted by the Proposed Scheme (see chapter 14 for details of watercourses) may be undertaken prior to the start of construction works to supplement the baseline surface water monitoring data obtained in 2018. This will be detailed in the Environmental Statement and CEMP. The purpose of the monitoring would be to provide data under differing flow conditions which would be used to assess the impact, if any, of the Proposed Scheme development on surface water quality during and post construction works.

10.7.9 An ALC survey will be undertaken to inform further stages of assessment, in accordance with the Revised Criteria for Grading the Quality of Agricultural Land (Ministry of Agriculture, Fisheries and Food, 1988).

10.7.10 The proposed assessment methodology is compliant with the NNNPS policy for geology and soils outlined in section 10.1.

10.8 Assessment assumptions and limitations

10.8.1 The proposed assessment methodology will largely be dependent of the quality of information obtained from third party sources which have not been fully verified.

10.8.2 The following limitations have been encountered:

- Only provisional ALC data were available for the majority of the study area. An ALC survey will be undertaken to inform further stages of assessment.
- Ground investigation is being undertaken at the time of writing this report. In the absence of ground investigation data for the Proposed Scheme, potential impacts to current land users, groundwater and surface water from contaminated land cannot be fully assessed at this stage.
- The ground investigation is programmed to be completed and data made available in time to inform the assessment. However, if some of the GI data are unavailable at the time of drafting the Environmental Statement (due to unforeseen circumstances), a qualitative land contamination risk assessment will be carried out, applying a ‘matrix approach’ to account for the probability and consequence associated with contaminant linkages.
- It is proposed to undertake additional technical consultation with various statutory and non-statutory bodies and external sources to obtain the latest information on baseline conditions. However, the information held by these sources may in some cases be limited and may be delayed. Where there is a lack of third-party data, professional judgement will be used in interpreting available desk study information.

11. Material assets and waste

11.1 NNNPS requirements

11.1.1 The National Networks National Policy Statement (NNNPS) sets out the Government's policies to deliver the development of Nationally Significant Infrastructure Projects (NSIP) on the national road and rail networks in England. The Secretary of State (SoS) uses the NNNPS as the primary basis for making decisions on Development Consent Order (DCO) applications.

11.1.2 Key policy from the NNNPS relevant to this aspect includes:

- Paragraphs 4.28 to 4.29 of the NNNPS state that applicants should include design as an integral consideration from the outset of a proposal; and inter alia produce sustainable infrastructure efficient in the use of natural resources.
- Paragraph 5.169 of the NNNPS states that applicants should safeguard any mineral resources on the proposed site as far as possible.
- Paragraph 5.182 of the NNNPS states that where a proposed development has an impact on a Mineral Safeguarding Area, the SoS should ensure that the applicant has put forward appropriate mitigation measures to safeguard mineral resources.
- Paragraph 5.42 of the NNNPS states the applicant should set out the arrangements that are proposed for managing any waste produced. The arrangements described should include information on the proposed waste recovery and disposal system for all waste generated by the development. The applicant should seek to minimise the volume of waste produced and the volume of waste sent for disposal unless it can be demonstrated that the alternative is the best overall environmental outcome.

11.2 Study area

11.2.1 This scoping assessment has been prepared in accordance with Highways England (2019) DMRB LA 110 Material Assets and Waste guidance which is the published environment assessment standard for assessing impacts associated with material assets and waste.

11.2.2 The scoping assessment for material assets and waste considers the following matters:

- The consumption of 'material assets' [Article 3.1 (d) of the EIA Directive] – this includes materials and products from primary, secondary, recycled, sustainable, and renewable sources, and the use of excavated and other arisings that fall within the scope of waste exemption criteria.
- The production and management of 'waste' [Annex IV of the EIA Directive] – this includes surplus materials which can become waste, as well as other substances which the holder discards or intends or is required to discard.

11.2.3 In accordance with DMRB LA 110, the assessment of material assets and waste will utilise two geographically different study areas to examine the use of primary, secondary and recycled construction materials; and the generation and management of waste:

- The first study area (Proposed Scheme) – based on the construction footprint / boundary of the proposed works which is delineated by the contiguous order limit boundary around the road alignment (as denoted by figure 11.1). Within these areas, construction materials will be consumed, and waste will be generated.
- The second study area (East of England region) – based on the likely provenance of construction materials required to construct the main elements of the Proposed Scheme, and waste infrastructure that is likely to be suitable to accept arisings and/or waste generated by the Proposed Scheme. These include:
  - The East of England Regional Aggregates Working Party area and Thames and East Coast dredging areas which is likely to be the primary source of primary, secondary and recycled aggregates used to construct the Proposed Scheme.
  - The former East of England Planning Region which is likely to be where the waste management infrastructure used to manage the majority of waste generated by the Proposed Scheme is located.

11.2.4 The East of England Regional Aggregates Working Party area comprises the former East Anglia Mineral Planning Authorities (MPA) (Norfolk, Suffolk, Cambridgeshire and Peterborough) and MPAs from the former South East (Essex, Southend-on-Sea, Thurrock, Hertfordshire, Central Bedfordshire, Bedford Borough and Luton). The former East of England Planning Region includes the Bedfordshire, Cambridgeshire, Essex, Hertfordshire, Norfolk and Suffolk sub-regions.

11.2.5 In accordance with DMRB LA 110, professional judgement, with consideration for a balance of the proximity principle and value for money principle, has been applied in establishing the second study areas.

11.3 Baseline conditions

Baseline sources

11.3.1 A desk-based assessment has been undertaken to establish, for the two study areas, the current and likely future baseline conditions for material assets and waste during the anticipated construction period (2023 to 2027), in the absence of the Proposed Scheme.

11.3.2 Baseline data have been collected at the regional (East of England) and sub-regional (Essex) level as appropriate, including: the availability of primary, secondary and recycled aggregates; presence of minerals safeguarding sites and/or peat resources; as well as information on waste management capacity, including remaining landfill void space and annual throughputs of waste transfer, waste treatment, metal recycling and waste incineration facilities, and the presence of safeguarded waste management infrastructure.

11.3.3 The baseline assessment has been prepared with reference to the latest minerals and waste planning information published by the East of England Aggregate Working Party (EEAWP), Essex County Council (ECC) Minerals and Waste Planning Authority, the Crown Estate and the Environment Agency (EA).

Baseline information

Material assets

11.3.4 For the purposes of this assessment, material assets are considered to be the physical resources in the environment required for constructing the Proposed Scheme, which may be of human or natural origin.

11.3.5 Primary, secondary and recycled aggregates have been chosen to act as a proxy indicator of regional and sub-regional material assets given that large quantities of aggregates are typically required for motorway and all-purpose trunk road projects. This was also considered appropriate due to the prominence given to aggregates in the DMRB LA 110 environmental assessment standard.

11.3.6 This is also supported by Highways England's (2017) 'Sustainable Development Strategy and Action Plan' which confirms that its key ambition covering manufactured capital is to: push towards a 'circular' approach to the management of its resources; minimising its demand for primary resources extracted from the ground; and maximising the reuse of the resources already in use on the network.

Aggregates consumption associated with the existing highways network

11.3.7 The operational maintenance of this section of the existing A12 trunk road consumes both unbound aggregates (used as sub-base and drainage applications) and bound aggregates (used in ready mixed concrete, asphalt and pre-cast concrete products).

11.3.8 At the time of writing, there were no precise figures available regarding the baseline quantities of operational / maintenance aggregates consumption generated across the first study area. This information will be sourced from Highways England where available.

Primary mineral landbanks and marine reserves

11.3.9 The principal materials used in road construction are primary aggregates, including sand, gravel and crushed rock. Primary aggregates are aggregates produced from naturally occurring mineral deposits and used for the first time, as defined by the British Geological Survey (BGS) (2019) Mineral Planning Factsheet Construction Aggregates.

11.3.10 Aggregates are normally defined as being hard, granular materials which are suitable for use either on their own or with the addition of cement, lime or a bituminous binder in construction. However, a proportion of aggregates sales are for construction fill or other uses where soft and non-granular material may be acceptable or specified.

11.3.11 The aggregate materials required for the construction of the Proposed Scheme would include both aggregates (e.g. sand and gravel and crushed rock) and aggregate-containing materials (e.g. asphalt and concrete products). Some of these materials would originate off site, purchased as primary construction products, but it is likely that some would arise onsite, particularly from the use of borrow pits, but also excavated soils, crushed concrete or recycled asphalt planings, or recycled materials brought in from off site, possibly from other projects or industries.

11.3.12 The National Planning Policy Framework (NPPF) requires MPAs to maintain a minimum landbank of ten years for crushed rock and a minimum landbank of 7 years for sand and gravel. This is used to determine whether there is a shortage or surplus of supply in a given minerals planning area. The EEAWP (2019) Annual Monitoring Report 2018 Data provides sales and reserves data from January to December 2018. These data are summarised in table 11.1 for the East of England region and Essex sub-region.

Table 11.1: Land-won aggregate sales, reserves and landbanks in the East of England and Essex, 2018

Mineral	Remaining reserves (at 31/12/18) (Mt)	Landbank based on sub-regional apportionment (years)	Landbank based on rolling average ten year sales (years)
East of England region			
Sand and gravel	121.08	8.2	11.4
Crushed rock (Cambridgeshire and Peterborough Limestone and Norfolk Carstone only*)	4.30	10.7	12.1
Essex sub-region			
Sand and gravel	29.98	6.7	9.3
Crushed rock	N/A	N/A	N/A
*Sales for Cambridgeshire, Peterborough and Norfolk have been aggregated for confidentiality reasons comprising limestone from Cambridgeshire and Peterborough and Carstone from Norfolk			

11.3.13 From table 11.1 it can be inferred that the East of England region demonstrates landbanks for sand and gravel and crushed rock in excess of the required NPPF thresholds as of the end of 2018, based on both sub-regional apportionment and rolling average ten year sales.

11.3.14 The ECC (2019) Greater Essex Local Aggregate Assessment (LAA) 2019 (Covering the Calendar Year 2018) confirms that whilst the sub-regional sand and gravel landbank was sufficient at the end of 2018 in terms of the ten-year sales, it was below the 7-year NPPF threshold when considering the adopted apportionment. However, ECC (2019) confirms that as of 1 January 2019, there were four pending permissions which would permit the working of an additional 10.29Mt of sand and gravel (equivalent to a 2.3-year landbank) which, if permitted and the pending reserves added to the 31 December 2018 landbank, would see the landbank return above 7 years.

11.3.15 Reference to the LAA 2019 confirms that there are no hard-rock quarries in Essex, and that Essex is heavily reliant on hard rock importation, used as construction material as well as limestone specifically used in cement making. The LAA reports a pattern of long-distance supply, with Essex exporting its sand and gravel, whilst importing hard rock from areas such as the East Midlands and South West of England. According to the most recent Aggregate Working Party (AWP) Reports for the East Midland and South West regions, these regions have an excess of crushed rock reserves (55 years and 43 years respectively).

11.3.16 The East of England is also served by the Thames and East Coast dredging regions. In addition to the land won aggregates, the Crown Estates (2019) Marine Aggregates Capability and Portfolio Document 2019 reports that there were an additional 32.71Mt and 70.03Mt of primary marine aggregate reserves respectively within the Thames and East Coast dredging areas as of 31 March 2018, which is expected to be sufficient to provide for the Thames region and the East Coast region for 29.47 years and 15.36 years respectively.

Regional secondary and recycled aggregates

11.3.17 The EEAWP (2019) Annual Monitoring Report 2018 Data confirms that data on secondary and recycled aggregate production and use in the East of England is variable and incomplete.

11.3.18 Notwithstanding this, the EA's (2020) Waste Data Interrogator 2018 confirms that approximately 12.73Mt of inert construction and demolition (C&D) waste was received at waste management facilities in the East of England in 2018, with 5.67Mt of this received at waste management facilities in Essex.

11.3.19 The ECC (2019) Greater Essex LAA 2019 suggests that there is a well-established network of C&D waste recycling and recovery facilities in Essex, with 37No. operational aggregate recycling facilities as of March 2019 with a combined operational capacity of 3.2Mtpa. Some of these sites are transient in nature, so there will be a reduction in recycling capacity as temporary permissions expire, unless further permissions / permits are granted. The LAA reports that it is not known whether secondary aggregates are produced in any significant quantity in Essex. However, the LAA reports that a lack of heavy industry in the county would imply that there will be little produced.

11.3.20 Defra (2020) UK statistics on waste – March 2020 reports that approximately 92% of mineral waste from C&D activities are currently subject to waste recovery in England. These data would therefore further indicate there is likely to be a good potential supply of recycled aggregates available within the East of England region and Essex sub-region to support the construction of the Proposed Scheme.

Minerals infrastructure and safeguarding sites

11.3.21 The NPPF requires that planning policies should:

- Provide for the extraction of mineral resources of local and national importance, but not identify new sites or extensions to existing sites for peat extraction (Paragraph 204,a).

- Safeguard mineral resources by defining Mineral Safeguarding Areas (MSA); and adopt appropriate policies so that known locations of specific minerals resources of local and national importance are not sterilised by non-mineral development where this should be avoided, whilst not creating a presumption that the resources defined will be worked (Paragraph 204,c).
- Set out policies to encourage the prior extraction of minerals, where practical and environmentally feasible, if it is necessary for non-mineral development to take place (Paragraph 204,d).
- Safeguard existing, planned and potential sites for: the bulk transport, handling and processing of minerals; the manufacture of concrete and concrete products; and the handling, processing and distribution of substitute, recycled and secondary aggregate material (Paragraph 204,e).

11.3.22 The ECC Minerals Local Plan 2014 confirms that MSAs are designated in Essex for mineral deposits of sand and gravel, silica sand, chalk, brickearth and brick clay considered to be of national and local importance, as defined on the Essex Mineral Local Plan Policies Map. Mineral Consultation Areas (MCA) are designated within and up to an area of 250m from each safeguarded permitted mineral development and preferred and reserve site allocation.

11.3.23 The ECC (2019) Greater Essex LAA 2019 reports that there were 31No. sand and gravel quarries (22 were operational, with a further site specifically producing silica sand) in Essex at the end of 2018. Of the remaining non-operational sand and gravel quarries, four were ‘dormant’ at the end of 2018. There are no hard-rock quarries in Essex as reported in table 11.1, whilst brick clay and chalk are not reported on for the purposes of an LAA, as they are not classed as aggregates. The LAA confirms that there were 345No. mineral processing facilities and 10No. rail and wharf transhipment facilities located in Essex at the end of 2018.

11.3.24 The ECC (2019) Consultation Response Letter - Minerals and Waste Safeguarding Implications of Proposed A12 Modifications confirms that a significant proportion of the first study area lies within an MSA for sand and gravel. Part of the eastern study area also falls within an MSA for brick clay. The first study area also passes through a number of MCAs for mineral infrastructure sites. These safeguarded minerals infrastructure and designations are identified in table 11.2 and figure 11.1 (Appendix A).

11.3.25 Policy S8 of the ECC Minerals Local Plan (MLP) seeks to ensure that mineral resources of national and local importance are not directly sterilised by surface development, and that surface development does not prejudice the effective working of permitted mineral reserves, preferred or reserve site allocations within the MLP. With regards to MCAs, Policy S8 of the MLP also seeks to ensure that existing and allocated mineral sites and infrastructure are protected from potentially sensitive or inappropriate neighbouring developments that may prejudice their continuing efficient operation.

Table 11.2: Schedule of minerals infrastructure and designations within the first study area

Site type	Site name	Planning application no.
MSAs	Sand and gravel	N/A
	Brick clay	N/A
MLP Allocations or Safeguarded Sites	Bulls Lodge Strategic Aggregate Recycling Site (existing)	MLP p186
	Bulls Lodge Quarry Coated Stone Plant	MLP p196
	Land at Colemans Farm (allocated for extraction, now existing)	A46 MLP p170
	Marks Tey Rail Siding (existing)	F3 MLP p180
Minerals Infrastructure	Bulls Lodge Strategic Aggregate Recycling Site	ESS/25/08/CHL
	Bulls Lodge Quarry Coated Stone Plant	ESS/01/11/CHL
	Bulls Lodge	CHL/1890/87
	Bulls Lodge	CHL/1019/87
	Bulls Lodge	ESS/28/14/CHL
	Colemans Farm	ESS/39/14/BTE
	Colemans Farm	ESS/35/17/BTE
	Marks Tey	ESS/26/08/COL

Peat resources

11.3.26 Reference to the ECC (2014) Minerals Local Plan confirms that there are no existing or potential peat extraction sites recorded within the study area, and the BGS Minerals Information Online Tool confirms that there are no superficial peat deposits within 250m of the Proposed Scheme extents.

Waste management

Waste generation associated with the existing highways network

11.3.27 The operational maintenance of this section of the existing A12 trunk road generates a wide range of C&D wastes including, but not limited to, asphalt planings, soft estate vegetative arisings, road sweepings, gully arisings, oil separator waste, animal by-products and litter.

11.3.28 At the time of writing, there were no precise figures available regarding the baseline quantities of operational / maintenance waste generated across the first study area. This information will be sourced from Highways England where available.

National and regional construction and demolition waste generation

11.3.29 The majority of waste generated by the construction of the Proposed Scheme would be C&D waste. A range of waste types including inert, non-hazardous and hazardous wastes would be generated by the Proposed Scheme; a large proportion of which could be suitable for reuse, recycling or other recovery, although a residual proportion may require disposal at landfill.

11.3.30 Defra (2020) UK statistics on Waste – March 2020 provides an update on the generation and management of UK waste, including the contributions made by various sectors. This confirms that the construction sector in England generated a total of 59.6 Mt of non-hazardous C&D waste in 2016, and that 92% of this was recovered. Defra (2020) also confirms that the rate has remained at similar levels from 2010 to 2016 and has at all times been well above the Waste Framework Directive 2020 target of 70%.

11.3.31 The EA (2020) Waste Data Interrogator 2018 confirms that approximately 12.99Mt of C&D waste was received at waste management facilities in the East of England in 2018, with 5.69Mt of this received at waste management facilities in Essex.

Waste treatment, recycling and recovery baseline

11.3.32 The availability of waste management infrastructure, to accept waste likely to be generated during the construction of the Proposed Scheme, has been considered through a review of the EA (2020) Waste Data Interrogator 2018.

11.3.33 Whilst annual capacity data are published by the EA for both landfill and incineration facilities at the national, regional and sub-regional level, no annual capacity data are published by the EA for waste transfer, treatment or metal recycling sites. Only annual permitted throughput is published for these facilities.

11.3.34 The total annual permitted throughput or capacity reported by EA (2020) for the East of England region and Essex sub-region are detailed in table 11.3.

Table 11.3: Total permitted throughput or capacity of transfer, treatment, metal recycling and incineration in the East of England and Essex, 2018

Site type	East of England region (000s tonnes)	Essex sub-region (000s tonnes)
Transfer (annual throughput)		
Hazardous waste transfer stations	1,049	316
Household, industrial, commercial waste transfer stations	2,990	926
Non-biodegradable waste transfer stations	498	452
Treatment and metal recycling (annual throughput)		
Material recovery	1,302	657
Physical treatment	4,396	1,187
Physico-chemical treatment	964	149
Chemical treatment	1,078	-
Composting	906	114
Biological treatment	2,175	783
Metal recycling	2,272	1,417

Site type	East of England region (000s tonnes)	Essex sub-region (000s tonnes)
Incineration (annual capacity)		
Co-incineration of hazardous waste	-	-
Co-incineration of non-hazardous waste	-	-
Hazardous waste incineration	-	-
Municipal and/or industrial & commercial incineration	269	-
Biomass / waste wood incineration	770	490
Total	**18,669**	**6,491**

11.3.35 The EA (2020) Waste Data Interrogator 2018 reports that, as of 2018, there were 1,069 No. permitted transfer, treatment, metal recovery, incineration and use of waste sites in the East of England.

11.3.36 The ECC (2017) Minerals and Waste Development Framework Authority Monitoring Report 2016 to 2017 reports that, as of 31 March 2017, there were 329 No. waste management facilities (including waste transfer facilities) in Essex. The Authority Monitoring Report 2017 to 2018 also confirms there were an additional 17No. applications granted in Essex during this period for: transfer facilities, inert waste recovery facilities, materials / energy recovery facilities and disposal (landfill) facilities.

11.3.37 These data would indicate that there is likely to be a significant opportunity for C&D waste arisings to be transferred, treated, recycled or recovered as appropriate within the region.

Inert, non-hazardous and hazardous landfill capacity baseline

11.3.38 For wastes which cannot be reused, recycled or otherwise recovered, disposal to landfill would be required. The EA (2020) Waste Data Interrogator 2018 details the total remaining merchant landfill capacity in the East of England region and Essex sub-region in 2018 and is presented in table 11.4.

Table 11.4: Total landfill capacity available in the East of England and Essex, 2018

Site type	East of England region (000s cubic metres)	Essex sub-region (000s cubic metres)
Hazardous merchant landfill	-	-
Non-hazardous landfill with SNRHW cell	5,711	-
Non-hazardous landfill	25,092	11,852
Inert landfill	20,342	3,191
Total	**51,145**	**15,043**
* Some non-hazardous sites can accept some stable non-reactive hazardous waste (SNRHW) into a dedicated cell, but this is usually a small part of the overall capacity of the site.		

11.3.39 The EA (2020) reports that, as of 2018 there were 64 No. permitted landfills in the East of England region (with 54 No. of these accepting waste in 2018). The ECC (2017) Minerals and Waste Development Framework Authority Monitoring Report 2016 to 2017 reports that, as of 31 March 2017, there were 10 No. operational inert landfills, 3 No. inert landfills that just have the benefit of planning permission, 5 No. operational non-hazardous waste landfills and 1 No. non-hazardous landfill for which prior extraction has commenced in Essex.

11.3.40 Whilst the East of England region and Essex sub-region both have good inert landfill, non-hazardous landfill, and non-hazardous landfill SNRHW capacity, there is no merchant hazardous waste landfill capacity currently available in the region.

Safeguarded waste management infrastructure

11.3.41 The ECC (2019) Consultation Response Letter - Minerals and Waste Safeguarding Implications of Proposed A12 Modifications confirms that the first study area passes through a number of Waste Consultation Areas (WCA) as identified in table 11.5 and figure 11.1.

11.3.42 Policy 2 of the Essex Waste Local Plan seeks to ensure that existing and allocated waste sites and infrastructure are protected from potentially sensitive or inappropriate neighbouring developments that may prejudice their continuing efficient operation. Policy 2 defines WCAs as extending up to 250m from the boundary of the majority of existing or allocated waste infrastructure.

Table 11.5: Schedule of waste infrastructure and designations within the study area

Site type	Site name	Planning application number
Waste management infrastructure	Boreham Recycling Centre	ESS/24/10/CHL/SO
	Bulls Lodge Waste Transfer Station	ESS/44/19/CHL
	Drovers Recycling Centre	ESS/42/11/CHL
	Winsford Way Waste Transfer Station	ESS/65/12/CHL
	Witham Recycling Centre	ESS/44/15/BTE

11.3.43 Whilst the point source locations of these safeguarded waste infrastructure sites are mapped on figure 11.1, it has not been possible to map their extents or their corresponding 250m WCA buffers given the absence of GIS data for these sites.

Future baseline

Future minerals availability and minerals safeguarding sites baseline

11.3.44 For the purpose of this assessment, it has been assumed that the size of the primary aggregate landbanks, marine aggregate reserves and the supply market for secondary and recycled aggregate would be largely the same during the construction period (2023 to 2027) as for the baseline year of 2018. It has also been assumed that the size and location of minerals infrastructure and designations within the study area will remain unchanged from the baseline year.

Future waste treatment, recycling and recovery capacity baseline

11.3.45 Waste treatment, recycling and recovery facilities are typically characterised by large annual throughputs; consequently, large step changes in capacity (as single facilities are commissioned) have an exaggerated impact on the historical trend. Waste treatment, recycling and recovery infrastructure capacity cannot therefore be realistically projected forward to the construction phase of the Proposed Scheme.

11.3.46 Furthermore, the available waste treatment and recovery infrastructure is considered to be a beneficiary of incoming feedstock through driving the management of waste up the waste hierarchy. These facilities are therefore not considered to be sensitive receptors for the purposes of assessment, in the same way as landfill sites, given that they have the potential to reduce the environmental effects associated with waste generation, management and disposal. Professional experience has shown that waste markets are flexible and adapt to changing markets within a region; and that historical trends show that waste treatment, recycling and recovery is added or removed, not least to cope with changes in waste generation.

11.3.47 It is expected that whilst the actual waste facilities available may change over the course of constructing the Proposed Scheme, the overall capacity is likely to remain similar as the market responds. The future waste treatment and recovery infrastructure capacity for use in the assessment will, therefore, be based on the most recent available EA annual capacity / input data for 2018. This suggests that there is likely to be adequate opportunity for wastes arising during the construction of the Proposed Scheme to be treated, recycled or otherwise recovered via appropriate means within the study area.

Future inert, non-hazardous and hazardous landfill capacity baseline

11.3.48 Projected future inert and non-hazardous landfill capacity has been estimated in table 11.6 and illustrated in insets 11.1 and 11.2 for the East of England region and Essex sub-region respectively based on the average annual percentage change in remaining combined (total) inert and non-inert landfill capacity for the years for which consistent data are available from the EA (i.e. 2005 to 2018).

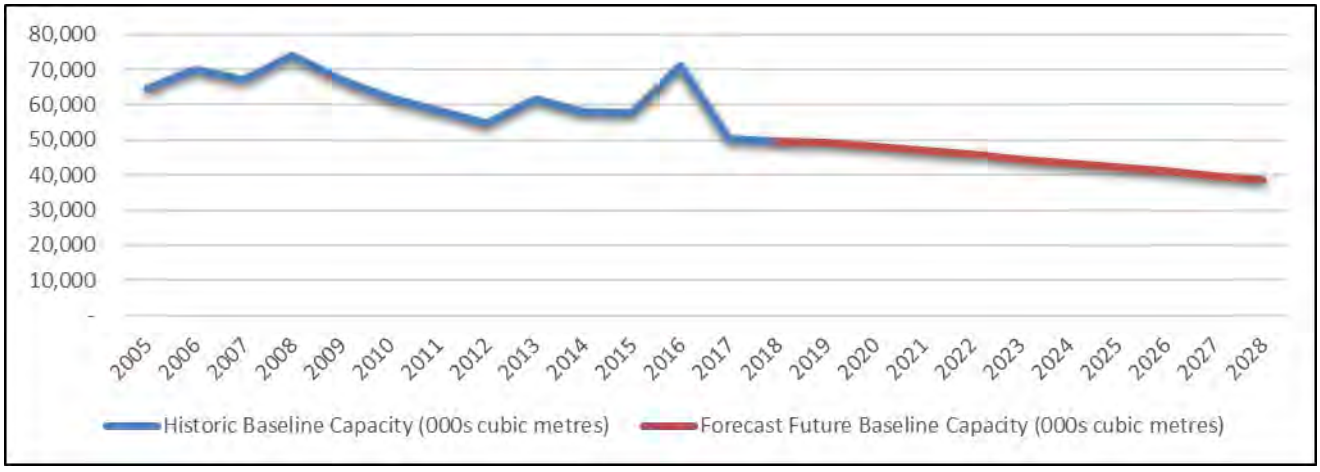
11.3.49 Landfill site classifications were changed in 2005. The assessed categories therefore include: inert (inert landfill only) and non-inert (non-hazardous landfill sites, non-hazardous landfill sites with a SNRHW cell, and merchant hazardous landfill sites); and exclude restricted user sites (non-hazardous and hazardous restricted landfill sites), which are permitted to only accept waste from the operators of these sites.

11.3.50 The predicted changes in landfill capacity are derived from the existing EA time-based data (remaining landfill capacity at the end of each calendar year). These data have been projected forward to 2027 (target opening year), using the ‘Exponential Smoothing forecasting algorithm’ in Microsoft Excel, in order to provide an estimate of the remaining landfill capacity that may be available during the construction of the Proposed Scheme (expected between 2023 and 2027). This does not include any additional capacity that may open in the future in the region.

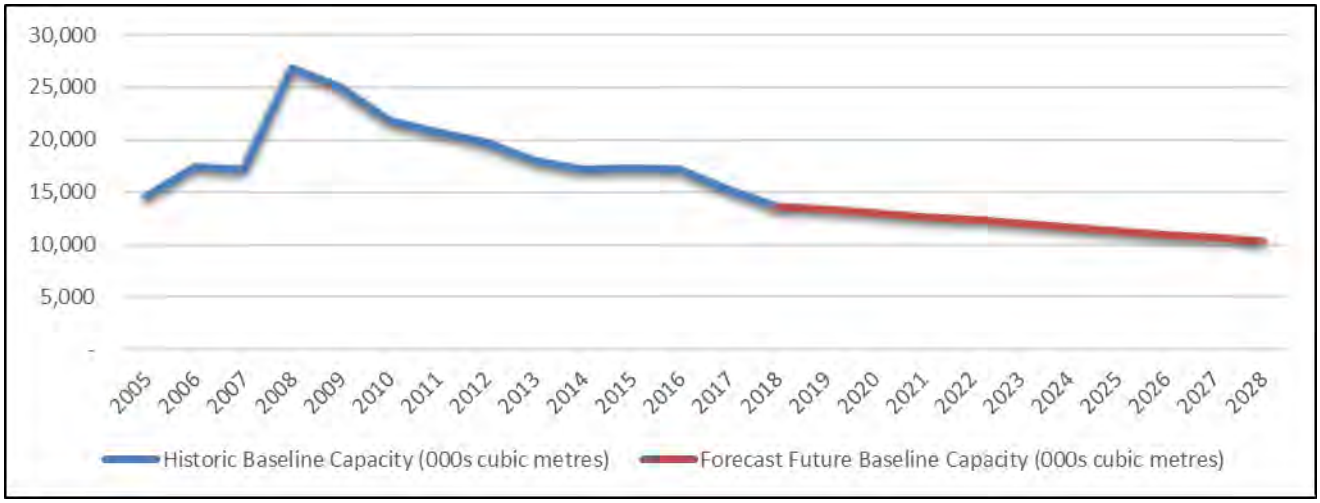
Table 11.6: Forecast future baseline landfill capacity in the East of England and Essex, 2019 to 2027

Timeline	Forecast future landfill capacity (000s cubic metres)	
	East of England region	Essex sub-region
2019	49,305	13,556
2020	48,117	13,359
2021	46,929	13,019
2022	45,741	12,679
2023	44,553	12,000
2024	43,365	11,660
2025	42,177	11,321
2026	40,988	10,981
2027	39,800	10,641
Average (2023 to 2027)	**42,117**	**11,321**

Inset 11.1: Forecast future landfill capacity in East of England (2019-2027) (000s cubic metres)



Inset 11.2: Forecast future landfill capacity in Essex (2019-2027) (000s cubic metres)



11.3.51 Although there is generally a reducing trend for landfill disposal in England, the forecast future baseline landfill capacity suggests that there is likely to be adequate inert landfill, non-hazardous landfill and non-hazardous landfill with SNRHW cell capacity available in the East of England region (~42,117,000 m^3) and Essex sub-region (~11,321,000 m^3) to support the construction of the Proposed Scheme based on the predicted average annual capacity between 2023 and 2027. However, there is unlikely to be any hazardous landfill capacity in the study area as is currently the case.

11.3.52 This means that any inert, non-hazardous and SNRHW waste that is destined for landfill would most likely find available regional capacity in the study area. It is also of note that even where wastes are accepted at landfill some may, subject to their properties, be used within landfill cover or other engineering uses rather than subject to and accounted as disposal. Any landfills that have ceased infilling, at the time of construction, and are no longer accepting waste may also still require inert and non-hazardous materials for capping and restoration purposes, and therefore may be amenable to accepting any suitable surplus materials arising from construction.

11.3.53 Notwithstanding this, it is envisaged that the vast majority of waste arising from constructing the Proposed Scheme will be re-used, recycled or otherwise recovered in accordance with legislative, policy and fiscal drivers. This assumption is validated by the available Defra (2020) statistics with 92% of non-hazardous C&D waste currently being diverted from landfill in England. This will also be required in order to demonstrate the Proposed Scheme's contribution to achieving the following mandatory and advisory targets in DMRB LA 110:

- At least 70% (by weight) of non-hazardous construction and demolition waste "shall" be subjected to material recovery / diverted from land (constitutes a requirement of Highways England).
- At least 90% (by weight) of non-hazardous construction and demolition waste "should" be subjected to material recovery / diverted from landfill and incineration (constitutes advice expressed as a recommendation by Highways England).

Value of receptors

11.3.54 The baseline environment is comprised of receptors which have been defined geographically based on the likely impacts and effects, associated with the use and consumption of material assets and the production and management of waste, as set out in DMRB LA 110.

11.3.55 Whilst these receptors and an indication of their sensitivity have been summarised in table 11.7, it should be noted that the DMRB LA 110 simplified significance framework precludes the need to assign a sensitivity rating to the identified receptors for the purposes of assessment.

Table 11.7: Sensitivity of receptors in the study area for material assets and waste

Sensitivity	Description	Examples within the study area
N/A	Primary, secondary and recycled aggregate resources	There is likely to be a good supply of both primary and recycled aggregates within the study area to construct the Proposed Scheme. There is no information covering secondary aggregates.

Sensitivity	Description	Examples within the study area
N/A	Mineral safeguarding sites and peat resources	A significant proportion of Proposed Scheme extents are located within a MSA for sand and gravel, and part of the eastern scheme extents also falls within a MSA for brick clay. The Proposed Scheme also passes through a number of MCAs for existing and allocated mineral sites and infrastructure. However, no peat resources have been identified in the study area.
N/A	Inert, non-hazardous and hazardous landfill capacity	There is likely to be sufficient waste management capacity within the study area to accommodate the majority of wastes arising from the construction of the Proposed Scheme, and there are unlikely to be any specific constraints with regards to disposing of inert, non-hazardous and stable non-reactive hazardous waste streams. However, any hazardous waste requiring disposal to landfill is likely to require disposal outwith the East of England due to the absence of permitted merchant capacity.
N/A	Waste safeguarding sites	The Proposed Scheme passes through a number of WCAs for existing and allocated waste sites and infrastructure.

11.3.56 DMRB LA 110 requires that sensitive receptors (designated sites identified in other environmental aspects) should also be considered in order to minimise the effects from material assets and waste. In addition to the generalised receptors identified in table 11.7 for material assets and waste, additional environmental receptors and designated sites are considered as part of the other aspect chapters in this scoping report and are not reproduced in this chapter.

11.4 Potential impacts

Construction

11.4.1 Constructing the Proposed Scheme would require the use of material assets and hence may result in potential impacts on the environment through the depletion of non-renewable natural resources; and compliance / non-compliance with relevant policies and plans.

11.4.2 Conversely, constructing the Proposed Scheme would also result in surplus materials and waste, leading to potential impacts on the available waste management infrastructure (i.e. through the permanent use of landfill void space), and compliance / non-compliance with relevant policies and plans.

11.4.3 The Proposed Scheme would require structural works (including earthworks and concrete and steel structures) as well as imported aggregates and asphalt for new offline road construction. Constructing the Proposed Scheme would require land to be acquired and used outwith the existing highway boundary for both temporary (e.g. borrow pits) and permanent (for new highways, access roads, structures, embankments, drainage etc.) construction purposes. Any land to be permanently acquired and used inside MSAs (for sand and gravel and brick clay) and/or MCAs (for existing, allocated and safeguarded mineral sites and infrastructure) may therefore result in potential partial sterilisation impacts to minerals extraction and infrastructure sites.

11.4.4 Whilst the Proposed Scheme would also be constructed through a number of WCAs (for existing and allocated waste sites and infrastructure), it is considered unlikely, given the arrangement and nature of the Proposed Scheme, that it would result in either the direct loss of safeguarded waste capacity or that the safeguarded waste development would result in indirect impacts to the Proposed Scheme (through noise, dust, odour, traffic, visual or light) that would prejudice the continuing efficient operation of these sites in line with their extant planning permission. Indirect effects (or proximal sterilisation) are more commonly associated with more sensitive land uses such as residential developments.

Operation

11.4.5 Operating the Proposed Scheme would result in similar impacts on material assets and waste to those described above for the construction phase.

11.4.6 DMRB LA 110 specifies that the assessment should only report on the first year of operational activities (opening year). It has been assumed that no significant maintenance activities would occur during the first year of operational activities (target opening year 2027), and thus no significant materials consumption or waste generation is likely to be realised. It has also been assumed that any sterilisation impacts to mineral safeguarding sites would have been mitigated as far as practicable during the design and construction phase.

11.4.7 It is therefore proposed that operational impacts be scoped out of the assessment on the basis that no likely significant effects would be realised. Whilst it is appreciated that the opening year is a time period not necessarily confined to operational effects, any construction phase effects overlapping within this period will be captured within the construction phase assessment nonetheless.

11.4.8 The design process will inherently seek to minimise the consumption of materials, sterilisation of minerals resources and the generation and disposal of waste throughout the lifecycle of the Proposed Scheme.

11.4.9 It is assumed that the assessment of any environmental impacts and effects associated with material assets and waste during any large scale future maintenance, renewal, or improvement works, would be undertaken by Highways England's East of England Asset Delivery Contractor(s) (or equivalent) in accordance with the requirements of DMRB LA 110 (or any future environmental assessment guidance specified by Highways England).

Summary of scope

11.4.10 Table 11.8 summarises the proposed scope for material assets and waste.

Table 11.8: Summary of material assets and waste scope

Matter	Scoped in – construction	Scoped in – operation
Material assets	✓	×
Waste	✓	×

11.5 Design, mitigation and enhancement measures

11.5.1 Measures would be implemented to minimise the impacts associated with both the consumption of material assets and the generation and management of waste during the construction of the Proposed Scheme.

11.5.2 The design of the Proposed Scheme has not been sufficiently developed to allow mitigation measures to be defined in detail. This section therefore identifies established and best practice mitigation measures considering relevant legislation, policy and best practice. This outline will be developed and refined further during subsequent assessment.

11.5.3 Any percentage targets identified below are taken from the DMRB LA 110 National Application Annex. This annex sets out Highways England's specific recycled aggregate targets and mandatory C&D waste recovery targets for use with DMRB LA 110.

Design

11.5.4 Design measures would include, but not be limited to, the following:

- Implementing WRAP (2011) Design for Resource Efficient (DfRE) construction principles, in a systematic manner to suit the scale of the Proposed Scheme, to identify, prioritise and select appropriate opportunities to improve project resource efficiency and design out waste. All opportunities to DfRE construction are covered by the following five principles:
  - Design for reuse and recovery: identifying, securing and using materials that already exist on site, or can be sourced from other projects.
  - Design for resource optimisation: simplifying layout and form to minimise material use, using standard design parameters, balancing cut and fill, maximising the use of renewable materials and materials with recycled content.
  - Design for off-site construction: maximising the use of pre-fabricated structure and components, encouraging a process of assembly rather than construction.
  - Design for resource efficient procurement: identifying and specifying materials that can be acquired responsibly, in accordance with a recognised industry standard.
  - Design for the future: identify how materials can be designed to be more easily adapted over an asset lifetime and how de-constructability and de-mountability of elements can be maximised at end of first life.
- Minimising the construction of any permanent assets within, or close to the boundary of, mineral safeguarding sites to minimise any unnecessary sterilisation and ensure that the construction of the Proposed Scheme does not prejudice the continuing efficient operation of existing, allocated and safeguarded mineral sites and infrastructure:

- Where sterilisation of mineral safeguarding sites is unavoidable, the viability of prior extraction of minerals ahead of or in conjunction with the Proposed Scheme will be considered where it is environmentally, socially and economically feasible, and practical to do so.
- Where the Proposed Scheme has the potential to result in the loss of a safeguarded minerals infrastructure site or its capacity, or constrain its operation, the viability of relocating the infrastructure will be considered.

Mitigation

11.5.5 Mitigation measures would include, but not be limited to, the following:

- Producing a Responsible Sourcing Plan (RSP) to maximise the responsible sourcing of construction materials and products with proven sustainability credentials that minimise adverse impacts on people and their environment during the construction of the Proposed Scheme. The plan will specify:
  - Use of key material elements (asphalt, concrete, aggregate, steel, aluminium and plastics) responsibly sourced from suppliers with industry recognised responsible sourcing certification for that material (e.g. certification to BRE BES 6001, or membership of a sector specific scheme that complies to BSI BS 8902).
  - Use of timber and wood-derived products that are sustainably sourced from independently verifiable legal and sustainable sources (i.e. originating either from independently verified legal and sustainable sources or from a licensed Forest Law Enforcement Governance and Trade partner).
  - Use of alternatives to primary materials, where available and permitted by the Specification for Highway Works. This could include materials that already exist on site, can be extracted from scheme borrow pits, or can be sourced from other projects / suppliers; and ensuring that any aggregates imported to site comprise re-used, secondary or recycled content at levels in line with the East of England regional guideline for aggregates provision 2005-2020 target of 31%.
  - Minimal use of hazardous materials that have the potential to harm human health or the environment; and that might cause problems for future reuse, recycling and recovery.
- Ensuring that waste is handled, stored, managed and re-used, recycled or recovered as close as possible to the point of origin during the construction of the Proposed Scheme provided there are no unacceptable adverse impacts on people, the environment or local amenities. Locally permitted transfer, re-use, recycling, other recovery and disposal sites would be used during construction, where available, to minimise the attendant environmental impact and cost of waste transport and support the economic well-being of the local communities.
- Implementing a Site Waste Management Plan (SWMP) to evidence how the design and construction of the Proposed Scheme has adopted the waste hierarchy of prevention, reuse, recycling, other recovery and disposal; supports the target of ensuring that at least 70% of non-hazardous C&D waste is subjected to material recovery in support of legislative and policy targets; and has complied with waste duty of care requirements.

- Obtaining all necessary waste carrier registrations; environmental permits, mobile plant deployments and/or waste exemptions in relation to the storage, sorting, treatment, use, disposal and transportation of waste during the construction of the Proposed Scheme; and preparing any documentation required of statutory and industry regulated codes of practice (e.g. CL:AIRE Definition of Waste Code of Practice).
- Complying with waste 'Duty of Care' requirements during the construction of the Proposed Scheme, ensuring that all surplus materials and waste are stored, transported, treated, used and disposed of safely without endangering human health or harming the environment. To minimise any attendant effects from storing and processing material assets and waste, ensuring that construction site compounds and on-site storage, stockpiling and processing areas are designed to minimise impacts to designated sites and sensitive environmental receptors during the construction.

Enhancement

11.5.6 No enhancement measures have been identified at this stage. Enhancement measures will be explored throughout the design and construction of the Proposed Scheme as an intrinsic part of developing the RSP and SWMP. Example enhancement opportunities for material assets and waste could include, but not be limited to:

- using surplus recycled or recovered materials in community projects, e.g. utilising recycled mulch from tree felling on adjacent community facilities.
- recycling suitable material for construction of noise and landscape bunding outside of the highway boundary where need has previously been identified (where land availability allows)

11.6 Description of the likely significant effects

11.6.1 Given the scale of the Proposed Scheme the potential exists for significant effects on material assets and waste to occur from the depletion of natural resources, the sterilisation of mineral safeguarding sites and the use of landfill capacity, as well as deviation from the relevant legislative and policy targets outlined in DMRB LA 110.

11.6.2 DMRB LA 110 confirms that five scoping questions should be answered in order to gain an understanding of the need to undertake further assessment for the material assets and waste aspect. Where the response to one or more of these questions is 'yes', then further assessment should be undertaken.

11.6.3 The responses to the scoping assessment questions for the Proposed Scheme are provided in table 11.9, based on the application of professional engineering judgement to the current design information.

Table 11.9: DMRB LA 110 Scoping questions and responses

Scoping questions	Response	Scoped in / out
Material assets		
1. Is the project likely to recover / reuse little on site material thereby requiring materials to be imported to site?	Yes	Scoped in
2. Is the project likely to use little / no recycled / secondary materials thereby requiring the majority of materials used on the project to comprise primary materials?	Uncertain	Scoped in
3. The project is likely to sterilise (substantially constrain / prevent existing and potential future use of) mineral sites or peat resources?	Uncertain for mineral sites. No for peat resources	Scoped in
Waste		
4. Would the project generate large quantities of waste relative to regional landfill capacity?	Uncertain	Scoped in
5. Will the project have an effect on the ability of waste infrastructure within the region to continue to accommodate waste from other sources?	Uncertain	Scoped in

11.6.4 Having answered 'yes' or 'uncertain' to one or more of the DMRB LA 110 scoping questions for the material assets and waste matters, it is recommended that this aspect and both of its matters be scoped into the EIA.

11.7 Assessment methodology

11.7.1 A quantitative material assets and waste assessment will be undertaken, with professional judgement applied to the DMRB LA 110 simplified assessment framework as required (see tables 11.10 and 11.11 and Appendix C).

11.7.2 The collection, interpretation and use of the information on materials and waste, identified in section 11.8, will be targeted during the environmental assessment in order to generate a meaningful assessment.

11.7.3 The following published resource efficiency statistics, benchmarks and key performance indicators will be used to populate any data gaps that may exist in relation to assessing the effects of constructing the Proposed Scheme in accordance with both NNNPS and DMRB LA 110 requirements:

- WRAP, Resource Efficiency Benchmarks for Construction Projects
- WRAP, Net Waste Tool – Data
- WRAP, Construction Procurement Guidance: Delivering Higher Recycled Content in Construction Projects
- Glenigan et al., UK Industry Performance Report 2018 – Based on the UK Construction Industry Key Performance Indicators
- EA, Waste Data Interrogator
- Defra, UK Statistics on Waste

11.7.4 These data sources are likely to be required in order to populate the following data gaps which may exist for the assessment:

- information on indicative levels of recycled content in imported aggregate and aggregate containing construction materials
- the amount of waste that could be recovered and diverted from landfill within the first or second study area
- quantities of waste arising from the project requiring disposal to landfill

11.7.5 No field surveys or modelling will be undertaken for this aspect. A desk based assessment is considered to be appropriate and proportionate based on DMRB LA 110.

Simplified assessment framework (significance categories and criteria)

11.7.6 DMRB LA 110 sets out how effects associated with the material assets and waste aspect should be assessed through the use of a 'simplified assessment framework'.

11.7.7 The assessment of effects on material assets and waste will adopt the significance categories in table 11.10. The significance of effects on material assets and waste will be reported in accordance with the significance criteria in table 11.11.

Table 11.10: DMRB LA 110 significance category descriptions

Significance category	Description
Very large	Material assets 1) no criteria: use criteria for large categories. Waste 1) >1% reduction or alteration in national capacity of landfill, as a result of accommodating waste from a project; or 2) construction of new (permanent) waste infrastructure is required to accommodate waste from a project.
Large	Material assets • project achieves <70% overall material recovery / recycling (by weight) of non-hazardous Construction and Demolition Waste to substitute use of primary materials; and • aggregates required to be imported to site comprise <1% re-used / recycled content; and/or[1] • project sterilises ≥1 mineral safeguarding site and/or peat resource[2]. Waste • >1% reduction in the regional capacity of landfill as a result of accommodating waste from a project; and • >50% of project waste for disposal outside of the region.

Significance category	Description
Moderate	Material assets: • project achieves less than 70% overall material recovery / recycling (by weight) of non-hazardous construction and Demolition Waste to substitute use of primary materials; and • aggregates required to be imported to site comprise re-used/recycled content below the relevant regional percentage target[3]. Waste: • >1% reduction or alteration in the regional capacity of landfill as a result of accommodating waste from a project; and • 1-50% of project waste for disposal outside of the region.
Slight	Material assets: • project achieves 70-99% overall material recovery / recycling (by weight) of non-hazardous Construction and Demolition Waste to substitute use of primary materials; and • aggregates required to be imported to site comprise re-used/recycled content in line with the relevant regional percentage target[3]. Waste: • ≤1% reduction or alteration in the regional capacity of landfill; and • waste infrastructure has sufficient capacity to accommodate waste from a project, without compromising integrity of the receiving infrastructure (design life or capacity) within the region.
Neural	Material assets: • project achieves >99% overall material recovery / recycling (by weight) of non-hazardous Construction Demolition Waste to substitute use of primary materials; and • aggregates required to be imported to site comprise >99% re-used / recycled content. Waste: • no reduction or alteration in the capacity of waste infrastructure within the region.

[1] The published version of DMRB LA 110 includes “AND” instead of “AND/OR”. This has been changed to correct an editorial error in the original guidance that was confirmed in an email from Wilson. S (2020) at Highways England.

[2] Sterilisation is defined by DMRB LA 110 to mean “substantially constrain / prevent existing and potential future use and extraction of materials”. In the absence of further guidance, this has been interpreted to mean that the Proposed Scheme would need to substantially sterilise (in their entirety) one or more allocated mineral extraction sites rendering them inaccessible for future use.

[3] The recycled aggregate target for the East of England region is 31%. This target is given in Table E/1.2 of DMRB LA 110, and is sourced from Ministry of Housing, Communities & Local Government (2009) National and Regional Guidelines for Aggregates Provision in England 2005 to 2020.

Table 11.11: DMRB LA 110 significance criteria

Significance	Description
Significant (one or more criteria met)	Material assets • category description met for moderate or large effect. Waste • category description met for moderate, large or very large effect.
Not significant	Material assets • category description met for neutral or slight effect. Waste • category description met for neutral or slight effect.

11.7.8 The descriptors of effect provided in table 11.10 will be used to assess the likely environmental effects of constructing the Proposed Scheme on material assets and waste. Professional judgement will be used to determine which significant effect categories the Proposed Scheme is likely to fall within, with regards to the material assets and waste matters of this aspect.

11.7.9 This table, reproduced from DMRB LA 110, uses very precise and deliberate language, specifically “OR”, “AND” and “AND/OR” after each descriptor of effect to denote which significance category should be applied. The descriptors for the material assets matter are generally summative (large, moderate, slight and neutral effects), and all descriptors need to be met in full in order to assign a relevant significance category (i.e. with the notable exception of a large effect which can be assigned when a project sterilises ≥1 mineral safeguarding site and/or peat resource). The descriptors of effect for the waste matter are either standalone (very large and neutral effects) or summative (large, moderate and slight effects).

11.8 Assessment assumptions and limitations

11.8.1 There is little information available at this stage regarding the precise material requirements and waste quantities associated with constructing the Proposed Scheme; and therefore, there is also limited information available at this stage regarding:

11.8.2 For material assets:

- types and quantity of material use associated with the operating the existing A12
- types and quantities of materials required to construct the project
- information on materials that contain secondary / recycled content
- information on any known sustainability credentials of materials to be consumed
- the type and volume of materials that would be recovered from on or off-site sources for use on the project
- the cut and fill balance
- degree of minerals sterilisation
- details of on-site storage and stockpiling arrangements, and any supporting logistical details

11.8.3 For waste management:

- types and quantities of waste associated with the operation of the existing A12
- amount of waste (by type and weight) that would be recovered and diverted from landfill either on site or off site (i.e. for use on other projects)
- types and quantities of waste arising from the project (demolition, excavation arisings and remediation) requiring disposal to landfill
- details of on-site storage and segregation arrangements for waste and any supporting logistical arrangements

11.8.4 The above limitations are not untypical at the scoping stage of assessments, and the information presented in this chapter is considered to be an appropriate level of detail in line with the scoping assessment methodology outlined in DMRB LA 110.

11.8.5 This scoping assessment for material assets and waste receptors is predominantly based on a review of the baseline information available at the time of assessment. Whilst the baseline data sources used in this assessment represent the most recently available information, conditions may have changed since publication. Although checks are made by stakeholders for anomalies or errors in their data prior to publication, it cannot be guaranteed that these data are error free, or whether any commercial decisions taken by site operators may have affected them. Furthermore, changes to the permitted minerals and waste management capacity during the construction of the Proposed Scheme are difficult to accurately predict.

11.8.6 Material assets and waste can affect the full range of environmental media and assessment factors. Where materials are consumed, and waste is generated, it is acknowledged that, depending on how they are managed, indirect adverse effects may arise (from greenhouse gas emissions; water consumption; visual impacts, dust, noise, vibration, vehicle emissions, disruption to traffic and other potential causes of nuisance; and water pollution, amongst others). Such effects and mitigation measures do not form part of the material assets and waste assessment and are considered as part of the other aspect chapters in this scoping report.

12. Noise and vibration

12.1 NNNPS requirements

12.1.1 The National Networks National Policy Statement (NNNPS) sets out the Government's policies to deliver the development of Nationally Significant Infrastructure Projects (NSIP) on the national road and rail networks in England. The Secretary of State (SoS) uses the NNNPS as the primary basis for making decisions on Development Consent Order (DCO) applications.

12.1.2 Key policy from the NNNPS relevant to this aspect includes:

- Paragraph 5.191 of the NNNPS states that operational noise, with respect to human receptors, should be assessed using the principles of the relevant British Standards and other guidance. The prediction of road traffic noise should be based on the method described in Calculation of Road Traffic Noise. For the prediction, assessment and management of construction noise, reference should be made to any relevant British Standards and other guidance which also give examples of mitigation strategies.
- Paragraph 5.193 states that developments must be undertaken in accordance with statutory requirements for noise. Due regard must have been given to the relevant sections of the Noise Policy Statement for England, National Planning Policy Framework and the Government's associated planning guidance on noise.
- Paragraph 5.194 states that the project should demonstrate good design through optimisation of scheme layout to minimise noise emissions and, where possible, the use of landscaping, bunds or noise barriers to reduce noise transmission. The project should also consider the need for the mitigation of impacts elsewhere on the road and rail networks that have been identified as arising from the development, according to Government policy.
- Paragraph 5.195 states that the SoS should not grant development consent unless satisfied that the proposals will meet the following aims, within the context of Government policy on sustainable development:
  - avoid significant adverse impacts on health and quality of life from noise as a result of the new development
  - mitigate and minimise other adverse impacts on health and quality of life from noise from the new development
  - contribute to improvements to health and quality of life through the effective management and control of noise, where possible
- Paragraph 5.200 states that applicants should consider opportunities to address the noise issues associated with the Important Areas as identified through the noise action planning process.

12.2 Study area

12.2.1 The study area for an assessment of noise and vibration is defined within the Design Manual for Roads and Bridges (DMRB) document LA 111 Noise and Vibration (Highways England, 2020). For construction and operation, defining the study area is based on professional judgement of likely changes in noise and vibration. For a project proceeding to further assessment, a method is provided within DRMB LA 111 to set the study areas for noise and vibration. These methods allow for the study areas to be reduced or extended to ensure they are proportionate to the risk of likely significant effects. An example of this would be where the study area is extended to cover concerned communities that might otherwise be excluded from the assessment.

12.2.2 When further assessment is identified for construction noise, DMRB LA 111 suggests that a study area of 300m from the closest construction activity is normally enough to cover potential adverse effects at sensitive receptors. A study area of 100m from the closest construction activity with the potential to generate vibration is normally enough to define the study area for vibration from construction. For this scoping exercise, these distances from the Proposed Scheme have been considered when examining the potential impacts from construction.

12.2.3 The study area for operational road traffic is defined by the extent of the Proposed Scheme and the extent of other road links away from this area with a potential to experience a short-term change in noise of more than 1 dB(A). DMRB LA 111 suggests that for most projects an operational study area is defined as the area within 600m of new road links or road links physically changed or bypassed by the project.

12.2.4 These areas are generally sufficient for most projects and have initially been used when considering the potential impacts from the Proposed Scheme. However, the assessment will not be limited to these distances if it is considered there is a risk of likely significant effects beyond 100m for construction vibration, 300m for construction noise, or 600m for operational noise.

12.2.5 As an indication of the likely study area for operational road traffic noise, figure 12.1 in Appendix A shows the study area defined using the PCF Stage 2 scheme design and traffic forecasts. The traffic data used for the EIA will be from a new traffic model. It is considered that any changes between the two traffic models will not change the size of the operational noise study area for the EIA. This is because the operational noise study area is defined primarily in relation to physical changes to the road, rather than changes to traffic flow.

12.2.6 There is no study area considered for operational vibration since DMRB LA 111 states that this is scoped out of the assessment methodology as a maintained road surface will be free of irregularities so operational vibration will not have the potential to lead to significant adverse effects.

12.3 Baseline conditions

Baseline sources

12.3.1 The following baseline source has been used during the scoping stage:

- England Noise Map Viewer (http://extrium.co.uk/noiseviewer.html)

Baseline information

12.3.2 At this stage of the assessment there has been no baseline noise survey undertaken. This was not completed during the options selection (PCF Stage 2) since this may have resulted in some unnecessary surveys being undertaken in relation to options not taken forward. To inform this scoping report a series of noise surveys was planned to be undertaken in Spring 2020. However, due to the COVID-19 pandemic in early 2020, these surveys were not undertaken due to travel restrictions and potentially low noise levels due to reduced traffic. A series of noise surveys are scheduled to be completed prior to the next stage of assessment and these are described in section 12.7.

12.3.3 The existing noise climate near the Proposed Scheme is dominated by road traffic noise, predominantly from the A12. The Great Eastern Main Line (GEML) is in places close to the alignment of the A12. Rail noise would therefore contribute to the local noise climate in some locations. Other noise sources include road traffic noise from local roads and noise associated with urban and rural activities.

12.3.4 There are 18 Noise Important Areas (NIA) along the A12 between junctions 19 and 25. In addition, there are other NIA on roads that are within the study area from PCF Stage 2. There is one on the A130 adjacent to junction 19, one on the A120 adjacent to junction 25, and one between junction 25 and 26 on the A12. These 21 NIA are listed in table 12.1.

Table 12.1: Noise Important Areas within the study area

NIA number	Road	Noise source asset owner	Noise receiving authority
6141	A12	Highways England	Chelmsford
5411	A12	Highways England	Chelmsford
5412	A12	Highways England	Chelmsford & Braintree
6191	A12	Highways England	Braintree
5413	A12	Highways England	Braintree
6192	A12	Highways England	Braintree
5414	A12	Highways England	Braintree
5415	A12	Highways England	Braintree
6144	A12	Highways England	Braintree
5419	A12	Highways England	Braintree
6145	A12	Highways England	Braintree
14874	A12	Highways England	Braintree
5416	A12	Highways England	Colchester

NIA number	Road	Noise source asset owner	Noise receiving authority
6142	A12	Highways England	Colchester
6143	A12	Highways England	Colchester
5417	A12	Highways England	Colchester
4759	A12	Highways England	Colchester
4760	A12	Highways England	Colchester
6173	A130	Essex	Chelmsford
4758	A120	Highways England	Colchester
4761	A12	Highways England	Colchester

12.3.5 Some of these NIA alongside the A12 are single or semi-detached properties. Where these are within sections of the Proposed Scheme where online widening is planned it is possible that these dwellings would be demolished to provide space for the new alignment. Details of dwellings proposed for demolition are still to be confirmed, but if any of these NIA or indeed other dwellings outside of an NIA are planned for demolition, they would be removed as noise sensitive receptors from the EIA.

12.3.6 Sensitive receptors for humans include residential properties located in Boreham, Hatfield Peverel, Witham, Rivenhall End, Kelvedon, Gore Pitt, Pott's Green, Long Green, and Marks Tey. There are also numerous individual dwellings along the route, including some located immediately adjacent to the A12. These include Hare Lodge, Badgers and Durward Cottages which are located between junctions 22 and 23.

12.3.7 Existing noise mitigation along some sections of the route is in the form of low noise surfacing and noise barriers. These areas of low noise surfacing will be identified and included within the EIA. There are three identified locations where, based on professional judgement, mitigation is deemed as being provided by barriers. These three locations are:

- 1,000m of old timber noise barrier to the south of the A12 alongside a housing development in Boreham. This barrier is approximately 2m high. It is unclear whether it is an asset owned by Highways England or the housing developer.
- 400m of timber noise barrier alongside a new development to the south of Witham. This barrier is approximately 2m high and is likely to be owned by the housing developer.
- 110m of brick wall to the south of the A12 in Rivenhall End, approximately 2m high. Although this is likely to have been built as a boundary wall for houses it will be providing some degree of noise mitigation.

12.3.8 The acoustic performance of these barriers will be confirmed for the EIA and if appropriate they will be included within the baseline noise model.

Future baseline

12.3.9 The Do-Minimum traffic scenario will be representative of the predicted growth in traffic, accounting for local and regional development. Cumulative impacts are implicit in the future Do-Minimum and Do-Something scenarios because committed developments will be included in the traffic model.

12.3.10 Traffic growth aside, the future noise baseline around the Proposed Scheme is likely to be similar to the existing baseline.

12.3.11 Any future committed developments (i.e. those where planning permission has been granted) that would introduce noise sensitive receptors within the study area will be included within the noise model. This will include individual receptors and large developments. The cut-off date for including receptors will be the same as that used for all environmental aspects. The potential impact at any large areas of land that may be marked for development but where no permission has been granted will be commented on within the reporting, but these potential receptors would not be included within assessment tables or considered for mitigation or enhancements.

Value of receptors

12.3.12 The DMRB LA 111 does not provide a scale of value or sensitivity for receptors. A receptor is considered to either be sensitive or not sensitive to noise and/or vibration. Within DMRB LA 111 are examples of receptors that are potentially sensitive to noise and vibration. A summary of these is provided in table 12.2.

12.3.13 With no scale of value, it is therefore not possible for the noise and vibration assessment to use the matrix-based approach to determine potentially significant effects. The approach to determining potential significant effects is described in section 12.7.

Table 12.2: Value of receptors in the study area for noise and vibration

Value/ sensitivity	Description	Examples within the study area
Sensitive	Dwellings, hospitals, healthcare facilities, education facilities, community facilities, quiet areas or potential quiet areas as defined by the Environmental Noise Directive, international and national or statutorily designated sites, public rights of way, buildings containing vibration sensitive equipment and cultural heritage assets.	Dwellings within Boreham, Hatfield Peverel, Witham, Rivenhall End, Kelvedon, Gore Pitt, Pott's Green, Long Green, and Marks Tey. Boreham Primary, Hatfield Peverel Infant School, Gershwin Park Day Nursery, Chipping Hill Primary, Holy Family Roman Catholic Primary, Howbridge Infants, Rivenhall Church of England Primary, Easterford Pre-School, Kelvedon St Marys Academic School, Feering Church of England Primary and Tadpoles Pre-School. Prested Hall grounds, Benton Hall Golf and Country Club.

12.4 Potential impacts

Construction

12.4.1 Impacts from construction can be defined as those that occur between the start of advance works and the end of the Proposed Scheme construction period. Although temporary, construction-related impacts may nevertheless require mitigation. Typical construction impacts might include a localised increase in noise and/or vibration and a loss of amenity due to the presence of construction traffic.

12.4.2 The following are generally applicable to temporary construction related impacts:

- the area where construction disruption occurs tends to be more localised than the impacts of the road scheme once it has opened to traffic
- it has been shown that disturbance arising from construction diminishes rapidly with distance
- the duration of the effects is important when considering the potential for disturbance

12.4.3 For construction noise, the following two situations are considered to determine the need for further assessment:

1. Does construction noise generated by the project have the potential to adversely affect any noise?
2. Are there any noise sensitive receptors where there would be a reasonable stakeholder expectation that a construction noise assessment would be undertaken?

12.4.4 If the answer to either of these scoping situations is 'yes' then DMRB LA 111 advises that further assessment shall be undertaken. For the Proposed Scheme it is considered very likely that the construction work associated with the project would adversely affect the noise climate in the area. Activities such as breaking up of existing structures and piling for foundations are some of the nosiest activities associated with a project of this kind. Any works being undertaken at night also have the potential to cause adverse impacts.

12.4.5 At various locations along the Proposed Scheme route there are sensitive receptors sufficiently close that these and other activities could increase the noise level and cause adverse impacts. Given the size and scale of the Proposed Scheme it is likely that stakeholders would expect to see the noise from construction assessed and controlled. It is therefore considered that the noise from construction should be scoped in for further assessment.

12.4.6 For construction vibration, the following two situations are considered to determine the need for further assessment:

1. Does vibration from construction have the potential to adversely affect any vibration sensitive receptors?
2. Does the scale of the development or type of construction mean that there will be a reasonable stakeholder expectation that a construction vibration assessment would be undertaken at any vibration sensitive receptors?

12.4.7 If the answer to either of these scoping situations is 'yes' then DMRB LA 111 advises that further assessment shall be undertaken. For the Proposed Scheme, there is likely to be activities that generate vibration, such as piling or compaction works. These activities would at times be close enough to sensitive receptors that vibration could be felt. However, it is unlikely that sufficiently high levels of vibration to cause structural damage would be generated. Given the nature of the construction and the close proximity to receptors it is likely that stakeholders would expect to see the vibration from construction assessed and controlled. It is therefore considered that the vibration from construction should be scoped in for further assessment.

Operation

12.4.8 The level of road traffic noise affecting any receptor is dependent on several variables, all of which are accounted for within the road traffic noise prediction methodology. In summary these are:

- traffic related factors: volume, speed and composition of vehicles
- road related factors: surface (e.g. concrete or bituminous) and gradient
- propagation factors: distance, the presence of screening and type of ground cover intervening between the road and any receptor
- receptor specific factors: view of the road and reflections

12.4.9 Should any of these factors alter, whether through changes on or to an existing road, or with the introduction of a new section of road, then noise levels are also likely to change. Individually, these variables might cause noise levels to increase or decrease for any receptor. DMRB LA 111 provides four situations to consider when determining whether further assessment is required. These are:

1. Is the project likely to cause a change in the basic noise level (BNL) of 1dB $L_{A10,18hr}$ in the do-minimum opening year (DMOY) compared to the do-something opening year (DSOY)?
2. Is the project likely to cause a change in the BNL of 3dB $L_{A10,18hr}$ in the do-something future year (DSFY) compared to the DMOY?
3. Does the project involve the construction of new road links within 600m of noise sensitive receptors?
4. Would there be a reasonable stakeholder expectation that an assessment would be undertaken?

12.4.10 Given the proximity of sensitive receptors to the Proposed Scheme, it is considered likely that some sensitive receptors would experience adverse impacts. It is therefore considered that operational noise should be scoped in for further assessment.

12.4.11 DMRB LA 111 states that operational vibration should be scoped out of the assessment methodology as a maintained road surface will be free of irregularities so operational vibration will not have the potential to lead to significant adverse effects. It is considered that there is nothing within the initial design of the Proposed Scheme that would change this assumption.

Summary of scope

12.4.12 Table 12.3 summarises the proposed scope for noise and vibration.

Table 12.3: Summary of noise and vibration scope

Matter	Scoped in - construction	Scoped in - operation
Construction noise	✓	*n/a*
Construction vibration	✓	*n/a*
Operational traffic noise	*n/a*	✓
Operational traffic vibration	*n/a*	×

12.4.13 The operational impact from traffic on vibration is the only matter to be scoped out from further assessment. This decision has been based on established guidance (DMRB LA 111).

12.5 Design, mitigation and enhancement measures

12.5.1 Mitigation measures for noise and vibration include measures embedded into a project design to reduce the overall environmental impact (e.g. new road alignment) and measures used solely to mitigate noise (e.g. noise barriers, restrictions on plant or activities during the construction phase, quieter road surfaces).

12.5.2 Prior to construction, the Construction Environmental Management Plan (CEMP) would be prepared and implemented. The CEMP would include the relevant construction noise criteria and any proposed monitoring during construction. It would also contain details of best practice measures associated with mitigating potential noise and vibration impacts. Appropriate mechanisms to communicate with local residents would be developed to highlight potential periods of disruption. These mechanisms could include web-based updates or articles, newsletters and radio announcements.

12.5.3 A complaint management system would be in place, in line with systems used by Highways England on other large infrastructure projects. Any noise and vibration complaints would be investigated and appropriate action taken as required. The complainant would be provided with a response outlining the results of the investigation and any action taken.

12.5.4 When considering noise mitigation from operational noise, the principle of source – path – receptor will be applied. This is a principle where noise mitigation is first considered at source as this is more than often the most practical and cost-effective solution, and it will also provide a reduction in noise to all the surrounding receptors. Examples of mitigation at source are:

- changes to the vertical or horizontal alignment of the road
- low noise road surfacing
- speed limits
- restrictions on noisy vehicle types

12.5.5 DMRB LA 111 notes that speed limits or restrictions on noisy vehicle types are not normally practical for use on motorways and all-purpose trunk roads, as they can encourage drivers to take alternative routes which can be less safe and result in higher noise levels for populations along the alternative routes.

12.5.6 The reduction of noise between the source and receptor is considered next as, after controlling noise at source, a reduction in the path would benefit the greatest number of receptors. A reduction in noise in the path is most likely to be achieved by placing a solid structure between the source and receptor, such as a purposely built noise barrier. However, the use of a solid barrier would only protect receptors within 200m of the barrier. Examples of mitigation in the path are:

- purpose built noise barriers
- bunds or earth embankments

12.5.7 The mitigation of noise at the receptor in the form of sound insulation of buildings is the last resort in terms of noise mitigation. This is because it would only be of benefit to the individual receptor. In addition, providing insulation in terms of improved glazing would be ineffective if the windows of a property are open or if the individuals are outside. Examples of mitigation measures at the receptor are:

- noise insulation

12.5.8 The suitability of each potential noise mitigation measure for use within the Proposed Scheme area will be considered based on the benefit of a measure in terms of elimination of likely significant effects, any engineering constraints, and the potential impact across other environmental factors. In addition, when considering mitigation for residential noise receptors only, a comparison of the monetised noise benefit of a mitigation measure against the cost of the measure over the anticipated design life of the Proposed Scheme shall be considered.

12.5.9 Enhancement measures in the form of noise barriers will be considered for residential receptors across the Proposed Scheme. The receptors considered will include not only NIA, but also other locations where it is considered that a reduction in noise could be achieved. An initial assessment of likely areas to benefit from enhancement will be based on professional judgement using knowledge gained from other large road projects. Any chosen locations will then be subject to detailed calculations where the cost of the barrier is compared against the benefit from the reduction in noise it would provide. The guidance within DMRB LA 111 for this process will be followed.

12.6 Description of the likely significant effects

12.6.1 Given the very close proximity of some receptors to parts of the Proposed Scheme there is the potential for significant adverse construction noise effects at the closest receptors. These are generally likely to be in the areas of online widening or where large infrastructure is constructed in the form of junctions. Night working is likely to be required for some activities and this has the potential to generate further significant effects.

12.6.2 There are not expected to be any significant adverse effects in relation to building damage from construction induced vibration. This is because it is unlikely that the required construction activities would generate vibration levels of the magnitude to cause building damage. However, there is the potential for significant construction vibration effects on human receptors in buildings.

12.6.3 It is likely that these potential significant effects from construction can be controlled through mitigation.

12.6.4 The Proposed Scheme has the potential to cause significant adverse operational effects in two ways. The first is from the sections of online widening, where receptors that are already close to the road would have the traffic moved closer. With a forecast increase in traffic flow along the A12, these changes have the potential to increase the noise levels at receptors that are already subject to a high level of noise. The second possible cause of significant effects would be from the bypass sections of the Proposed Scheme moving the traffic closer to some new receptors. Within this context, situations could also exist where the main noise source at a receptor is moved from, for example, the front to the rear of the receptor. It may not be possible to mitigate some of these potential significant effects due to the isolated nature of some receptors, whereby noise mitigation may not be cost effective.

12.6.5 There is the potential for significant beneficial effects in areas where the traffic is moved away from existing sensitive receptors (for example, de-trunked sections of the existing A12 where new offline sections are proposed).

12.7 Assessment methodology

12.7.1 The assessment of impacts from noise and vibration will be undertaken in accordance with the guidance in DMRB LA 111. By using the guidance within DMRB LA 111 it is considered that the Proposed Scheme can be measured against the NNNPS policy requirements.

12.7.2 DMRB LA 111 incorporates the noise effect levels that have been introduced to English noise policy by the Noise Policy Statement for England (NPSE) (Department for Environment, Food and Rural Affairs, 2010). These effect levels are defined as:

- LOAEL - Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected.
- SOAEL - Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur.

12.7.3 The NPSE does not assign decibel values to these effect levels as they will vary depending upon the type of assessment being undertaken. However, suggested effect levels for construction and operational noise and vibration are contained within DMRB LA 111 and these will be used for the EIA of the Proposed Scheme. These suggested levels are replicated in Appendix C.

Data requirements

12.7.4 The following data sources will be used to undertake the assessment:

- baseline noise survey and site walkover
- land use OS mastermap (including building heights), OS addressbase and building use, and data.gov.uk datasets of designated sites
- topographical information along the existing route and that of the Proposed Scheme
- traffic data from the traffic modelling of the Proposed Scheme; the core scenario from the traffic model will be used for the operational noise assessment

- Highways England Pavement Management System (HAPMS) and Environmental Information System (ENVIS) databases of road surfacing information and existing noise barriers
- information from the planning applications of recently completed developments within the area to inform on locations of non-Highways England noise barriers and, where considered reliable, data from noise surveys
- information from planning applications within the area to inform on committed developments that may not be included within the OS addressbase dataset
- likely construction plant and programme

Baseline noise and vibration levels

12.7.5 DMRB LA 111 states that "*noise monitoring should be used to inform baseline noise modelling results and to provide data for public consultation purposes*". As has been described in section 12.3, there have been no noise measurements undertaken to inform this scoping report. A series of noise measurements will be undertaken prior to the EIA at a selection of locations representative of individual or groups of sensitive receptors. A selection of these locations will be compared against the predicted noise levels for validation purposes (ref: DMRB LA 111 para 3.45).

12.7.6 It is proposed to undertake unattended long-term (i.e. one week) noise measurements at 11 locations along the route of the Proposed Scheme. Figure 12.1 shows the proposed noise survey locations.

12.7.7 No baseline vibration surveys will be undertaken as the guidance within DMRB LA 111 states "*the construction vibration baseline shall be assumed to be zero due to the absence of construction work prior to project commencement*".

Construction noise and vibration approach

12.7.8 The assessment of noise from construction will be undertaken quantitatively based on the guidance within DMRB LA 111, which in turn references the guidance and calculation methodology within BS 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise (British Standards Institution, 2014).

12.7.9 Noise predictions from construction are undertaken using known noise levels from the various items of plant that would be used during the different activities associated with the construction of the Proposed Scheme. Factors such as the amount of time that each item of plant is operating over a working day are also considered within the calculations. Until construction physically starts some of the information required to inform these predictions will be based on professional judgement and in collaboration with the principal contractor.

12.7.10 The noise levels from construction will be calculated at selected locations which are considered to be representative of all noise sensitive receptors in the study area. These selected locations may be individual sensitive receptors or groups of sensitive receptors. These calculations will be undertaken by using the noise model produced for the assessment of the operational noise. The items of plant and corresponding noise levels will be added to the noise model in order to undertake the calculations.

12.7.11 To determine significance of effect from construction noise, the method involves a comparison between the predicted noise level arising from construction operations and the pre-construction ambient noise level. Table 3.16 of DMRB LA 111 includes a scale of magnitude that will be used to determine the impact, and this table is shown in Appendix C. Construction noise shall constitute a significant effect where it is determined that a major or moderate magnitude of impact would occur for a duration exceeding (ref: DMRB LA 111 para 3.19):

- 10 or more days or nights in any 15 consecutive days or nights
- a total number of days exceeding 40 in any six consecutive months

12.7.12 If significant effects are identified then specific noise mitigation measures to reduce the noise impact from activities will be considered.

12.7.13 The impact from additional construction traffic on the road network and that from diversion routes will be assessed in accordance with the guidance from para 3.15 to 3.19 within DMRB LA 111. This method compares the existing level of traffic against that predicted during construction. Table 3.17 of DMRB LA 111 includes a scale of magnitude that will be used to determine the impact, and this table is shown in Appendix C.

12.7.14 Predicted noise levels from the construction of the Proposed Scheme will also be provided to inform the assessment of other aspects (e.g. cultural heritage).

12.7.15 The assessment of vibration from construction will, where possible, be undertaken quantitatively based on the guidance within DMRB LA 111, which in turn references the guidance and calculation methodology within BS 5228-2:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 2: Vibration (British Standards Institution, 2014).

12.7.16 For some activities of construction (e.g. piling, compaction) equations are available within BS 5228-2:2009+A1:2014 to calculate the level of vibration at a distance from the construction activity. Certain input parameters are required for these calculations and until construction physically starts some of the information required will be based on professional judgement. Where a construction activity is not covered by the calculation methodology, the level of vibration from the activity will be based on professional judgement or empirical data contained within BS 5228-2:2009+A1:2014.

12.7.17 The level of vibration will be calculated at selected locations which are considered to be representative of all vibration sensitive receptors in the study area. These may be individual sensitive receptors or groups of sensitive receptors.

12.7.18 To determine significance of effect from construction vibration, the magnitude of the predicted level is compared against a scale shown in Table 3.33 of DMRB LA 111, and this table is shown in Appendix C. Construction vibration shall constitute a significant effect where it is determined that a major or moderate magnitude of impact would occur for a duration exceeding (ref: DMRB LA 111 para 3.34):

- 10 or more days or nights in any 15 consecutive days or nights
- a total number of days exceeding 40 in any six consecutive months

12.7.19 If significant effects are identified, then specific vibration mitigation measures to reduce the vibration impact from activities will be considered.

Operational road traffic noise approach

12.7.20 The assessment of noise from the operation of the Proposed Scheme will be undertaken quantitatively based on the guidance within DMRB LA 111. The approach within DMRB LA 111 is to compare the predicted noise level with and without the Proposed Scheme at individual or groups of sensitive receptors. Noise levels will be calculated using the methodology contained within the Calculation of Road Traffic Noise (CRTN) (Department of Transport and Welsh Office, 1988).

12.7.21 To determine the significance of effect, the predicted change in noise in the short-term (i.e. on opening) will be compared against the scale of magnitude shown in table 12.4 (ref: DMRB LA 111 tables 3.54a and 3.54b). Where the magnitude of change in the short-term is negligible, this will be deemed as not giving rise to a likely significant effect.

Table 12.4: Classification of magnitude of noise impacts

Magnitude of impact	Noise change, dB	
	Short term noise change (dB $L_{A10, 18h}$ or L_{night})	Long term noise change (dB $L_{A10, 18h}$ or L_{night})
Major	Greater than or equal to 5.0	Greater than or equal to 10.0
Moderate	3 - 4.9	5 – 9.9
Minor	1 - 2.9	3 - 4.9
Negligible	less than 1.0	less than 3.0

12.7.22 For noise sensitive receptors where the magnitude of change in the short-term is minor, moderate or major then a noise change of 3 dB (i.e. a moderate increase in noise level) will be used as the starting point to determine whether the effect is likely to be significant. Other factors will be considered in determining whether the impact is significant or not. Table 3.60 of DMRB LA 111 provides a series of factors that can be considered, and these are summarised as:

- the actual short-term change, i.e. a change of 2.9 dB or less (in the short-term) may still be considered a significant environmental effect
- the predicted long-term (i.e. 15 years after opening) change in noise, i.e. comparison of the Do Minimum scenario in baseline year against Do Something in the future assessment year
- absolute noise level with reference to the LOAEL and SOAEL values
- circumstances of the receptor or receptor group, e.g. location of windows, outdoor spaces, use of receptor
- the existing acoustic character of the area
- changes to the landscape or setting of the receptor or receptor group

12.7.23 If significant effects are identified, then mitigation measures described in section 12.5 will be considered.

12.7.24 Predicted noise levels from the construction of the Proposed Scheme will also be provided to inform the assessment of other aspects (e.g. cultural heritage).

12.7.25 An assessment of likely eligibility for sound insulation measures under the Noise Insulation Regulations 1975 (as amended 1988) will be undertaken to identify residential dwellings that may potentially qualify under the Regulations.

12.7.26 The four local authorities for which the Proposed Scheme passes through (i.e. Colchester Borough Council, Chelmsford City Council, Braintree District Council, and Maldon District Council) have been consulted with regard this proposed scope.

Consideration against noise policy

12.7.27 Consideration of the Proposed Scheme with respect to national policy on noise will also be undertaken. The EIA will report against the three aims within the NNNPS and describe the actions taken to support delivery of each aim. These three aims, together with the actions required by DMRB LA 111, are shown in table 12.5.

Table 12.5: NNNPS aims and associated actions

NNNPS aim	Action required during assessment
Aim 1: Avoid significant adverse impacts on health and quality of life from noise as a result of the new development. NOTE: Significant adverse noise effects occur when noise levels are above SOAEL.	• For each receptor or group of receptors, set out the mitigation measures used to reduce noise exposure to below SOAEL. • Where project noise levels are not predicted to be below the SOAEL, report the reasons why noise levels could not be reduced below the SOAEL, in terms of Government policy on sustainable development.
Aim 2: Mitigate and minimise other adverse impacts on health and quality of life from noise from the new development. NOTE: Other adverse impacts occur when noise levels are between LOAEL and SOAEL.	• Set out measures used to mitigate and minimise other adverse impacts for all receptors or groups of receptors where project noise levels are above LOAEL. • Where project noise levels are not predicted to be below the LOAEL, report the reasons why noise levels could not be reduced below the LOAEL, in terms of Government policy on sustainable development.
Aim 3: Contribute to improvements to health and quality of life through the effective management and control of noise, where possible. NOTE: Applies to all noise levels.	• Set out mitigation measures used to improve the noise environment. • Where it has not been possible to contribute to improvements to health and quality of life through management of project noise levels, report the reasons why it is not possible in terms of Government policy on sustainable development.

12.8 Assessment assumptions and limitations

12.8.1 The information available at this stage is considered sufficient to define the scope of the noise and vibration assessment for the EIA. The study area for the EIA cannot be determined until detailed traffic data are received allowing for affected road links to be identified. However, it is considered that this is unlikely to change from the study area used during the PCF Stage 2 environmental assessment.

12.8.2 At this stage of the assessment there has been no baseline noise survey undertaken. This was not completed during the options selection (PCF Stage 2) since this may have resulted in some unnecessary surveys being undertaken in relation to options not taken forward. To inform this scoping report a series of noise surveys were planned. However, due to the COVID-19 pandemic in early 2020 these surveys were not undertaken due to travel restrictions and potentially low noise levels due to reduced traffic. This is not considered to be a constraint on the scoping exercise as no decisions on the scope of the next stage have been taken based on the baseline data.

12.8.3 A series of noise surveys are scheduled to be completed prior to the next stage of assessment and will be reported within the EIA. Prior to these surveys the traffic flow on the A12 for the most recent full month will be examined using the automatically gathered data presented on the Highways England WebTRIS website. This will be compared against a similar month from 2019 and the percentage difference in flow will be determined. Should these monthly flows be more than 25% different, then the noise surveys will not be undertaken. The figure of 25% is the equivalent of 1 dB(A). If the monthly traffic flows are within 25% of each other, and there are no local or national restrictions on movement at the time of the proposed surveys, then the surveys will be undertaken. Should the surveys not be undertaken, then either delaying the survey or gathering baseline data from other sources will be considered. Should the decision be made to gather baseline data from other sources then guidance produced in April 2020 by the Association of Noise Consultants (ANC) and the Institute of Acoustics (IOA) titled Joint Guidance on the Impact of COVID-19 on the Practicality and Reliability of Baseline Sound Level Surveying and the Provision of Sound & Noise Impact Assessments will be consulted.

12.8.4 The noise modelling incorporates many different data sources. Therefore, the outcome of the modelling is reliant on the quality of these data. Any limitations of these data sources will be reported in the EIA, along with any associated implications.

12.8.5 The construction noise calculation methods enable the level of noise during various construction activities to be determined. However, the precision of any such prediction is dependent on assumptions and predictions that have to be made regarding the number and type of plant to be utilised, their location and detailed operating arrangements. Some of this information will be clarified as the scheme design progresses, but other information (such as exactly where the plant operates and for how long) would be assumed as a reasonable worst case.

13. Population and health

13.1 NNNPS requirements

13.1.1 The National Networks National Policy Statement (NNNPS) sets out the Government's policies to deliver the development of Nationally Significant Infrastructure Projects (NSIP) on the national road and rail networks in England. The Secretary of State (SoS) uses the NNNPS as the primary basis for making decisions on Development Consent Order (DCO) applications.

13.1.2 Key policy from the NNNPS relevant to this aspect includes:

- Paragraph 3.22 states that severance can be a problem in some locations. Where appropriate applicants should seek to deliver improvements that reduce community severance and improve accessibility. Paragraph 5.205 states that applicants should consider reasonable opportunities to support other transport modes in developing infrastructure, and that the applicant should provide evidence that they have used reasonable endeavours to address any existing severance issues that act as a barrier to non-motorised users.
- Paragraph 4.82 of the NNNPS states that the applicant should identify measures to avoid, reduce or compensate for adverse health impacts as appropriate. These impacts may affect people simultaneously, so the applicant, and the SoS (in determining an application for development consent) should consider the cumulative impact on health.
- Paragraph 5.166 states that existing open space, sports and recreational buildings and land should not be developed unless the land is surplus to requirements or the loss would be replaced by equivalent or better provision in terms of quantity and quality in a suitable location. Applicants considering proposals which would involve developing such land should have regard to any local authority's assessment of need for such types of land and buildings.
- Paragraph 5.184 states that public rights of way, National Trails and other rights of access to land (e.g. open access land) are important recreational facilities for walkers, cyclists and equestrians. Applicants are expected to take appropriate mitigation measures to address adverse effects on coastal access, National Trails, other public rights of way and open access land and, where appropriate, to consider what opportunities there may be to improve access. In considering revisions to an existing right of way consideration needs to be given to the use, character, attractiveness and convenience of the right of way.
- Paragraph 5.206 states that for road and rail developments, if a development is subject to EIA and is likely to have significant environmental impacts arising from impacts on transport networks, the applicant's environmental statement should describe those impacts and mitigating commitments.

13.2 Study area

13.2.1 The study areas for the assessment of effects on population and health are set out below and shown in figure 13.1 (Appendix A).

Land use and accessibility

13.2.2 The study area for land use and accessibility will be the construction footprint plus a buffer of 500m as set out in the Design Manual for Roads and Bridges (DMRB) LA 112 Population and Health (Highways England, 2020).

13.2.3 A wider context will also be considered to understand the sensitivity of routes within the study area used by walkers, cyclists and horse-riders (WCH) that could potentially be affected by the Proposed Scheme. For cyclists, recreational walkers and horse riders, consideration will be given to possible origins and destinations of up to 10km from the construction footprint of the Proposed Scheme, while a distance of up to 2km will be considered for regular walking journeys. The consideration of this wider context is deemed sufficient to provide insight into the likely purpose of journeys that cross the footprint of the Proposed Scheme since typical regular walking distances are up to 2km, while cycle commutes are typically up to 10km (Department for Transport (DfT), 2017). It is also considered sufficient to capture the context for horse riders and long distance walkers who would typically travel more than 2km as part of a recreational journey.

Human health

13.2.4 The study area for human health will consist of:

- The study area for operational effects on air quality i.e. the affected road network (ARN) for air quality plus a buffer of 200m from the edge of the carriageway as set out in section 6.2 of chapter 6. Note that at this stage the ARN for air quality has not yet been defined as the traffic data used for the EIA will be from a new traffic model, and so the final ARN is not shown on figure 13.1.
- The study area for the operational effects on noise i.e. the extent of the Proposed Scheme with potential to experience a short term change in noise of 1 dB (A) (for most projects this is defined as the area within 600m of new road links or road links physically changed or bypassed by the project) as set out in section 12.2 of chapter 12.
- The study area for land use and accessibility.

13.2.5 The area defined above will capture potential direct effects on human health associated with changes in air and noise pollution, temporary and permanent changes in land use and access, and also indirect effects associated with changes in traffic volumes, speed or composition which could indirectly affect active travel or recreational journeys undertaken by pedestrians, cyclists and horse riders.

13.2.6 The study area for population and human health used for scoping is set out in figure 13.1 (note that this does not include the ARN at this stage as this has not yet been determined).

13.3 Baseline conditions

13.3.1 This section provides a preliminary summary of the baseline context for population and human health. The purpose of this summary at the scoping stage is to identify the key baseline issues for population and health that are likely to be influenced by the Proposed Scheme. These key issues will then be the focus of further baseline study as part of the EIA process and will be described more fully in the Environmental Statement.

Baseline sources

13.3.2 Key sources used to inform the understanding of baseline conditions were:

- Public Health England's public health profiles
- Ordnance Survey 1:25,000 mapping
- The Propensity to Cycle Tool: An open source online system for sustainable transport planning (Lovelace et al. 2017)
- Strava Global Heatmap
- Maldon District Approved Local Development Plan 2014 – 2029
- Chelmsford Local Plan, Full Council Version, May 2020
- Colchester Emerging Local Plan 2017 – 2033[5]
- Braintree District Council Local Plan: Publication Draft June 2017
- Braintree District Cycling Action Plan – Draft, January 2018
- Chelmsford Cycling Action Plan, March 2017
- Essex County Council Rights of Way Improvement Plan, 2009
- Essex Joint Strategic Needs Assessment and Area Profiles (Essex County Council 2019)
- Essex Joint Health and Wellbeing Strategy 2018-2022 (Essex County Council 2018)

Baseline information – land use and accessibility

Residential property and housing

13.3.3 The main settlements along the A12 corridor are Chelmsford, Boreham, Hatfield Peverel, Witham, Rivenhall End, Kelvedon, Tiptree, Feering, Marks Tey and Copford. The city of Colchester is within 2km of the eastern point of the study area, Maldon is located within 6km to the south-east, and Braintree within 10km north of the study area. The populations of these settlements, based on 2011 census data, are set out in table 13.1.

[5] Emerging plans for Colchester and Braintree are in draft and not yet adopted, but due to their advanced stage of development, considerable weight is given to their policies

13.3.4 There are many farms, lodges, and cottages located close to the A12 in the open countryside. The closest residential areas to the existing A12 are in Rivenhall End (Oak Road and Foxmead), Hatfield Peverel and Marks Tey (residential properties along Old London Road and London Road). Many of these properties are within 10 to 20m of the A12 trunk road. There are also individual residential properties and businesses along the corridor that directly access the A12, including on the slip roads at junction 25.

Table 13.1: Settlements and usual resident population*

Settlement	Distance from study area	Population size
Chelmsford	Partially within (eastern-most extents of Chelmsford only), central Chelmsford is approximately 2.9km west of study area	111,511
Colchester	Outskirts within 2km east of study area, central Colchester approximately 6km from study area	121,859
Braintree	Approximately 8km north of study area	53,477
Boreham	Within study area	3,244
Hatfield Peverel	Within study area	3,950
Witham	Partially within study area (southern and eastern part of settlement)	25,353
Rivenhall End (parish level data)	Within study area	742
Kelvedon	Partially within study area (central and southern part of settlement)	5,322
Tiptree	Approximately 1km south-east of study area	9,182
Feering	Within study area	2,035
Marks Tey	Partially within study area (central and southern part of settlement)	2,551
Copford	Within study area	1,689
Maldon	Approximately 6km south-east of study area	21,462
** Data from National Census 2011 and is the usual resident population for built up areas, with exception of Rivenhall End, Feering, Marks Tey and Copford where parish level data has been used.*		

13.3.5 The larger settlements of Chelmsford, Colchester and Braintree are likely to provide places of employment for a sizeable proportion of residents within the study area and may therefore attract regular commuting journeys by various modes across the study area.

13.3.6 There are several housing allocations in the emerging local plans for Chelmsford, Braintree and Colchester. The Chelmsford Local Plan has recently been adopted so weight can be given to the allocations within the plan. There are also approved planning applications for housing for most of the allocations, meaning there is committed development. Table 13.2 includes some of the housing allocations and applications within the study area which have been identified through the preliminary baseline study. Some of these allocations, such as ones at Hatfield Peverel and Witham, fall within the footprint of the Proposed Scheme.

Table 13.2: Housing allocations and applications within study area

Source of allocation	Location	Number of units	Notes
Chelmsford Local Plan Full Council Version, May 2020	East of Boreham	145 new homes	Approved planning application in place.
Braintree Publication Draft Local Plan (2017)	Hatfield Peverel	Up to 200 dwellings	Comprehensive redevelopment of former Arla Foods dairy site, approved planning application in place
Planning application	Land North East of Gleneagles Way, Hatfield Peverel	120 homes	Outline application for residential development
Braintree Publication Draft Local Plan (2017)	Wood End Farm, Witham	Up to 450 dwellings	Strategic growth location, approved planning application in place.
Braintree Publication Draft Local Plan (2017)	Land south of Maltings Lane, Witham South	63 homes	Residential site, approved planning application in place
Braintree Publication Draft Local Plan (2017)	Land off Forest Road, Rivenhall	370 homes	Already under construction
Braintree Publication Draft Local Plan (2017)	Land at Feering	750 dwellings	Strategic growth location
Braintree Publication Draft Local Plan (2017)	Feering	30 dwellings	Strategic growth location
Emerging Colchester Borough Council: Draft Publication LP (June 2017)	Queensbury Avenue, Copford	70 dwellings	Residential allocation
Emerging Colchester Borough Council: Draft Publication LP (June 2017)	West of Hall Road, Copford	50 dwellings	Residential allocation

Community land and assets

13.3.7 Community land and assets includes land, buildings and infrastructure which provide a service or resource to a community, for example open spaces, village greens, village halls, healthcare and education facilities.

13.3.8 Community land identified within the study area includes Boreham recreation ground, Hatfield Peverel cricket ground and Stutt Memorial recreation ground (Hatfield Peverel). These are all south of the current A12 and within settlements, so unlikely to be directly impacted by the Proposed Scheme. Beaulieu Park recreation ground is located at the western end of the study area, approximately 150m west of junction 19 (Boreham). Marks Tey recreation ground is located immediately north of Old London Road between the A120 and A12 near to junction 25 (Marks Tey). A further recreation ground is located in Copford within 150m, south of the existing A12.

13.3.9 The Whetmead local nature reserve (see chapter 9, biodiversity) abuts the A12 corridor east of Witham and can be reached by residents of Witham via an underpass beneath the A12, alongside the River Brain. This underpass also provides for the Witham River Walk which is an area of open space designated as green corridor which runs through Witham either side of the River Brain and is accessible by foot from central Witham. Also of note is the Blackwater Rail Trail Country Park which follows the route of a disused railway track in Witham, which passes underneath the A12 approximately 500m west of the River Brain underpass. Maintaining connectivity to these recreational assets south of the A12 for the main residential population of Witham north of the A12 will therefore be a sensitive consideration for the Proposed Scheme.

13.3.10 There are two allotment sites at the eastern edge of Rivenhall End, one of which abuts the north side of the A12 corridor.

13.3.11 No green belt land, registered common land or open access land has been identified within the study area.

13.3.12 Registered parks and gardens within the study area include Boreham House and Braxted Park (see chapter 7, cultural heritage). Both of these are privately owned and offer wedding venues and other corporate and recreational pursuits. Prested Hall, approximately 750m south-east of junction 24 (Kelvedon North) also provides a venue for weddings, health spa and tennis. Private golf clubs in the study area include Benton Hall Golf and Country Club (300m south of the A12 corridor, south of Witham) and Rivenhall Oaks Golf Course (north of the Great Eastern Main Line (GEML), some 360m from the A12 corridor). There are also some fishing lakes, and reservoirs used for recreational fishing, located between 100m and 500m south of the A12 at Hatfield Peverel, Witham and Little Braxted.

13.3.13 The Church of Jesus Christ Latter-Day Saints is located within 50m of the A12 along the B1018. Additional places of worship in the study area are located at Hatfield Peverel, Witham, Little Braxted, Kelvedon, Prested Hall, Feering, Stocks Green, Marks Tey and Copford.

13.3.14 Gershwin Park Nursery and Chipping Hill Primary School are located approximately 80m and 180m north of the A12 at Witham. Additional nurseries and schools are located within the settlements of Boreham, Copford, Witham, Feering, Kelvedon, and Marks Tey.

13.3.15 Care homes within the study have been identified in Hatfield Peverel, Witham, Kelvedon, Feering, Marks Tey and Copford. The closest of these to the existing A12 is the one at Marks Tey, which is within 70m of junction 25.

13.3.16 While these schools and care homes are unlikely to be directly impacted by the Proposed Scheme, the close proximity of these is an important consideration for human health since children and resident populations of care homes are more likely to be vulnerable to health effects associated with air pollution and noise.

13.3.17 Other community facilities such as dentists, doctor’s surgeries, public houses, post offices, convenience stores and supermarkets are located within the settlements within and close to the study area, so the proximity and potential impacts on access to these facilities will be an important consideration for the assessment.

Development land and business

13.3.18 Larger areas of business in the study area include the Springfield Business Park on the north-east side of Chelmsford close to junction 19. Within this area there is a variety of retail and commercial assets including a large supermarket, retail outlets and distribution depots. Also located in the vicinity of junction 19 are the Boreham service station, a Premier Inn hotel and a public house.

13.3.19 Boreham Industrial Estate is located off Waltham Road within 20m of the A12 corridor, separated by the GEML. There is no direct access from this industrial estate to the A12 trunk road.

13.3.20 There is a large area (approximately 90 hectares) of industrial and commercial use along the south-eastern edge of Witham abutting the northern side of the A12 corridor. Within this area is a sewage treatment works as well as offices, builders' merchants, warehousing, distribution and manufacturing units. The industrial estate is connected to the A12 via junction 22 (Colemans Interchange). There is a 6.8 hectare employment allocation in the Braintree Publication Draft Local Plan (2017) for an extension to this industrial estate.

13.3.21 A hotel, service station, car sales and retailer all have direct access onto the A12 in Rivenhall End. The Essex County Fire and Rescue headquarters at Rivenhall End also has direct access onto the A12. There is a 3.3 hectare allocation for special employment land to support the fire and rescue services at this location set out in the Braintree Publication Draft Local Plan (2017).

13.3.22 Threshelfords Business Park in Kelvedon is located approximately 120m north of the A12. It does not have direct access onto the A12 so traffic to and from this site is likely to regularly travel through the Feering village centre to access the A12 via junction 24 (Kelvedon North), which could create difficult traffic conditions for pedestrians, including schoolchildren, to negotiate at peak times. However, since the business park mainly comprises offices, it is unlikely to generate much in the way of heavy goods vehicle traffic.

13.3.23 There are several other individual businesses with direct access onto the A12 along the A12 corridor through the study area. There is a hotel and service station some 450m east of junction 24 and there are several shops and businesses located around junction 25. These include a food retailer, post office and hotel.

Agricultural land holdings

13.3.24 The area is generally broadacre arable cropping with pockets of other farming types. There are a number of large commercial plots (over 100ha in size) along the route. Smaller plots are located at either end of the study area and around the fringes of the towns and villages. Farms in the baseline which would be most at risk of being impacted by the Proposed Scheme are those which are located close to the A12 corridor in locations where new off-line sections are proposed, for example farms along the A12 corridor occupying land between junctions 22 to 23 and junctions 24 to 25.

Walkers, cyclists and horse riders

13.3.25 Walkers and cyclists can be considered as two types - those who walk or cycle as part of an active travel journey (e.g. as part of a regular commute or to access services); and those who are walking or cycling for recreational purposes. The first type will typically be more interested in an efficient, convenient route while the second type would be more interested in the recreational amenity of the route. Equestrian activity is dominated by recreational horse-riding and therefore horse riders will be assumed to be recreational unless there is clear evidence otherwise.

13.3.26 Although pedestrians, cyclists and horse riders are not prohibited from using the A12, the current road is not suitable for this type of use for the majority of the length due to high traffic volumes and speeds, and the high proportions of heavy goods vehicles (HGV). Therefore, the A12 is a barrier for WCH in many locations.

13.3.27 There are 15km (9 miles) of footways and cycleways between junctions 19 and 25 that run parallel to the A12 and provide alternative access along the corridor. These include:

- Hatfield Peverel to Witham: footways between junction 20b and junction 21
- Witham to Kelvedon: shared use path (footway/cycleway) between junction 22 and junction 23 on the north-west side of the carriageway. Footway on the south-east side of the carriageway
- Kelvedon to Marks Tey: shared use path on the north-west side of the carriageway. Footway on the south-east side of the carriageway

13.3.28 These routes are not continuous, however, and the volume and speed of traffic on the A12 can act as a disincentive to their use as there is limited physical segregation provided. They are also relatively narrow, unclear, inconsistently marked and poorly signed. Nevertheless, evidence from the Strava Global Heatmap web page suggests high cycle use between Chelmsford and Colchester, with many cyclists generally following the A12 but taking the B1389 through Witham and the B1024 through Kelvedon. The route also appears to be regularly used by runners.

13.3.29 There are three dedicated cycle routes that cross perpendicular to the A12:

- National Cycle Network (NCN) National Route 16 starts in Birchanger near Stansted and finishes in Great Totham where it connects with NCN Route 1. NCN Route 16 is an on-road route which crosses the A12 at junction 22 via Coleman's Bridge.
- NCN Regional Route 50 starts in Rickling Green and is routed in a south-easterly direction towards Wickham Bishops where it connects with NCN Route 1. NCN Regional Route 50 is an on-road route which crosses the A12 via the Terling Hall Road overbridge.
- A local traffic free route in Witham passes under the A12 via a designated combined cycle/footpath using the old Maldon Branch railway line. It links two residential areas, Witham and Wickham Bishops, which are divided by the A12. This links with NCN Route 16.

13.3.30 NCN National Route 16 and the local traffic free route are likely to be used for both active travel and recreational purposes, whilst NCN Regional Route 50 is predominantly used for recreational purposes.

13.3.31 Minor roads with footways traverse the A12 via overbridges or underbridges at several locations and are important for providing connectivity across the A12. These include Waltham Road (east of Boreham); Terling Hall Road (between Boreham and Hatfield Peverel); Bury Lane, Station Road and the junction 20b slip road at Hatfield Peverel; Maldon Road and Blackwater Lane (Witham); Henry Dixon Road (Rivenhall End); and Maldon Road, Ewell Hall Chase and Inworth Road (B1023) (Kelvedon).

13.3.32 The baseline review has considered the public rights of way (PRoW) and other routes which cross or meet the A12 within the study area. The wider context has then been checked to make assumptions on the likely reasons for people using these routes.

13.3.33 Over 30 PRoW have been identified which meet or cross the A12 within the study area. In summary, PRoW are likely to be used mainly for recreational purposes. Some PRoW, such as those routed between Copford and Marks Tey, Tiptree and Kelvedon, and Wickham Bishops and Witham, may be used for active travel journeys by walkers and cyclists. There are known areas of historic severance of rights of way along the A12 as a result of previous schemes which hinder access between settlements located around and immediately north of the A12 and the more rural areas to the south. Appendix J sets out identified PRoW and other routes and how they may be used.

13.3.34 Eleven riding schools have been identified within 10km of the study area, the nearest of which is at Tiptree, approximately 3.7km south of the study area. There is therefore potential for horse riders to be using the lanes and bridleways which cross the A12.

Public transport

13.3.35 Public transport has been considered in the scope to provide further context of local accessibility and where walkers and cyclists may need to access public transport hubs as part of a longer journey.

13.3.36 The A12 is currently used by a number of local and regional bus services, and national coach services, which provide links between the major settlements along the corridor. National Express operates regional services between London and Ipswich, Felixstowe and Walton-on-the-Naze.

13.3.37 Local bus services operate along or adjacent to the A12 between Brentwood and Colchester, as well as more limited services to neighbouring towns, rural areas, and towns and cities outside the county. There are existing bus stops located on the A12 between junctions 22 and 23, and between junctions 24 and 25. This causes safety concerns for both the operators and for users who have to cross the road at-grade at these locations. The services which currently stop on the A12 are:

- Route 71, 71A and 71X – Chelmsford to Colchester. These services stop along the A12 in both directions and are operated by FirstGroup (Essex).

- Route 71C – Chelmsford to Colchester via Witham and Kelvedon. This service stops along the A12 in both directions and is operated by Regal Busways on Sundays only.

13.3.38 The GEML runs parallel to the A12 for much of its length, which runs from London Liverpool Street to Ipswich and Norwich. Existing stations are located in Chelmsford, Hatfield Peverel, Witham, Kelvedon and Marks Tey.

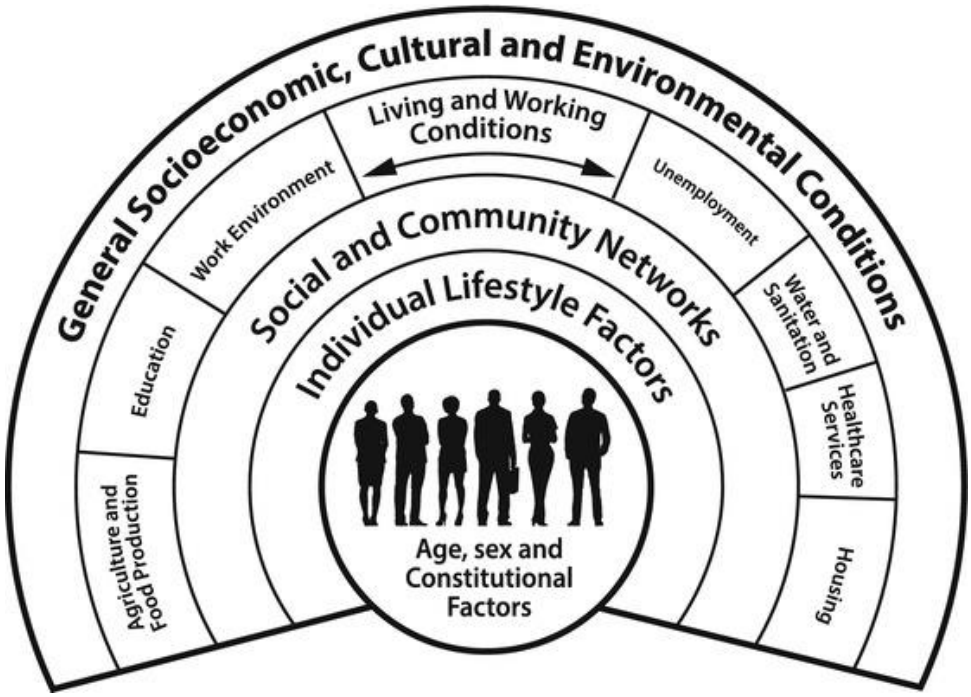
13.3.39 Around 90 million journeys were made using the GEML in 2017-18 and this is expected to grow (Network Rail, 2019). There are increasing capacity pressures during peak periods, with the most heavily used section between Liverpool Street and Colchester, with Chelmsford being one of the busiest regional stations outside of London. A new railway station is proposed located in the vicinity of the Boreham Interchange. This would serve the proposed Beaulieu Park development, and is anticipated to become operational in 2022.

Baseline information - human health

13.3.40 The World Health Organization (WHO) constitution defines health as *"a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity"*. This scope of assessment therefore includes consideration of potential impacts of the Proposed Scheme on physical, mental and social health.

13.3.41 Health is determined by a complex interaction between individual characteristics, lifestyle and the physical, social and economic environment. Most public health experts agree that these 'social determinants of health' are more important than formal healthcare for ensuring a healthy population. Inset 13.1 provides a widely cited conceptual illustration of the social determinants of health.

Inset 13.1 The Dahlgren and Whitehead model of health determinants (Source: Dahlgren and Whitehead (1991))



13.3.42 A related issue, of key importance to public health, is the issue of social inequalities of health. The Marmot Review into health inequalities (Marmot, 2010) looked at differences in health and well-being between social groups and described how the social gradient on health inequalities is reflected in the social gradient on educational attainment, employment, income, quality of neighbourhood and other issues. Addressing the social determinants of health is seen as an important means of tackling health inequalities and improving population health as a whole.

13.3.43 The preliminary health baseline therefore considers factors such as income deprivation as well as indicators for certain types of health condition in the area, before considering the specific resources and receptors within the study area.

13.3.44 Health data have been obtained from Public Health England. Data have been obtained for the wards which coincide with the study area to provide an indication of local health issues. This is based on aggregated population level data. It should be noted that the health of individuals within the study area will vary considerably and cannot be inferred from these data.

13.3.45 Table 13.3 sets out data for each ward for certain health indicators which are relevant to transport (refer to glossary for explanation of measures of health used in the table). Cells in table 13.3 which are shaded indicate health values which are significantly worse than the average for England. As can be seen, some of the communities within Witham score significantly worse than England for indicators of chronic obstructive pulmonary disease (COPD) emergency admissions, long-term illness, life expectancy and income deprivation. Communities within Witham score worse than average across a number of the other health indicators as well, including premature deaths. This indicates that communities in Witham, particularly those in Witham Central ward, may be more sensitive to pollution and problems of traffic than other communities. However, there will be sensitive individuals in all communities, regardless of that community's average level of health.

13.3.46 There may also be a greater dependency on public transport, taxis, walking and cycling among people in income deprived communities to access services and employment.

Table 13.3: Health profile of local communities (ward level data)

	Ward in study area														
Health indicator	**Chelmer Village & Beaulieu Park**	**Boreham and The Leighs**	**Hatfield Peverel and Terling**	**Little Baddow, Danbury and Sandon**	**Great Totham**	**Witham South**	**Witham Central**	**Witham West**	**Witham North**	**Silver End & Cressing**	**Wickham Bishops & Woodham**	**Kelvedon & Feering**	**Marks Tey & Layer**	**Lexden & Braiswick**	**England average**
Percentage of total resident population age 0-15 years of age (2017)	21.8	20.5	15.9	21.2	17.6	22.5	18.6	19.8	20.5	20.1	15.2	18.1	18.5	18.1	19.1
Percentage of total resident population who are 65 and over (2017)	10.2	17.8	25.5	26.3	27.3	13.3	20.3	18.1	15.7	19.6	29.8	21.7	21.8	23.3	18.0
Emergency hospital admissions for COPD (2013/14 – 2017/18) (SAR)	55.8	56.3	83.6	47.5	23.5	99.0	121.7	**151.8**	**123.5**	112.3	23.5	68.4	41.5	41.4	100
Percentage of people who reported long-term illness or disability (2011)	9.2	12.9	17.7	15.2	16.2	14.5	**19.6**	16.5	16.4	17.2	13.7	15.0	15.9	17.0	17.6
Deaths from respiratory diseases, all ages, (2013-2017) (SMR)	49.3	85.8	115.3	75.0	88.0	70.7	129.2	75.5	120.1	105.9	62.3	67.2	67.0	74.4	100.0

	Ward in study area														
Health indicator	**Chelmer Village & Beaulieu Park**	**Boreham and The Leighs**	**Hatfield Peverel and Terling**	**Little Baddow, Danbury and Sandon**	**Great Totham**	**Witham South**	**Witham Central**	**Witham West**	**Witham North**	**Silver End & Cressing**	**Wickham Bishops & Woodham**	**Kelvedon & Feering**	**Marks Tey & Layer**	**Lexden & Braiswick**	**England average**
Deaths from coronary heart disease, all ages, (2013-2017) (SMR)	64.3	86.5	71.3	103.0	79.9	91.2	119.5	103.4	122.9	87.4	73.8	98.9	76.2	81.7	100.0
Income deprivation (English Indices of Deprivation 2015) (%)	6.5	9.6	8.5	6.5	6.7	10.0	**16.0**	15.3	**16.2**	12.4	5.0	8.3	6.2	6.8	14.6
Life expectancy at birth (male) (2013-2017) (years)	85.7	82.2	81.0	81.6	80.3	82.4	**75.8**	82.9	78.1	81.4	83.3	80.0	82.3	81.4	79.5
Life expectancy at birth (female) (2013-2017) (years)	85.8	84.2	81.9	83.7	87.3	86.3	**79.8**	83.5	84.0	83.0	84.4	84.2	84.9	85.2	83.1

13.3.47 Certain health data are not available at ward level and yet are relevant in helping to inform a broad understanding of health which can be influenced by transport schemes. Table 13.4 sets out some district level health indicators. The data show that the rate of people killed or seriously injured is higher than the England average across all districts and substantially higher in Maldon district, which is the most rural district. The data also show that the percentage of physically active adults in Braintree is slightly lower than average for England. Improvements to active travel infrastructure can provide opportunities to improve levels of physical activity as well as reduce risks of being killed or seriously injured on roads.

13.3.48 Active forms of travel, such as walking and cycling, are associated with a range of health benefits. These include improved mental health, reduced risk of premature death and prevention of chronic diseases such as coronary heart disease, stroke, type 2 diabetes, osteoporosis, depression, dementia and cancer (British Medical Association, 2012). Research also suggests that countries with highest levels of active travel generally have amongst the lowest obesity rates (Bassett et al., 2008).

Table 13.4: Physical activity and rates of killed and seriously injured (district level data)

	Local authority area (districts)				England average
Health indicator	Chelmsford	Braintree	Maldon	Colchester	
Percentage adults physically active (%)	71.4	63.6	69.7	71.4	67.2
Rate killed or seriously injured on roads (2016-2018) (rate per 100,000)	52.4	53.4	74.5	48.2	42.6

Future baseline

13.3.49 The future baseline will likely be characterised by continued population growth within and around the study area as more of the residential development allocations get built out. For example, a further 3000 households are expected at North East Chelmsford, which is just outside the study area but may result in a larger population interacting with the study area.

13.3.50 The COVID-19 pandemic that has affected the UK in 2020 may influence future trends. For example, there may be an increase in people working from home. Some people may switch from the use of public transport to walking, cycling or using their own cars due to concern about communicable diseases. There may be a further increase in cycling levels, which have been increasing in England since 1993 (Cycling UK, 2019). In addition, people may have an increased preference for outdoor recreation where social distancing is easier than in indoor leisure and recreation venues. The level to which these types of behaviour change may occur will depend on the trajectory of the pandemic and individual responses to their experience of 2020 (e.g. heightened anxiety or concern) which is at this time uncertain.

Value of receptors

13.3.51 The estimated value of land use and accessibility receptors is set out in table 13.5. The value is based on criteria in DMRB LA 112 (Highways England, 2020) but has been adapted based on the professional judgement and experience of the assessor to take account of policy objectives in the NNNPS and to enable the practical application for the context of the Proposed Scheme. The proposed adapted value criteria are provided in Appendix C.

13.3.52 All human health receptors are valued high. Although it is known that some areas have higher prevalence of certain sensitive health conditions, it is not known exactly where those individuals are, and individuals with sensitive conditions will be located throughout the study area. Therefore, it is deemed logical that all communities should be regarded as having high sensitivity in terms of health.

Table 13.5: Value of land use and accessibility receptors in the study area for population and health

Value/ sensitivity	Description	Examples within the study area
Very high	Residential settlements within the study area which exceed 5ha or 150 houses.	Chelmer Village and Springfield in Chelmsford; Boreham; Hatfield Peverel; Witham; Rivenhall End; Kelvedon; Feering; Marks Tey and Copford.
	Community land and assets providing essential services for the daily health and functioning of the community where: • there is limited potential for substitution • they are frequently used by the majority of the community or by vulnerable groups who could be disproportionately affected by changes in the baseline due to potentially different needs	Schools (e.g. Boreham Primary School); GP surgeries (e.g. the Laurels Surgery, Boreham); care homes.
	Large employment sites and allocations within the study area which exceed 5ha.	Springfield Industrial Estate, Chelmsford; Eastways Industrial Estate, Witham.
	National trails and routes likely to be used regularly by high numbers for commuting and/or recreation (with limited potential for substitution).	NCN 16; Regional cycle route 50 (high commuting numbers); shared use cycleway/footway along A12.
	Grade separated crossing points of the A12 for walkers, cyclists and/or horse riders which link communities and there are no alternatives without substantial detours.	B1018 Maldon Road, Witham. Other examples to be identified through further EIA.
	At grade crossing points with >16,000 vehicles per day; and/or routes with no accessibility provision.	Footpath 103 (Witham). Other examples to be identified through further EIA.

Value/ sensitivity	Description	Examples within the study area
High	Small settlements (>1-5ha / circa 30 – 150 houses).	Examples in study area to be identified through further EIA process.
	Community land and assets supporting the health and functioning of the community where: • alternatives are available only by travel to other settlements / areas • they are regularly used by a large portion of the community or by vulnerable groups who could be disproportionately affected by changes in the baseline due to potentially different needs	Recreation grounds (e.g. Marks Tey Recreation Ground); Village Greens and local areas of recreational value; sports grounds (e.g. golf courses open to the public); convenience stores; post offices (e.g. Marks Tey Post Office and Store); train stations.
	Extensive arable farm holdings dependent on access to extensive land.	Examples throughout study area.
	Employment sites and allocations (circa >1 – 5ha).	Threshelfords Business Park, Feering. Other examples to be identified through further EIA.
	Regional trails and routes (e.g. promoted circular walks) located close to communities likely to be used for recreation and to a lesser extent commuting, that record frequent (daily) use and have limited potential for substitution.	Regional cycle route 50; Blackwater Rail Trail; public footpath 25 (Kelvedon).
	At grade crossings with >8,000 - 16,000 vehicles per day and/or routes with limited accessibility provision.	Waltham Road, Boreham. Further examples in study area to be identified through further EIA process.
Medium	Isolated houses and very small hamlets (<1ha and/or <30 houses) within study area.	Examples throughout study area.
	Community land and assets supporting the health and functioning of the community where: • alternatives are available only by travel to adjacent communities / neighbourhoods • they are regularly used by the community	Public houses; neighbourhood playgrounds; local shops (where others exist in the settlement).
	Small employment sites and land allocated for employment (circa <1ha).	Examples throughout study area.
	Small agricultural land holdings requiring access to limited areas of land with potential for relocation.	Examples could include free range chicken sites. To be identified through further EIA process.
	Public rights of way and other routes close to communities which are used for recreational purposes (e.g. dog walking), but for which alternative routes can be taken. These routes are likely to link to a wider network of routes to provide options for longer, recreational journeys.	Several public rights of way and other routes throughout study area.
Low	Proposed housing development on unallocated sites providing housing with planning permission/in the planning process.	Examples throughout study area.

Value/ sensitivity	Description	Examples within the study area
	Community land and assets where: • alternatives are available at a local level in the wider community • level of use is infrequent • land and assets are used by a minority in the community	Examples would include small areas of green space in neighbourhoods (to be determined through further study).
	Proposed development on unallocated sites providing employment with planning permission or are in the planning process.	Examples in study area to be identified through further EIA process.
	Agricultural business not dependent on land access and with potential for relocation.	Examples could include farm shops. To be identified through further EIA process.
	Routes which have fallen into disuse through past severance and/or which are scarcely used because they do not offer a meaningful route for either utility or recreational purposes.	Examples in study area to be identified through further EIA process.
Negligible	Community land and assets which are very infrequently used.	Examples in study area to be identified through further EIA process.
	Agricultural land which is infrequently used on a non-commercial basis.	Examples in study area to be identified through further EIA process.

13.4 Potential impacts

Construction: land use and accessibility

Residential property and housing

13.4.1 The Proposed Scheme would lead to permanent loss of land from residential premises, and although efforts will be made to limit the impacts on residential dwellings, there would likely be a number of demolitions of buildings to accommodate the footprint of the Proposed Scheme. As well as impacts on the individuals affected, there would be a potential effect on the wellbeing of local communities where demolition alters the character and social capital of the communities.

13.4.2 Construction of the Proposed Scheme may cause temporary disruption of access to residential dwellings from sections of the A12 undergoing online widening or where improvements to existing junctions or the construction of new junctions is proposed.

Community land and assets

13.4.3 There would be potential loss of some areas of community land and other community assets, although none have been identified at this stage from the preliminary baseline review.

13.4.4 Construction of the Proposed Scheme may cause temporary disruption of access to community facilities from sections of the A12 undergoing online widening or where improvements to existing junctions or the construction of new junctions is proposed.

13.4.5 There is also potential for disturbance to community facilities as a result of construction noise and vibration which could affect community activities which take place in certain venues, for example schools, churches and community meetings.

Development land and business

13.4.6 There would be potential temporary and permanent loss of some areas of land allocated for employment and commercial premises to allow for the construction footprint of the Proposed Scheme, for example at locations in Witham and Rivenhall End.

13.4.7 Construction of the Proposed Scheme may cause temporary disruption of access to businesses from sections of the A12 undergoing online widening or where improvements to existing junctions or the construction of new junctions is proposed.

13.4.8 There would also be potential disruption to businesses from construction noise and vibration.

Agricultural land holdings

13.4.9 There would be permanent and temporary loss of agricultural land from the construction footprint of the Proposed Scheme, including land required for borrow pits.

13.4.10 The Proposed Scheme may cause temporary or permanent severance or access difficulties to some agricultural land holdings, particularly where off-line sections are proposed.

Walkers, cyclists and horse riders

13.4.11 The construction footprint of the Proposed Scheme, including associated haul routes, would require the diversion and temporary closures of PRoW throughout the study area, with associated impacts on local outdoor recreation and access. There would also be a likely loss of amenity during construction from factors such as dust, noise and visual intrusion.

Construction: human health

13.4.12 There is potential for general disruption due to construction to affect community wellbeing. Individuals most susceptible would likely be those prone to anxiety, who live alone and those with certain disabilities such as autism spectrum disorders who may be more sensitive to changes of routine, noise and visual intrusion.

13.4.13 Large scale earthworks associated with construction and demolition works have the potential to release contaminants which could be harmful to health. However, with appropriate mitigation as would be developed as part of the assessment of geology and soils (see chapter 10), this is not likely to be significant over baseline conditions and is scoped out of further consideration.

13.4.14 Temporary impacts on access to community facilities could affect individuals' ability to access social support networks and services, which could affect health and wellbeing in a variety of ways depending on individual circumstances.

13.4.15 A further potential health impact would be from construction noise, particularly where sleep disturbance could occur. Individuals most at risk would be night workers and shift workers as well as residents in any neighbourhoods close to where night-time working may be required.

13.4.16 The loss of residential properties, requiring individuals and families to move, has the potential to affect health. It has been found that when moving to a new house or being rehomed, control was the main factor that dictated the stress of those moving. Those who had more control over the moving process exhibited less stress than those who had no control (Allen, 2000).

13.4.17 Studies have shown that people who are moved out of their house with no option have an internal feeling of grief that can lead to depression and other mental health problems, as well as social problems that stem from moving away from the area where a specific social group is found (Fried, 1966).

Operation: land use and accessibility

Residential property and housing

13.4.18 Since land and property loss would occur at the construction stage, this is not considered to be an operational effect even though it would be permanent.

13.4.19 The Proposed Scheme could potentially have an impact on access to homes and residential areas during operation. Impacts on access could occur from changes in traffic flows in the wider network (for example if higher traffic flows are induced along particular residential streets), or through improvements to access from the Proposed Scheme (for example where a settlement is bypassed).

Community land and assets

13.4.20 Potential impacts on community land and assets would be similar to impacts on residential property and housing and arise from changes in accessibility related to changes in traffic conditions.

Employment land and business

13.4.21 Potential impacts on employment land and businesses would be similar to impacts on residential property and housing and arise from changes in accessibility related to changes in traffic conditions. The Proposed Scheme is designed to improve traffic flows along the A12 and could improve access to some areas of employment, opening up opportunities for further businesses to locate to the area.

13.4.22 Conversely, for those businesses where direct access would be removed from the A12 and in particular along sections of the existing A12 that would be de-trunked between junctions 22 and 23 and junctions 23 and 24, there is a risk that there could be a loss of trade.

Agricultural land holdings

13.4.23 There is potential for permanent severance of some agricultural land holdings. Should agricultural land holdings be severed, there is the potential for impacts on the long-term viability of the local agricultural economy, although it is anticipated that a relatively low number of agricultural land holdings would be affected by the Proposed Scheme.

Walkers, cyclists and horse riders

13.4.24 There would be potential beneficial impacts on access for WCH where the Proposed Scheme could address issues of past severance, poor accessibility and inadequate cycleway and footway provision. Improvements in access may help more people access public transport hubs and bus stops. Improvements to footway and cycleway provision could improve amenity for active travellers, for example through increasing segregation from fast traffic and HGVs.

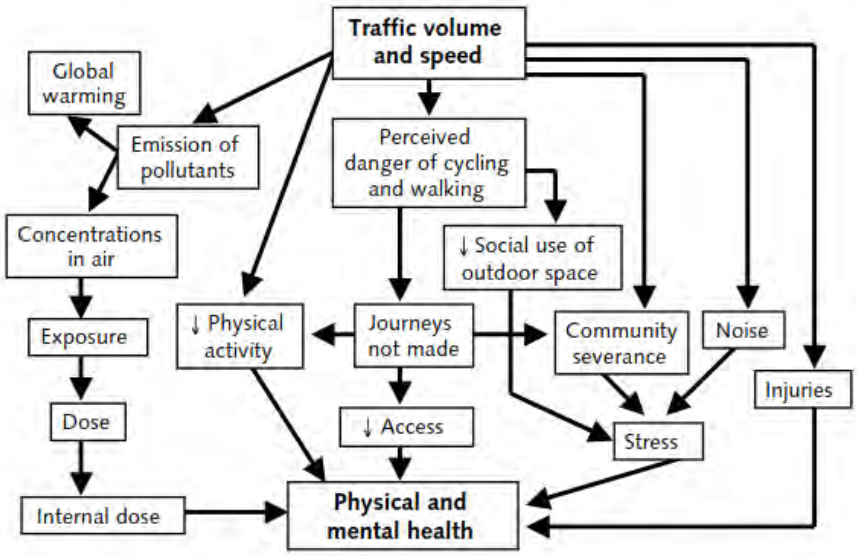
13.4.25 It is assumed that any PRoW or other routes temporarily severed by the Proposed Scheme would be reinstated and so no new operational severance is anticipated. However, there may be diversions and closures of existing PRoW with new routes being provided to access existing or proposed new crossing points.

13.4.26 Since the A12 already exists in the baseline environment (meaning there is already traffic noise and highway infrastructure visible), it is assumed there would be no likely significant adverse effects on recreational amenity of PRoW during operation. However, this assumption will be reviewed against the findings of the landscape and visual impact assessment (see chapter 8) which will involve a greater analysis of the influence of topography, intervening vegetation and local landscape character to inform the understanding of local conditions on the PRoW network.

Operation: human health

13.4.27 The potential pathways between traffic and health outcomes are illustrated by inset 13.2, which shows how potential impacts on health involve the interaction between a number of aspects.

Inset 13.2: Links between traffic volume and speed on health (source: West Midlands Public Health Observatory (2006) in Williams P and Fisher C (2007))



13.4.28 The Proposed Scheme has the potential to reduce the exposure of local communities to some of these impact pathways, for example through bypassing some communities which would reduce exposure to traffic emissions.

13.4.29 Both short-term and long-term exposure to air pollution is a significant cause of ill health and premature death. Air pollution causes short-term health effects on the respiratory system and more serious impacts due to long-term exposure including permanent reductions in lung function. Air pollution is linked to asthma, chronic bronchitis, cardiovascular disease, cancer and impaired foetal development. While exposure to air pollution can affect everyone, it can be particularly harmful for the elderly and the very young. The Proposed Scheme has the potential to either increase or reduce the size of population exposed to air pollution, thereby either increasing or reducing the risk of several health conditions.

13.4.30 Transport is the main source of noise pollution in Europe and, except for people living in close proximity to railway lines or airports, road traffic is the major cause of human exposure to environmental noise. Results from a study carried out by the WHO concluded that one in three individuals in Europe is annoyed by traffic noise during the daytime and one in five has disturbed sleep at night purely from traffic noise alone (WHO, 2011). Traffic noise causes impaired communication (difficulty in making oneself heard), sleep disturbance, annoyance and increased aggression. There is also increasing evidence of a link to heart disease and hypertension which could be significant given the large proportion of the population who are exposed to noise. The Proposed Scheme has the potential to either increase or reduce population exposure to noise, which could either increase or reduce risk of noise associated health conditions for some people in local communities.

13.4.31 The Proposed Scheme has the potential to address some social determinants of health such as access to services, employment, and education by improving access for all modes of travel including for walking, cycling and public transport.

13.4.32 The removal of at grade pedestrian crossings on the A12 and replacement with bridges or underpasses has the potential to remove an ongoing safety risk. Furthermore, by potentially improving opportunities for active travel, the Proposed Scheme has the potential for health improvements gained through regular physical activity as described in section 13.3.

Summary of scope

13.4.33 Table 13.6 summarises the proposed scope for population and health. As mentioned earlier in section 13.4, there are interrelationships between population and human health and other environmental aspects, particularly air quality, landscape, and noise and vibration. The combined effect on community and health receptors from these aspects will be assessed within the population and human health assessment.

Table 13.6: Summary of population and human health scope

Matter	Scoped in - construction	Scoped in - operation
Population and housing	✓	✓
Community land and assets	✓	✓
Development land and business	✓	✓
Agricultural land holdings	✓	✓
Walkers, cyclists and horse riders	✓	✓
Human health	✓	✓

13.5 Design, mitigation and enhancement measures

13.5.1 The design of the Proposed Scheme, including construction activities, will seek to limit land-take as far as practicable. This would help to reduce the loss of property and land, and limit disruption to people's livelihoods.

13.5.2 Measures to maintain connectivity for agricultural landholders could include provision of wayleaves along proposed maintenance access points. This would help ensure farm businesses could continue to access land either side of the Proposed Scheme.

13.5.3 Clear, regular and sensitive communication between the developer's land agents and affected parties would be maintained to reduce uncertainty and anxiety among the residential, business and agricultural communities.

13.5.4 Clear communication over construction activities and phasing would also be important to allow individuals to make necessary plans and better cope with any potential disruption. It would also create opportunities for individual residents to discuss their specific needs which may be possible to accommodate depending on the situation.

13.5.5 The use of noise bunds and barriers, and/or low noise surfacing may help to mitigate operational noise in some circumstances. The noise assessment will identify whether these types of measures are required to be incorporated into the final design of the Proposed Scheme, depending upon the results of the assessment (refer to chapter 12, noise and vibration).

13.5.6 Good signposting would be incorporated to inform people of any new or diverted PRoW. The type and quality of surfacing, crossing and access points for PRoW and other routes used by WCH would be suitable for the intended use and context (i.e. whether rural or urban, or whether there is likely cyclist, wheelchair or horse rider use). Key design considerations include GG 142 Walking, Cycling and Horse-Riding Assessment and Review (WCHAR) guidance (Highways England, 2019), the Equality Act 2010, and relevant Essex County Council and district and borough council plans and strategies.

13.5.7 Mitigation for businesses that would no longer benefit from direct access from the A12 could be in the form of signage to direct vehicles to their businesses via the appropriate junctions and routes.

13.5.8 Opportunities to create new WCH routes will be explored where important linkages between communities and facilities can be made. Furthermore, opportunities to improve the existing WCH infrastructure will be explored to improve the quality and capacity of cycling and pedestrian infrastructure which could contribute to improvements in health by promoting and encouraging healthier, more active lifestyles.

13.5.9 Enhancement opportunities to address past severance will be explored, with the aim of recreating PRoW networks and useful routes via provision of safe crossings where feasible.

13.6 Description of the likely significant effects

13.6.1 Where the Proposed Scheme involves online improvements, the likely significant effects would relate to a requirement to demolish some properties, including residential property. Standard mitigation and compensation may not fully mitigate the social effects on the residents and neighbourhoods where property loss is required, and so this is considered a likely significant effect.

13.6.2 The inclusion of proposed bypasses may also mean that neighbourhoods along the existing A12, such as Rivenhall End, would be subject to reduced air pollution and noise resulting in an overall healthier built environment, which could be significant given the association with air pollution and noise to several population health effects.

13.6.3 The construction of the proposed bypasses may mean that several farm holdings are affected by severance and loss of land which would affect the wider agricultural economy in the area.

13.6.4 Other likely significant effects would relate to improved provision for WCH. For example, where networks of PRoW are enhanced through improvements to highway crossing opportunities, resulting in an improved outdoor recreation resource for the local community.

13.6.5 During the construction stage there would be temporary disruption to parts of the PRoW network which could cause frustration and affect recreational opportunities for some local communities. However, with best practice mitigation and diversions, these effects would be minimised, and therefore unlikely to be significant.

13.7 Assessment methodology

Land use and accessibility methodology

13.7.1 The approach to assessment will be based on guidance set out in DMRB LA 112.

13.7.2 The baseline will be developed further to identify and provide more detail on sensitive receptors within the study area. Sensitive receptors relating to each matter will be mapped out to allow for an assessment to be made as to whether and how they could be affected by the Proposed Scheme. In particular, the location and number of properties at risk of demolition, as well as area of land-take, will be identified as the Proposed Scheme design is refined.

13.7.3 The assessment will be informed by other work being undertaken on the EIA and for the development consent application, including results of air quality and noise assessments, work (including frequency/use data) being undertaken for the Walkers, Cyclists and Horse Riders Assessment and Review (WCHAR) and land referencing activities.

13.7.4 Data sources to inform the assessment will also include a variety of desk-based sources including:

- local authority local development plans, cycling action plans, rights of way plans and local transport plans (these will provide information on policy priorities, settlement hierarchies, proposed developments and transport, community and recreation initiatives)
- web-based data sources including Office of National Statistics/NOMIS, Essex County Council interactive mapping, Sustrans interactive mapping, Propensity to Cycle Tool, Strava Heatmap (see limitations in section 13.8)
- information on agricultural land holdings, businesses and other landowners from the developer's land agents
- ordnance survey mapping, particularly 1:25,000 scale mapping which provides good information on PRoW
- project-specific GIS data that has been developed, drawing on datasets from several sources

13.7.5 It is not proposed to undertake any bespoke user count surveys of PRoW, community facilities or routes to inform the EIA (although such surveys will be undertaken by the WCHAR process to inform the design requirements). Count surveys can be misleading as they typically only capture a few days of data which may not be a representative sample of annual use, particularly for PRoW. Furthermore, lack of use can be an indication of poor access or dangerous/intimidating traffic conditions which suppress use, particularly for cyclists and pedestrians. However, site visits will be undertaken to particular locations to understand the context in terms of access provision and amenity. Signs of use (e.g. footprints, hoof prints, vegetation beaten down) will be noted.

13.7.6 Engagement with WCH groups and council PRoW and cycling officers will further inform the understanding of current use and demand for walking, cycling and horse-riding provision.

13.7.7 Effects will be assessed for the construction phase and for the first year of operation of the Proposed Scheme. The assessment will set out the predicted quantities of land use and accessibility resources that will be affected to provide an indication of magnitude. The magnitude and sensitivity of the resources will then be taken into account to assess significance. Some professional judgement will be applied in the interpretation of the guidance in DMRB LA 112, particularly for the sensitivity criteria.

13.7.8 The judgement of likely significant effects on land use and accessibility will have regard for the sensitivity and magnitude criteria adapted from DMRB LA 112 (refer to Appendix C), combined with judgement as to whether:

- several receptors are affected to the extent that effects are noticeable at a community level (rather than individual level)
- the function of a land use and accessibility resource, such as factors required to support a population (for example services, employment, recreation, local economy, community cohesion), are likely to be lost, severely degraded or greatly enhanced

Human health methodology

13.7.9 The approach to assessment will be based on guidance set out in DMRB LA 112 and will also consider a primer by the Institute of Environmental Management and Assessment (IEMA) (Cave et al., 2017) and emerging guidance by the International Association of Impact Assessment (IAIA) and European Public Health Association (EUPHA) (2019).

13.7.10 The health baseline will be developed further as relevant for the communities likely to be affected by the Proposed Scheme.

13.7.11 The main sources of health data will be from Public Health England's public health profiles website and from Essex County Council's web-based data portal. For some indicators the data are available at GP or ward level, allowing for more local insight, while for other health indicators, data are only available at district or larger area levels. All health data will be at an aggregated population level of data, rather than individual clinical level.

13.7.12 It is proposed to engage with the local Director of Public Health to understand the main public health concerns for the area and to discuss and agree the evidence base and assessment approach.

13.7.13 The assessment will identify the determinants of health that would be affected by the Proposed Scheme and then explore the strength of evidence for associations with health outcomes. Evidence sources will be peer reviewed medical research papers identified through sites such as PubMed (https://pubmed.ncbi.nlm.nih.gov/) or the Cochrane Library (https://www.cochranelibrary.com/). Evidence will also be drawn from the Environmental Noise Guidelines for the European Region (WHO, 2018) and WHO Air Quality Guidelines for Particulate Matter, Ozone, Nitrogen Dioxide and Sulfur Dioxide (WHO, 2006).

13.7.14 Effects will not be quantified as it will not be possible to measure the level of effect attributable to the Proposed Scheme with any degree of certainty. This is due to the high number of variables which cannot be known by desk study (for example variations in degree of exposure, lifestyle factors, age, exposure to other risk factors associated with the health outcome).

13.7.15 Instead the assessment will involve a qualitative assessment of how changes to health determinants from the Proposed Scheme could be associated with health outcomes, and an estimate of how many people would be exposed to the changes in health determinants. The degree to which individuals could go on to develop certain health outcomes associated with the changes will be subject to several factors which cannot be known for this type of assessment, such as individual genetics, lifestyle choices, personal circumstances, and many other factors.

13.7.16 The assessment will draw upon the results of the air quality and noise assessments and will provide information on changes in air quality and noise levels with reference to EU Limit Values, as informed by the air quality and noise assessments (refer to chapters 6 and 12).

13.7.17 The assessment will consider whether exposed populations have higher than average prevalence of conditions that would make people more susceptible to certain health outcomes associated with air and noise exceedances, which would increase the significance for that population, although sensitive individuals will be present in all communities.

13.7.18 Health outcomes will be reported as positive, neutral, negative or uncertain, and no judgement of significance will be made.

13.8 Assessment assumptions and limitations

13.8.1 This scoping assessment has been undertaken based on a preliminary understanding of the baseline. Further potential receptors will be identified as part of the ongoing EIA process to close existing data gaps.

13.8.2 The assessment will consider health effects and data relating to population level data, rather than health data and effects relating to individuals. The aggregated data and statistics used to support the assessment cannot be used to make inferences about the health of individuals within the communities assessed.

13.8.3 The EIA process will assess changes in concentrations of air pollutants, as well as changes in outdoor noise at specific receptor sites. These measurements do not equate to level of exposure experienced by people at these receptor sites. Several factors such as amount of time people spend in the locations, quality of buildings or ventilation will all affect the level of potential exposure that people may have, which cannot be quantified in the EIA with the data and techniques available.

13.8.4 Although the assessment will refer to research that demonstrates evidence of association between changes in health determinants and effects on health, this should not be interpreted as causation. It is not possible to draw conclusions on cause and effect relationships for human health using aggregated population level data.

13.8.5 The assessment will not draw conclusions on the viability of any individual businesses, including farm businesses, that may be affected by changes in land or access from the Proposed Scheme. Such matters would relate to the relevant margins that support the businesses and any impacts on business viability would require direct negotiation between the interested parties and their representatives. Instead the assessment will present effects in relation to whether widespread or localised effects on business and agriculture are anticipated, to provide an indication of economic effects.

13.8.6 Although it is proposed to consult with the Director of Public Health, it is understood that current public health priorities are in tackling COVID-19 outbreaks associated with the coronavirus pandemic. It is therefore not guaranteed that public health teams will have the availability and capacity to participate in consultation for the EIA while the public health emergency continues.

13.8.7 The use of the Strava Heatmap to inform cycling activity in the area has the limitation that it is likely to be a selective group of cyclists and runners who use the app. The app is likely used more by very keen and more competitive cyclists and runners and may not reflect the activities of occasional cyclists and runners, family rides with younger children or short regular commutes. Nevertheless, the app is widely used and provides an indication of routes regularly used and routes which tend to be avoided.

14. Road drainage and the water environment

14.1 NNNPS requirements

14.1.1 The National Networks National Policy Statement (NNNPS) sets out the Government's policies to deliver the development of Nationally Significant Infrastructure Projects (NSIP) on the national road and rail networks in England. The Secretary of State (SoS) uses the NNNPS as the primary basis for making decisions on Development Consent Order (DCO) applications.

14.1.2 Key policies from the NNNPS relevant to this chapter include:

- Paragraphs 5.91 to 5.97 state that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk although essential transport infrastructure is permissible in areas of high flood risk subject to the Exception Test. But where development is necessary, it should be made safe without increasing flood risk elsewhere. The Proposed Scheme transects areas of high flood risk and therefore would be subject to the requirements of the Sequential and Exception Tests. The Environmental Statement (ES) will need to be accompanied by a FRA, which will identify and assess the risks of all forms of flooding to and from the project and demonstrate how these flood risks will be managed, taking climate change into account.
- Paragraph 5.93 states that the assessment of impact should take climate change into account.
- Paragraph 5.99 states that when determining an application, the SoS should be satisfied that flood risk would not be increased elsewhere, that the most vulnerable development is located in the areas of lowest risk, and that it is appropriately flood resilient and resistant.
- Paragraph 5.109 states that the scheme should be designed and constructed to remain operational and safe for users in times of flood.
- Paragraph 5.220 states that the scheme should not contribute to water pollution or put the local environment at risk from water pollution.
- Paragraphs 5.221 to 5.223 require that the applicant carries out an assessment of the impacts of the proposed project on water quality, water resources and the physical characteristics of the water environment, as part of an ES. It requires projects to adhere to National Standards for Sustainable Drainage Systems (SuDS), careful design, and good pollution control practice (para 5.229). It also states for those projects that are improvements to the existing infrastructure, such as road widening, opportunities should be taken to improve upon the quality of existing discharges where these are identified and shown to contribute towards WFD commitments. The NNNPS also states that the overall aim of projects should be no deterioration of ecological status in watercourses, ensuring that Article 4.7 of the WFD Regulations does not need to be applied.
- Paragraph 5.226 states that in terms of Water Framework Directive (WFD) compliance, the overall aim of projects should be no deterioration of overall status in watercourses.

14.2 Study area

14.2.1 This scoping assessment has been undertaken based on Design Manual for Roads and Bridges (DMRB) LA 113 Road Drainage and Water Environment (Highways England, 2020). This assessment has used baseline information gathered from desk-based sources. The next phase of the assessment in late 2020-21 will include a more detailed study of receptors and a site walkover.

14.2.2 The groundwater matter has close links with the geology and soils aspect (chapter 10) and biodiversity aspect (chapter 9).

14.2.3 The study area for the road drainage and the water environment (RDWE) aspect has been based on professional judgement and is defined by applying a 1km buffer around the provisional order limits of the Proposed Scheme (see figure 14.1). This extent could increase during the assessment should the potential for significant impacts beyond this area be identified as the design evolves. For the groundwater study area, given the relatively low sensitivity of the hydrogeological conditions (up to secondary A aquifers for superficial deposits and the bedrock being almost entirely defined as unproductive strata), a study area of 1km is considered appropriate.

14.2.4 The study area includes surface water features including main rivers, ordinary watercourses, lakes and ponds and groundwater features including designated aquifers, groundwater abstractions and groundwater dependent terrestrial ecosystems (GWDTEs). This distance will allow for an assessment of potential direct effects, as well as providing a broader catchment context appropriate for the purpose of the assessment. The proposed study area and key water environment features within it are shown on figures 14.1, 14.2, 14.3, and 14.4 (Appendix A).

14.3 Baseline conditions

Baseline sources

14.3.1 The baseline conditions have been established based on the following sources:

- Environment Agency Flood Map for Planning (Environment Agency, 2020)
- Environment Agency Long Term Flood Risk Information Mapping (Environment Agency, 2020)
- Environment Agency Catchment Data Explorer (Environment Agency, 2020)
- Environment Agency Risk of Flooding from Surface Water (RoFSW) Extent: 0.1, 1 and 3.3 percent annual chance (Environment Agency, 2020) datasets
- Environment Agency Historic Flood Map (Environment Agency, 2020)
- Environment Agency Risk of Flooding from Reservoirs (Environment Agency, 2020)
- Environment Agency water quality data (Environment Agency, 2020)
- OS Open Rivers (Ordnance Survey, 2019) dataset
- Mid-Essex Level 1 Strategic Flood Risk Assessment (Braintree District Council et al., 2007)

- Mid-Essex Level 1 Strategic Flood Risk Assessment, Appendix D Maldon Supplementary Report (Maldon District Council et al., 2008)
- Chelmsford City Council Level 1 and Level 2 Strategic Flood Risk Assessment (JBA Consulting, 2018)
- Braintree District Council Level 1 Strategic Flood Risk Assessment Update (AECOM, 2016)
- Colchester Borough Council Level 1 Strategic Flood Risk Assessment Update (AECOM, 2016)
- Anglian River Basin Management Plan and Annexes (Environment Agency, 2018)
- Geomorphological site survey (carried out in June 2017)
- Designation data and mapping from Natural England's MAGIC map application (Defra, 2020)
- Contemporary Ordnance Survey maps, (Ordnance Survey, 2020)
- Aerial imagery (Google Earth, 2020)
- British Geological Survey mapping (BGS, 2020) at 1:50,000 scale
- Envirocheck report (Landmark Information Group, 2016)
- Historical maps (National Library of Scotland, 2020)

14.3.2 Ground investigation (GI) works are currently ongoing. However, as data collection has not been completed it has not supported the assessment of baseline conditions. The data will be utilised in subsequent reporting of the baseline conditions within the Preliminary Environmental Information Report (PEIR), if available, and Environmental Statement (ES).

14.3.3 In relation to groundwater, the GI includes the following:

- installation of groundwater monitoring boreholes
- measurement of groundwater levels in monitoring boreholes over a 12 month period with the installation of groundwater level data loggers installed in selected boreholes
- groundwater sampling and chemical testing in selected boreholes
- permeability testing in selected boreholes (rising and falling head tests)
- soakaway testing

Baseline information

Surface water features

14.3.4 There are numerous main rivers and surface water bodies within the study area as summarised in table 14.1.

Table 14.1: Surface water bodies within the study area

Watercourse	Description
Baddow Meads Ditch	The Proposed Scheme is not anticipated to cross Baddow Meads Ditch, however there is floodplain associated with the watercourse within the study area south-east of Chelmer Village.
River Chelmer (main river)	The River Chelmer has its source north-west of Braintree in Rowney Wood. It flows through predominantly rural land with some small urban areas before flowing through Chelmsford. The WFD water body within the study area is the section downstream of Chelmsford and the confluence with the River Can. From this point, the channel flows through agricultural land, with a predominantly sinuous planform, eventually joining the River Blackwater at Maldon. The existing A12 crosses the River Chelmer within the study area, south-east of Chelmer Village. The Proposed Scheme is not anticipated to cross the River Chelmer, however there are considerable areas of River Chelmer floodplain within the study area east, north-east, and south-east of Chelmer Village.
Boreham Brook (main river)	Boreham Brook is a tributary of the River Chelmer with its source to the north of the A12 at Brent Hall. The channel flows through agricultural land with a predominantly sinuous planform. The watercourse is culverted under the A12, Roman Road and other local access roads prior to the confluence with the River Chelmer. Within the study area, the Boreham Brook floodplain is narrow (approximately 40m wide immediately adjacent to the existing A12 crossing west of Boreham). There is also floodplain associated with Boreham Brook within the study area to the north of Boreham.
River Ter (main river)	The River Ter is a tributary of the River Chelmer and has its source west of Braintree at Stebbing Green. The river channel has a predominantly sinuous planform and flows through woodland, agricultural land and small urban areas. The watercourse is culverted under the A120, A131 and A12, as well as several local access roads prior to its confluence with the River Chelmer. Within the study area, the River Ter floodplain is narrow (approximately 40m wide immediately adjacent to the existing A12 crossing west of Hatfield Peverel).
River Blackwater (main river)	The River Blackwater originates at Braintree. The upstream length of this watercourse is referred to as River Pant. The channel has a predominantly sinuous planform and flows through agricultural land, woodland and several urban areas prior to its confluence with the River Chelmer. Within the study area, the River Blackwater floodplain is more extensive than the other watercourses (approximately 200m wide immediately adjacent to the existing A12 crossing south-west of Kelvedon). There is also floodplain associated with the River Blackwater within the study area in various locations from south of Witham to south of Kelvedon.
River Brain (main river)	The River Brain originates north-west of Braintree near Great Bardfield. Upstream of Braintree, the watercourse is named Pods Brook. The river channel has a predominantly sinuous planform; however, it appears to be straightened along some lengths. The river flows through woodland, agricultural land and large urban areas of including Braintree and Witham. The watercourse is culverted under the A12 prior to its confluence with River Blackwater. Within the study area, the River Brain floodplain is narrow (approximately 50m wide immediately adjacent to the existing A12 crossing south-east of Witham).
Colemans Farm Ditch (main river)	The Proposed Scheme is not anticipated to cross Colemans Farm Ditch, however there is floodplain associated with Colemans Farm Ditch within the study area north-east of Witham.

Watercourse	Description
Rivenhall Brook (main river)	Within the study area, the Rivenhall Brook floodplain is narrow (approximately 50m wide immediately adjacent to the existing A12 crossing north-west of Rivenhall End). The Brook discharges into the River Blackwater to the east of Rivenhall End.
Domsey Brook (main river)	Domsey Brook originates north of the A12 at Marks Tey, passing through agricultural land and woodland before crossing the A12 upstream of its confluence with the River Blackwater at Kelvedon. The river channel has a predominantly sinuous planform. The existing A12 crosses Domsey Brook east of Kelvedon and west of Easthorpe. Within the study area, the Domsey Brook floodplain is relatively narrow (approximately 90m wide immediately adjacent to the existing A12 crossing west of Easthorpe).
Roman River (main river)	Roman River originates north of the A12, passing through woodland and agricultural land before crossing the A12. Downstream of this, the channel flows through woodland, agricultural land and urban area before its confluence with the River Colne. Within the study area, the Roman River floodplain is narrow (approximately 30m wide immediately adjacent to the existing A12 crossing north of Copford).
Unnamed watercourses and drains	There are several unnamed drains and watercourses within the study area. These appear to be predominantly small field and road drains and will be further assessed as part of the next phase of the EIA.
Ponds, lakes and reservoirs	There are several ponds, lakes and reservoirs within the study area, most appearing to be man-made. These will be further assessed as part of the next phase of the EIA.

Surface water quality

14.3.5 The current overall, chemical and physico-chemical status of the WFD water bodies within the study area are shown in table 14.2. Phosphate is the only chemical with a 'poor' to 'moderate' classification for several watercourses. The sources of this point or diffuse phosphate pollution for each watercourse are stated below:

- River Chelmer (downstream of the confluence with the Can) – urban and transport, agricultural and land management, industry and waste industry
- River Ter – water industry, agricultural and rural land management, urban and transport
- River Brain – water industry, agricultural and rural land management, urban and transport
- River Blackwater (Combined Essex) – water industry, urban and transport, agricultural and rural land management, industry
- Roman River – agricultural and rural land management, water industry, urban and transport

14.3.6 As shown in table 14.1 there are other water bodies and watercourse crossings in the study area, including Rivenhall Brook (a main river), unnamed tributaries and unnamed drains (see figure 14.1). These watercourses are not classified as WFD waterbodies and therefore the water quality statuses are unknown.

14.3.7 Existing water quality in these smaller watercourses is likely to be influenced by surrounding land uses which is predominantly agricultural. This leads to elevated levels of phosphate which is reflected in the currently monitored larger downstream watercourses.

Table 14.2: Current WFD status (2016, Cycle 2) for water bodies, plus historic Environment Agency river quality results

Water body ID	GB105037033530	GB105037033910	GB105037033940	GB105037041140	GB105037041160	GB105037033870	GB105037034150
Water body name	Chelmer (d/s confluence with Can)	Boreham Tributary	Ter	Brain	Blackwater (Combined Essex)	Domsey Brook	Roman River
Water body type	River	River	River	River	River	River	River
Hydromorphological designation	Heavily modified	Not designated	Not designated	Heavily modified	Heavily modified	Heavily modified	Heavily modified
Overall ecological status	Poor	Good	Moderate	Moderate	Moderate	Good	Moderate
Overall chemical status	Good	Good	Good	Good	Good	Good	Good
Overall water body classification	Poor	Good	Moderate	Moderate	Moderate	Good	Moderate
Physico-chemical quality elements							
Acid-neutralising capacity	High	-	High	High	High	-	-
Ammonia	High	High	High	High	High	High	High
Dissolved oxygen	High	High	High	High	High	Good	High
pH	High	High	High	High	High	High	High
Temperature	High	High	High	High	High	High	High
Phosphate	Poor	Good	Poor	Poor	Moderate	Good	Moderate
Biological oxygen demand	High	-	-	High	High	-	-

Hydromorphological quality elements							
Hydrological regime	Does not support Good	High	Supports Good	Supports Good	-	Supports Good	Does not support Good
Morphology	-	Supports Good	Supports Good	-	-	-	-
EA historical river quality monitoring summary results (until 2009)							
Biology	Good natural ecosystem – similar to unpolluted river	-	Good natural ecosystem – similar to unpolluted river	Good natural ecosystem – similar to unpolluted river	Good natural ecosystem – similar to unpolluted river	-	-
Nitrate	High	-	Very High	Very High	Very High	-	-
Phosphate	High	-	High	High	High	-	-
Dissolved oxygen	-	-	-	-	Potentially restricting ecosystem	-	-

Surface water resources

14.3.8 The majority of the study area falls within the Essex Catchment Abstraction Management Strategy (CAMS) area. Based on data obtained in 2016, there are 18 surface water abstraction locations within the study area, all for agricultural use (Landmark Information Group, 2016). Three of these are located immediately adjacent to the existing A12 within the study area. Further small-scale surface water abstractions could be present within the study area but not recorded within the Envirocheck report. Some landowners noted at the public engagement events that they are not on mains water.

14.3.9 There are Drinking Water Directive protected areas, with three surface water safeguard zones:

- SWSGZ1029 – between Chelmsford and Hatfield Peverel
- SWSGZ1028 – between Hatfield Peverel and Marks Tey
- SWSGZ1200 – between Marks Tey and Beacon Ends

14.3.10 The study area also falls within a surface water nitrate vulnerable zone (NVZ).

Surface water flows

14.3.11 On the National River Flow Archive (NRFA) website, data are available from several gauging stations along watercourses within, or upstream or downstream of the study area. The Q95 is the flow that is exceeded 95% of the time and is representative of low flows. Along the River Chelmer at Rushes Lock the NFRA website records a Q95 of 0.132m^3/s; along the River Blackwater at Langford and Appleford Bridge a Q95 of 0.224m^3/s and 0.355m^3/s, respectively; and along the River Brain at Guithavon Valley a Q95 of 0.159m^3/s.

Existing drainage

14.3.12 A desk study assessment of the existing drainage network serving the A12 between junctions 19 and 25 (Proposed Scheme) has been undertaken using the Highways England HADDMS (Highways Agency Drainage Data Management System) information, online resources such as Google Earth and limited topographical survey information. This desk study assessment was largely able to identify the visible surface water drainage collection system at the road surface for the Proposed Scheme extent. This included different types of primary drainage elements as follows:

- concrete surface water channels with catchpit gratings at regular intervals along the longitudinal centreline of the channel
- kerb inlet gullies and traditional kerb/gully drainage
- combined kerb drainage
- filter drains

14.3.13 Surface water drainage runs of traditional kerb and gully drainage and/or kerb inlet gullies appear to be most commonly used through small urban and residential areas encountered along the A12 and at junction locations with other local roads. Combined kerb drainage appears to be commonly used for the kerb edges on bridge decks, along road edges for underbridges (e.g. where it is not feasible to continue drainage methods such as concrete surface water channels, filter drains, etc.), lay-bys or at junction locations with other local roads.

14.3.14 The presence of existing surface water attenuation features such as attenuation ponds, underground attenuation tanks, etc. or pollution control measures could not be confirmed by this desk study assessment. This is not to say that such drainage infrastructure is not present. The existing surface water drainage collection system, attenuation features and/or pollution control measures will be confirmed following the receipt of existing highway drainage surveys information during PCF Stage 3 (Preliminary Design).

14.3.15 The desk study assessment undertaken using the HADDMS information (i.e. use of drainage as-built drawings, drainage construction drawings, etc) was the preliminary source of information to establish the existing drainage catchments/outfalls arrangement for the proposed scheme extent. It is however noted that the HADDMS information was limited and required appropriate assumptions to develop the PCF Stage 2 drainage design with regards to the drainage catchments/outfalls. Based on preliminary highway drainage design assessment at PCF Stage 2, there are 71 potential drainage catchments/outfalls (includes assumed existing and proposed outfalls) for the Proposed Scheme extent of which 49 outfalls are assumed to be discharging to nearby watercourses or existing culvert crossings and 22 outfalls discharging to the existing surface water drainage system.

Fluvial geomorphology

14.3.16 Figure 14.1 shows the location of all fluvial geomorphological receptors within the boundary of Proposed Scheme. There are 10 Main Rivers found within the study area. Baselines for all these as WFD water bodies are detailed in Appendix K (Preliminary WFD Assessment).

14.3.17 Within the study area there are numerous unnamed watercourses which can all be characterised as drainage ditches, lined by continuously vegetated riparian corridors. The watercourses have straight planforms and trapezoidal cross sections, and historical map analysis shows little change since 1876.

14.3.18 In addition to the drainage channels, there are numerous small ponds, gravel pits and lakes, with most concentrated between junction 19 and junction 23 of the A12, particularly between Hatfield Peverel and Kelvedon. The ponds and lakes are generally offline, with some exceptions which remain online and part of the drainage networks.

Groundwater

14.3.19 Chapter 10 (geology and soils) provides the baseline information for the geology beneath the Proposed Scheme. The mapped superficial deposits (Defra, 2020) are classified mainly as secondary A and secondary undifferentiated aquifers with pockets of secondary B aquifer between junctions 19 (Boreham) and 20B (Hatfield Peverel South) (table 14.3).

Table 14.3: Strata aquifer designations in the study area

Superficial deposits	Aquifer designation
Alluvium	Secondary A
River terrace deposits	Secondary A
Head deposits	Secondary undifferentiated
Interglacial lacustrine deposits	Unproductive
Lowestoft Formation (formerly known as Boulder Clay)	Secondary undifferentiated
Glaciofluvial deposits	Secondary A
Kesgrave Catchment Subgroup	Secondary A
Brickearth	Secondary B
Bedrock	**Aquifer designation**
London Clay Formation	Unproductive
Lambeth Group	Secondary A
Thanet Formation	Secondary A
Chalk Group (Upper and Middle Chalk) (at depth and does not occur at the surface in the study area)	Principal

14.3.20 In terms of the bedrock, the London Clay Formation which underlies the majority of the Proposed Scheme is designated as unproductive strata. The Lambeth Group and Thanet Formation which outcrop in two very small areas between junctions 22 (Colemans) and 23 (Kelvedon South) are classified as secondary A aquifers. At depth the Chalk Group is classified as a principal aquifer.

14.3.21 The aquifer designations are included in figure 14.4.

14.3.22 The groundwater vulnerability map (Defra, 2020) shows that the majority of the Proposed Scheme lies on aquifers with medium-low or low vulnerability. Small areas of medium vulnerability are also present. The two small areas of Lambeth Group and Thanet Formation bedrock deposits are defined as medium-high vulnerability.

14.3.23 A high level assessment of groundwater levels reported in borehole logs shown on the BGS GeoIndex website (BGS, 2020) shows that groundwater levels are encountered in the superficial deposits at varying depths, and frequently the borehole logs show groundwater is not encountered during drilling. However, the logs do also show that groundwater can be encountered at relatively shallow depth, within 1m or 2m of the ground surface.

14.3.24 No formal groundwater monitoring has been completed to validate groundwater levels as part of the Proposed Scheme to date, notably during the winter period when groundwater levels are expected to be at their highest. Continuous groundwater monitoring, initially for a 12 month period, is to be undertaken in a number of boreholes across the Proposed Scheme to gain a clear understanding of baseline groundwater levels and fluctuations across the Proposed Scheme. The work is planned as part of the ongoing GI work and will inform the groundwater assessment.

14.3.25 The local groundwater may be connected (either directly or indirectly) to surface watercourses and changes to groundwater quality and level beneath the Proposed Scheme area may therefore influence water quality or flows in these watercourses.

14.3.26 Much of the study area contains the Essex Gravels WFD groundwater body (GB40503G000400) (Environment Agency, 2020). This currently has 'poor' overall status, due to its poor chemical quality, and an objective of achieving 'good' status by 2027. Further details of this groundwater body is provided in Appendix K.

14.3.27 Eleven groundwater abstractions have been identified within the study area (Landmark Information Group, 2016). One of these abstractions is a public potable water supply abstraction owned by Anglian Water approximately 60m to the west of the existing A12 near junction 24 (Kelvedon North), close to the crossing of Inworth Road and Domsey Brook. There is a 50m radius source protection zone 1 (SPZ1) defined for this supply and it is likely that this abstraction pumps groundwater from the Chalk aquifer at depth (the Chalk is protected by the overlying London Clay). A borehole log for a borehole at this location shows there to be 49m of London Clay at this location.

14.3.28 A SPZ is also defined for an abstraction situated approximately 3.3km to the south of the Proposed Scheme to the south-east of Hatfield Peverel (Defra, 2020). The SPZ3 abuts the Proposed Scheme at the location of a potential borrow pit. However, SPZ1 and SPZ2 associated with this abstraction lie outside of the 1km study area.

14.3.29 The SPZ map (Defra, 2020) also shows that the eastern end of the Proposed Scheme (from Kelvedon eastwards) is defined as SPZ3. It appears that this SPZ is associated with groundwater abstractions from the Chalk to the north of the Proposed Scheme.

14.3.30 The SPZs are used by the Environment Agency as screening tools to identify those areas where it would object in principle to certain potentially polluting activities, or other activities that could damage groundwater where additional controls or restrictions on activities may be needed to protect water intended for human consumption. SPZ1 is the most sensitive of these protective areas and indicates the zone in which contamination released to the ground could reach the point of abstraction within 50 days. SPZ2 similarly defines a travel time of 400 days. Normally discharges of road drainage should be outside SPZ1 and should ideally be outside of SPZ2 (Environment Agency, 2018).

14.3.31 Of the 10 licensed groundwater abstractions with no SPZ defined, four are used for spray irrigation, three are for domestic use, two are for industrial use and one is for general agricultural use. None of these abstractions are shown to be within the Proposed Scheme boundary, with the closest shown to be approximately 20m from the boundary. The locations of the abstractions are shown on figure 14.3. However, the grid references provided for the abstractions may only be to the nearest 100m and as such these abstractions may be nearer to or further from the Proposed Scheme.

14.3.32 It is currently uncertain whether these abstractions are from the shallow superficial deposits or from the confined Chalk. However, based on the borehole logs available on the BGS GeoIndex site (BGS, 2020) for some of the boreholes, it is more likely that the groundwater is abstracted from the superficial deposits (most likely to be sand and gravel deposits which form the secondary A superficial aquifers). Further information on the abstractions will be obtained from the Environment Agency.

14.3.33 Groundwater abstractions of less than $20m^3$/day do not require a licence. The location of unlicensed groundwater abstractions may be recorded by the local authority. To date, this information has not been obtained but has been requested and will be considered in the assessment. It should be noted, however, that groundwater abstractions for private water supplies that are used for potable supply or food production purposes have a default SPZ1 of a minimum radius of 50m, but are not mapped.

14.3.34 Groundwater users may be particularly vulnerable to any disruptions of groundwater flow, provision and quality, and could therefore require consideration in the assessment of impacts due to the Proposed Scheme.

14.3.35 Discharges of liquids to ground or groundwater may be occurring within the study area. The location of these are currently unknown for the full extent of the study area and permitted discharge data will be obtained from the Environment Agency.

14.3.36 GWDTEs are wetlands which critically depend on groundwater flows or chemistry. A full assessment of GWDTEs has not been undertaken at this stage. However, an initial assessment of the locally designated ecological sites (see chapter 9, biodiversity) has been undertaken as indicated in table 14.4 to determine the potential groundwater dependency of the local wildlife sites (LWS) and local nature reserves (LNR). This has been undertaken from desk-based data such as maps and brief online descriptions of the site (Essex Wildlife Trust, 2019) and will be followed up at later stages of the EIA by field surveys, if needed, and consultation with Essex Wildlife Trust. Sites defined as coastal and floodplain grazing marsh priority habitat have also been included in the initial assessment of GWDTEs. This preliminary assessment will be followed up at later stages of the EIA by further desk study, field surveys (if needed) and consultation with Essex Wildlife Trust. No statutory designated sites (such as sites of special scientific interest (SSSI), special areas of conservation (SAC) or Ramsar sites) are present in the groundwater study area. GWDTE's are identified in figure 14.3.

Table 14.4: Potential GWDTEs and an initial assessment of their groundwater dependency

Ecologically designated site name	Site reference	Initial assessment of potential groundwater dependency
Braxted Park LWS	Ma44	High
Brockwell Meadows (LWS and part LNR)	Bra229	Medium
Chantry Wood	MA37	High/Medium
Coggeshall Hall Farm LWS (also coastal and floodplain grazing marsh priority habitat)	Bra225	Medium
Copford Hall Wood North LWS	Co49	Medium
Domsey Brook Pasture LWS	Co20	Medium
Feering Marsh LWS	Bra234	High
Hoo Hall Meadow LWS	Bra188	Medium
Inworth Wood LWS	Co6	Low
Keeper's Cottage Wood LWS	Co51	Medium
Kelvedon Hall Wood LWS	Ma52	Low
Long Wood Complex LWS	Bra114	High
Marks Tey Brick Pit LWS	Co31	High/Medium
Mope Wood Complex LWS	Ma30	Low
Perry's Wood LWS	Co5	Medium/Low
Pits Wood LWS	Co44	Medium
River Chelmer LWS	Ch109	Medium
Riverview Meadows LWS	Bra174	High
Sparkey Woods LWS	Ma23	Low
The Grove LWS	Ch107	Medium
The Old Rectory Meadows LWS	Bra175	Low
Titbeech Wood LWS	Bra118	Low
Toppinghoehall Wood LWS	Bra87	Low
Whetmead LNR	Bra183	Medium
Coastal and floodplain grazing marsh priority habitat	Adjacent Chelmsford Water Recycling Centre	Medium
Coastal and floodplain grazing marsh priority habitat	SW of Wickham Place Farm	Medium/High

14.3.37 Groundwater quality data have been obtained from the Environment Agency's water quality database (Environment Agency, 2020). The data show that there are no groundwater quality monitoring points within the groundwater study area. However, a small number of groundwater monitoring points are situated a short distance outside the study area as shown in table 14.5. It should be noted that at this stage it is uncertain which aquifer the water is sampled from. Groundwater quality data are also being collected as part of the GI, principally to allow assessment of impacts to groundwater quality from contaminated land. Agricultural inputs (such as fertilisers and pesticides) may also impact on groundwater quality. The Environment Agency and GI quality data will be considered in the next stage of the assessment.

Table 14.5: Groundwater quality monitoring data available from Environment Agency (2015 to 2020 data)

Monitoring point name	NGR	Typical monitoring frequency
Bellhouse Landfill Site GW BE6	594562, 223272	Annually
Ravens Farm B/H, Woodham Walter	580424, 207998	6 monthly
Sextons Farm Spring Gt. Braxted	585757, 214119	Annually
Wickham Bishops Spring Nr B1018 Rd	582758, 211604	6 monthly

Water Framework Directive

14.3.38 The study area interacts with seven WFD surface water bodies, two downstream water bodies (which are transitional and coastal water bodies (TraCs)), and one groundwater body. Detailed information of each WFD water body and the impacts upon each WFD quality element are provided in the Preliminary WFD assessment found in Appendix K, including the key information for each WFD surface water body, transitional water body and groundwater body.

Flood risk

Fluvial flood risk

14.3.39 The Environment Agency's Flood Map for Planning (Environment Agency 2020) indicates that there are areas designated as flood zone 3 (greater than a 1% (1 in 100) annual exceedance probability (AEP) of fluvial flooding) and flood zone 2 (between 0.1% (1 in 1000) and 1% (1 in 100) AEP of fluvial flooding) within the study area (see figure 14.1). These areas of floodplain are associated with the 10 main rivers within the study area.

14.3.40 In addition to the main rivers, there are several ordinary watercourses within the study area that could interact with the Proposed Scheme (as well as numerous small local drainage ditches):

- a tributary of the Boreham Brook, north-west of Boreham
- Boreham Brook before it is classified as a main river, north of Boreham
- a tributary of the River Blackwater, south of Kelvedon
- a watercourse associated with the Roman River, north of Copford

14.3.41 Flood risks from ordinary watercourses, which are the responsibility of the Lead Local Flood Authority (LLFA), are unlikely to be accounted for in the Environment Agency's Flood Map for Planning. A review of the Environment Agency's Risk of Flooding from Surface Water (RoFSW) mapping has been undertaken to account for baseline risk associated with ordinary watercourses. The flood risk associated with these watercourses has been detailed in the surface water flood risk sub-section below.

14.3.42 The remainder of the study area is designated as flood zone 1 (less than 0.1% (1 in 1000) AEP of fluvial flooding).

14.3.43 Further investigation will be required to determine the fluvial flood risk.

Tidal flood risk

14.3.44 None of the watercourses within the study area are tidal rivers. The nearest tidal point is the upstream tidal limit of the River Chelmer at Beeleigh Falls, approximately 5.5km downstream from the study area.

Surface water flood risk

14.3.45 The Environment Agency's RoFSW mapping details that the study area is predominantly within an area at very low risk (less than 0.1% (1 in 1000) AEP) of surface water flooding (figure 14.2). However, there are several overland flow routes and isolated areas of ponding within the study area which could intersect with the Proposed Scheme, with a high (greater than 3.3% (1 in 30) AEP) to low (between 0.1% (1 in 1000) and 1% (1 in 100) AEP) risk of surface water flooding.

14.3.46 The RoFSW mapping indicates that there is a risk from surface water flooding along the existing A12 at Boreham, Hatfield Peverel, Witham, south of Kelvedon, north-west of Easthorpe and Marks Tey, with further areas at risk of localised ponding in between.

14.3.47 There are areas of high to medium (between 1% (1 in 100) and 3.3% (1 in 30) AEP) risk of surface water flooding immediately adjacent to all of the main rivers, but are predominantly located within the flood zone 3 extent associated with those watercourses. These areas of surface water flood risk are likely to be associated with flows from these watercourses and are discussed in the fluvial flood risk sub-section above.

14.3.48 The RoFSW mapping has been reviewed to give an indication of the fluvial flood risk for the smaller watercourses not covered in the Environment Agency's Flood Map for Planning. The RoFSW mapping identifies overland flow routes of high surface water flood risk associated with the ordinary watercourses identified. Other areas of surface water flood risk are located predominantly within localised topographic depressions or against existing road embankments. It should be noted that the high level models often used for large scale surface water mapping may not take full account of the influence of existing drainage and culverts.

14.3.49 There are several significant overland flow routes and other areas of high surface water flood risk within the study area.

Groundwater flood risk

14.3.50 The Chelmsford City Council Strategic Flood Risk Assessment (SFRA) (JBA Consulting, 2018), Braintree District Council Strategic Flood Risk Assessment (AECOM, 2016), and Colchester Borough Council Strategic Flood Risk Assessment (AECOM, 2016) were consulted to understand groundwater flood susceptibility within the study area. The groundwater mapping within these SFRAs is based on the Environment Agency's Areas Susceptible to Groundwater Flooding mapping. The mapping shows the proportion of each 1km grid square where geological and hydrogeological conditions show groundwater might emerge.

14.3.51 The northern extent of the study area is located predominantly within a zone designated as having less than 25% of its area susceptible to groundwater flooding. Within this area, land adjacent to main rivers is generally designated as having between 25% and 50% of its area susceptible to groundwater flooding.

14.3.52 The majority of land adjacent to the River Blackwater and River Chelmer is designated as having between 25% and 100% of its area susceptible to groundwater flooding.

14.3.53 Further investigation will need to be undertaken to understand the groundwater flood risk.

Reservoir flood risk

14.3.54 The Environment Agency's Risk of Flooding from Reservoirs mapping (Environment Agency 2020) gives an indication of the areas at risk of flooding due to failure of large raised reservoirs, as defined under the Reservoir Act 1975.

14.3.55 The following areas within the study area have been identified as being at risk from reservoir flooding, each of which is located over the route of an existing watercourse:

- north-east of Chelmer Village
- west of Hatfield Peverel
- south-east of Witham
- south-west of Kelvedon
- east of Kelvedon

14.3.56 All large raised reservoirs, as defined by the Reservoirs Act, are regularly inspected and maintenance is supervised by reservoir engineers. Therefore, the risk of failure is considered very low due to their monitoring and inspection regime. If any smaller reservoirs local to the Proposed Scheme are identified at a later stage these will be considered as required.

Other flood sources and historical records

14.3.57 It is likely that there is water supply and sewerage infrastructure within proximity to the Proposed Scheme due to the proximity of residential and other properties. Flood risk from these sources is likely to be low, however, further investigation will be required at the next stage to confirm if this is the case.

14.3.58 A review of the Environment Agency Flood Map for Planning (Environment Agency 2020) reveals that there is one area benefitting from flood defences located within the study area, to the east of Chelmer Village. At this location the Proposed Scheme does not involve any works to the highway, however, as an area benefitting from flood defences is located within the study area, risk of flooding from flood defence failure requires further investigation as the Proposed Scheme design progresses.

14.3.59 There are no canals within the study area. The Chelmer and Blackwater Navigation is the canalisation of the Rivers Chelmer and Blackwater in Essex. The Navigation connects Chelmsford with the tidal estuary of the River Blackwater but is considered within the fluvial flood risk sub-section. Consequently, there is no realistic risk of flooding from canals.

Historical flood events

14.3.60 The Environment Agency's Historic Flood Map (Environment Agency 2020) identifies the maximum extent of recorded flood outlines from the rivers, sea and groundwater springs. A review of the map identifies several areas of historic flooding within the study area, each of which is closely aligned with the flood zone 2 extent:

- flooding associated with the River Chelmer, to the east of Chelmsford
- flooding associated with the River Brain, in Witham
- flooding associated with the River Blackwater, to the east of Witham
- flooding associated with the River Blackwater, in Kelvedon

14.3.61 The Mid-Essex Strategic Flood Risk Assessment (Braintree District Council *et al*., 2007), Chelmsford City Council Strategic Flood Risk Assessment (JBA Consulting, 2018), Braintree District Council Strategic Flood Risk Assessment (AECOM, 2016), and Colchester Borough Council Strategic Flood Risk Assessment (AECOM, 2016) contain further details of historic flood events relevant to the study area. Historic flood events detailed in the SFRAs include events attributed to tidal (although not within the study area), surface water, fluvial and sewer sources.

Future baseline

Surface water

14.3.62 The future baseline conditions for water quality could change as a consequence of land use changes and measures to improve water bodies in line with WFD objectives. It is anticipated that in the future water quality will generally improve over time.

Groundwater

14.3.63 For reasonably foreseeable external third party projects as identified in chapter 16 (cumulative effects assessment), there would be no impact on groundwater resources and associated receptors that would significantly change the groundwater baseline.

14.3.64 Dewatering for quarrying has the potential to reduce groundwater levels if future mineral abstraction requires quarries to be dewatered. Conversely, if existing quarries are currently dewatering, then on completion of mineral extraction groundwater levels may rise.

14.3.65 Over the medium term and long term, groundwater resources in the groundwater study area may be affected by climate change. However, any changes would be complex and may result in:

- a long-term decline in groundwater storage due to higher soil moisture deficits due to warmer, drier summers
- increased frequency and severity of groundwater droughts leading to reduction in base flow to watercourses or GWDTEs
- increased groundwater flooding from high intensity summer storms

14.3.66 Baseline conditions for water quality could change over the anticipated lifetime of the Proposed Scheme, as a consequence of land use changes and measures to improve water bodies in line with WFD objectives. It is likely that groundwater quality would generally improve, as historical pollution sources are removed, and better water quality management measures are put into place.

14.3.67 However, based on currently available information, there is unlikely to be a significant change in the baseline groundwater quality. Changes to the groundwater regime brought about by climate change are unlikely to affect groundwater quality (for example, saline intrusion would not be anticipated).

Flood risk

14.3.68 Over the anticipated lifetime of the Proposed Scheme (100 years) changes to the baseline as a consequence of climate change would likely occur, including a likely increase in the frequency and magnitude of flood events.

14.3.69 Future baseline accounting for climate change will be assessed in line with the latest Environment Agency guidance for increases in fluvial flows and rainfall intensity[6].

Value of receptors

14.3.70 Initial high-level assessment of the water environment has been made using desk-based information and the criteria set out in DMRB LA 113 (Highways England, 2020), which summarises the importance of the receptors identified within the study area. These assessment criteria are detailed further and more specifically for each matter in Appendix C. In terms of fluvial geomorphology and groundwater, each receptor has been assigned a sensitivity, which is detailed in table 14.6. The sensitivity is subject to change with more detailed assessment.

[6] available from: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

14.3.71 It is not considered appropriate at this stage to identify each of the numerous un-named watercourses or ponds as individual receptors. Based upon the criteria for establishing importance in DMRB LA 113 the un-named watercourses and ponds have all been assigned the same level of importance. Ponds and un-named watercourses are unlikely to be more than low importance. However, a precautionary approach has been taken and therefore a medium value has been assigned to all but geomorphology. Receptors and attribute importance will be reconfirmed at the next stage of assessment.

Table 14.6: Value of receptors in the study area for road drainage and the water environment

Value/ sensitivity	RDWE matter	Description	Examples within the study area
Very high	Surface water quality	Watercourse having a WFD classification shown in the River Basin Management Plan (RBMP) and a Q95≥1.0m^3/s.	No receptors of this value within the study area.
	Geomorphology	A watercourse that appears to be in complete natural equilibrium and exhibits a natural range of morphological features (such as pools and riffles). There is a diverse range of fluvial processes present, free from any modification or anthropogenic influence.	No receptors of this value within the study area.
	Groundwater	Groundwater that locally supports a GWDTE.	Groundwater discharging to Whetmead LNR.
		SPZ1.	SPZ1 associated with Inworth Road groundwater abstraction.
	Flood risk	Essential infrastructure or highly vulnerable development.	Railway line within the study area to the north-east of junction 19 (Boreham). Existing A12.
High	Surface water quality	Watercourse having a WFD classification shown in RBMP and a Q95<1.0m^3/s.	River Chelmer, Boreham Tributary, River Ter, River Blackwater, River Brain, Domsey Brook, Roman River.
	Geomorphology	A watercourse that appears to be in natural equilibrium and exhibits a natural range of morphological features (such as pools and riffles). There is a diverse range of fluvial processes present, with very limited signs of modification or other anthropogenic influences.	River Ter, River Blackwater.
	Groundwater	Principal or secondary A aquifer providing locally important resource or supporting a river ecosystem.	River terrace deposits and Kesgrave Catchment Subgroup.

Value/ sensitivity	RDWE matter	Description	Examples within the study area
		Groundwater that supports a GWDTE.	Groundwater discharging to Brockwell Meadows.
		Grade I, II* and II listed buildings.	Boreham House.
		Scheduled monuments.	Rivenhall Long Mortuary Enclosure.
		Buildings of regional importance.	Schools.
	Flood risk	More vulnerable development.	Residential properties within the study area for example in Witham in close proximity to the A12 crossing of the River Brain.
Medium	Surface water quality	Watercourse not having a WFD classification shown in RBMP and a Q95>0.001m^3/s.	Rivenhall Brook, unnamed watercourses and drains, ponds, lakes and reservoirs.
	Geomorphology	A watercourse showing signs of modification, recovering to a natural equilibrium, and exhibiting a limited range of morphological features (such as pools and riffles). The watercourse is one with a limited range of fluvial processes and is affected by modification or other anthropogenic influences.	Boreham Brook, River Chelmer, River Brain, Domsey Brook, Roman River, Rivenhall Brook, Baddow Meads Ditch.
	Groundwater	Aquifer providing water for agricultural or industrial use with limited connection to surface water.	Superficial sand and gravel aquifer. Location of unlicensed abstractions still to be determined.
		SPZ3.	SPZ3 at north-east of scheme.
		Unlicensed groundwater abstractions.	To be identified via data request to the local authorities.
		Buildings of local importance.	Residential properties.
	Flood risk	Less vulnerable development.	Commercial properties within the study area – for example in Rivenhall End in close proximity to the existing A12.
Low	Surface water quality	Watercourse not having a WFD classification shown in RBMP and a Q95≤0.001m^3/s.	No receptors of this value within the study area.

Value/ sensitivity	RDWE matter	Description	Examples within the study area
	Geomorphology	A highly modified watercourse that has been changed by channel modification or other anthropogenic pressures. The watercourse exhibits no morphological diversity and has a uniform channel, showing no evidence of active fluvial processes and not likely to be affected by modification.	Colemans Farm Ditch, Greys Mill Ditch, all unnamed watercourses, all ponds and lakes.
	Groundwater	Unproductive strata.	London Clay.
		Undesignated historic buildings.	Eight undesignated historic buildings.
	Flood risk	Water compatible development.	Rivenhall Oaks Golf Centre within the study area north-west of Rivenhall End.

14.4 Potential impacts

14.4.1 Potential impacts on the water environment could arise from a number of direct and indirect sources during the construction and operational phases. This section summarises the potential effects associated with the Proposed Scheme. At this stage, due to the level of information, it is not possible to define specific magnitude of impact values for the activities and each receptor. These will be further developed in detail as part of the next phase of the environmental assessment.

Construction

Surface water quality

14.4.2 During construction, there are generally two sources of pollutants; sediments and the use of potentially polluting substances. There would be an increased pollution risk from sediments being mobilised in runoff which could reach watercourses via the drainage network and impact water quality. This could occur during earthworks (i.e. regrading and construction of new embankments), and the movement of heavy plant, and runoff from stockpiles. There is high likelihood of silt being generated from construction activities which would be greater after rainfall events.

14.4.3 During construction, there is a risk of pollution to surface waters from activities involving polluting substances such as fuels, concrete, and other chemicals. There is also a risk of accidental spillages.

14.4.4 The risks of pollution are greater where works occur within or immediately adjacent to a watercourse, such as during the construction or modifications of outfall structures and culverts. There is also a higher risk where works would take place close to existing gullies or drains forming part of the existing highways drainage network, creating a pathway for pollutants to reach the watercourses.

Fluvial geomorphology

14.4.5 The greatest risks to the water environment are likely to occur during the construction phase. Potential impacts to the geomorphology of each watercourse within the study area could include:

- accidental release of fine sediment into watercourses following vegetation clearance and earthworks
- changes in local flow dynamics and scour arising from culverts and outfalls
- potential disruption of flow pathways and changes in flow routes and runoff rates
- bank destabilisation and the replacement of bed substrate during the construction and operation of any culvert crossing

14.4.6 These impacts, however, would be dependent on the proximity of the construction phase activities to the watercourses and would likely be mitigated through design interventions, therefore impacts would unlikely be significant.

14.4.7 WFD related impacts are similar and are covered in the WFD compliance assessment (Appendix K).

Groundwater

14.4.8 During construction, it is considered likely that potential impacts to groundwater features could arise from the following:

- Increased pollution risks, including the accidental spillage of fuels, lubricants, cements, hydraulic fluids or other harmful substances, which may be stored on site during the construction phase, and could migrate into groundwater bodies.
- Physical contamination of groundwater from ground disturbance such as soil stripping, construction of cuttings, and foundations and piling, leading to the potential for increased sediment in aquifers reaching groundwater features. The pollution risk to groundwater bodies, from the disturbance of contaminated ground specifically, is covered in chapter 10, geology and soils.
- Local groundwater drawdown as a result of temporary de-watering. This may be required to construct any sub-surface structures, such as cuttings and borrow pits. Drawdown impacts may be experienced in areas outside of the works area. Discharges from dewatering may also impact on receiving surface water or groundwater.
- Impedance of groundwater flow from temporary below ground structures.
- Buildings have the potential to be affected by dewatering which may cause localised subsidence. The cultural heritage chapter (chapter 7) identifies listed buildings in the vicinity the Proposed Scheme. Other buildings of regional and local importance are identified in the population and health chapter (chapter 13).
- Interception of overland flows through the introduction of impervious structures or compaction of soils, and the movement and storage of earth materials within the study area, potentially disrupting local groundwater recharge.

Flood risk

14.4.9 Temporary works located within or adjacent to watercourses could affect the frequency, depth, extent and duration of fluvial flooding. Construction activities taking place in the floodplain of watercourses have the potential to create a loss of floodplain storage. Alterations to culverts and other structures conveying water could also result in a temporary loss of capacity. This has the potential to increase flood risk to receptors up or downstream.

14.4.10 Surface water flow paths could be altered due to construction activities or haul roads blocking existing flow paths or creating new flow paths. Alterations to culverts and other structures conveying water could result in a temporary loss of capacity, and the potential blocking of drainage systems with construction debris could result in overflowing drains. These potential impacts could result in an increased surface water flood risk.

14.4.11 The temporary increase in impermeable surfaces due to haul routes and construction compounds could lead to increased runoff volumes and velocities as opportunity for infiltration to groundwater could be reduced. This could lead to an increase in the risk of flooding downstream.

14.4.12 Temporary drainage could increase both the rate and volume of surface water runoff to a receiving watercourse and has the potential to transfer sediment to the receiving watercourse (potentially affecting flooding mechanisms).

14.4.13 Activities associated with creating a cutting for the Proposed Scheme, including the excavation of materials and construction of below ground structures, could provide a route of egress for groundwater, potentially placing the new road and surrounding areas at risk.

Operation

Surface water quality

14.4.14 There are two main types of pollution from roads during the operational phase; road runoff and accidental spillage risk. The main contaminants from road runoff include:

- fuel and other oil deposits on the road surface due to leakage
- hydrocarbons from exhaust deposits
- lead, copper, zinc, iron and cadmium deposits from exhaust emissions, brake dust and tyre wear
- synthetic rubber deposits from tyre wear
- chemicals used in windscreen washes such as detergents or de-icer
- de-icing agents such as road salt, but also potentially including trace amounts of impurities such as cyanide, metals and clays

14.4.15 These pollutants, when combined with rainfall, can runoff into the highway drainage system and have an adverse effect on the receiving watercourses. Contaminants deposited on the road surface are quickly washed off during rainfall. Where traffic levels are high, the level of contamination increases and therefore, the potential for unacceptable harm being caused to the receiving water also increases. There is also a risk of accidental spillage which can lead to pollution of watercourses.

Fluvial geomorphology

14.4.16 Impacts arising from the operation phase of the Proposed Scheme would include:

- further replacement of the bed and banks of the channel as a result of new or modification of existing culverts
- changes to local flow dynamics following adaptations to new or modification of existing culverts and outfalls
- bed and bank scour localised to new or modification of existing culverts and outfalls
- local impacts to the lateral connectivity of culverted watercourses
- potential reduction in the length of the channel as a result of channel realignment and straightening, which could lead to localised scour

14.4.17 These impacts would likely be localised to the Proposed Scheme, whilst significant effects would be mitigated through design interventions during the detailed design stage and covered in the operational assessment section of the WFD compliance assessment.

Groundwater

14.4.18 During operation, it is considered likely that potential impacts to groundwater features could arise from the following:

- Increased pollution risks from routine runoff during the operational life of the Proposed Scheme if drainage is discharged to the ground or groundwater. Potential substances would primarily consist of silts, hydrocarbons and dissolved heavy metals, which may migrate to groundwater bodies. Notably, drainage features such as soakaways installed and operating in or near SPZ1 or SPZ2, designated areas, or licensed and unlicensed groundwater abstractions and GWDTEs.
- Increased pollution risks from accidental spillages during the operational phase. Road collisions involving Heavy Goods Vehicles and the potential spillage of fuels pose the greatest risk.
- Potential ongoing de-watering effects from cuttings may cause the groundwater table to fall, impacting on GWDTEs, surface water flows and water users.
- Changes to groundwater levels and flow directions due to the presence of below ground structures such as bridge abutments in shallow aquifers. This could lead to changes to groundwater flow and discharge points, for example to GWDTEs.

Flood risk

14.4.19 New watercourse crossings could affect flood flows and result in the loss of functional floodplain. There could also be a loss of floodplain storage due to new infrastructure located within the floodplain, resulting in an increased flood risk.

14.4.20 The addition of new (or modification of existing) culverts and associated infrastructure, the interception of overland flows, and the realignment of watercourses, could potentially disrupt local flow routes and result in an increase in flood risk.

14.4.21 Roads are designed to drain freely to prevent a build-up of standing water on the carriageway whilst avoiding exposure to, or causing, flooding. A permanent increase in impermeable area could result in an increased amount of runoff volume and the rate of discharge from the road surface, and a subsequent increase in flood risk elsewhere.

14.4.22 Any proposed below-ground features (e.g. areas of the Proposed Scheme which would be in cutting), could intercept groundwater flows which may result in permanent alterations to the groundwater table, including flow patterns and baseflow to rivers, and increase local groundwater flood risk.

Summary of scope

14.4.23 Table 14.7 summarises the proposed scope of the assessment for road drainage and the water environment.

14.4.24 The potential loss of floodplain storage, increase in impermeable area and changes to flow paths as a consequence of the Proposed Scheme could result in increased flood risk elsewhere and represent a potential significant impact on the environment. Mitigation would therefore be required to prevent this from occurring and a Flood Risk Assessment (FRA) will be completed as part of the ES to demonstrate the design will comply with the requirements of the NNNPS. Flood risk has been scoped in for further assessment, although as part of that, the risk of reservoir failure, canals and coastal flooding have been scoped out.

14.4.25 All large raised reservoirs, as defined by the Reservoirs Act, are regularly inspected and maintenance is supervised by reservoir engineers. Therefore, the risk of failure is considered very low due to their monitoring and inspection regime. If any smaller reservoirs local to the Proposed Scheme are identified at a later stage these will be considered as required.

14.4.26 There is no realistic flood risk from canals as there are no canals within the study area.

14.4.27 Given that none of the watercourses are tidal within the study area, the risk of coastal flooding has been scoped out.

Table 14.7: Summary of road drainage and the water environment scope

Matter	Scoped in - construction	Scoped in - operation
Surface water quality	✓	✓
Fluvial geomorphology	✓	✓
Groundwater	✓	✓
Flood risk	✓	✓
WFD compliance	✓	✓

14.5 Design, mitigation and enhancement measures

14.5.1 Mitigation measures will be incorporated into the design and assessment using a hierarchical approach, in accordance with DMRB, LA104 (Highways England, 2020). Improvements to the existing drainage network to be retained will be considered as part of the design process.

14.5.2 Consultation will be undertaken with the Environment Agency, LLFA and statutory bodies, as appropriate, and local flood risk management authorities to identify the most appropriate drainage strategy for the Proposed Scheme. Controlled discharge to ground using infiltration techniques would be the preferred option (subject to the outcome of the ground investigation). If discharge to the ground is not possible then controlled discharge to ordinary watercourses and surface water bodies or to existing drainage infrastructure (highways drainage or public sewers) will be investigated. This will need to be confirmed once the outcome of the GI results and feasibility of using infiltration techniques are known and the drainage strategy has been developed, along with details including the discharge rates and any associated attenuation.

14.5.3 To mitigate for potential impacts, it is proposed that construction works within the floodplain will be reduced as far as reasonably practicable and temporary mitigation measures and emergency response measures put in place for works which are required. The alterations to the existing bridge structures will be designed so as to maintain existing channel capacity wherever practicable.

Construction

Surface water quality

14.5.4 Potential mitigation measures that could be applied to surface water quality are as follows:

- Pollution prevention guidelines would be outlined in a construction environmental management plan (CEMP) to mitigate changes in contaminant pathways. Bespoke mitigation may be required to reduce the risk of contaminated land sources affecting water receptors. These will be identified through the development of the conceptual site model.

Fluvial geomorphology

14.5.5 Mitigation measures, which could be implemented to avoid, prevent and reduce possible impacts upon fluvial geomorphology during the construction phase of the Proposed Scheme, are provided below:

- drainage and sediment management to control the quantity and quality of runoff from construction areas
- limiting the amount of vegetation clearance along the riparian corridor and floodplain
- attenuating discharge arising from construction drainage and aligning outfalls downstream
- culverts for temporary haul roads and access tracks would be kept to minimal length and tied into the bed and banks to prevent bank instability (e.g. respectively submerging the culvert beneath the bed substrate to prevent knickpoints and bed destabilisation up and downstream of the culvert connection, and align wingwalls with the banks to prevent outflanking)
- preventing knickpoints from forming in the channel as a result of culvert crossings, and reinstate natural bed substrate material following the removal of culverts

Groundwater

14.5.6 Best practice recommendations for the prevention of contamination will be outlined in detail in a CEMP and agreed with relevant statutory consultees prior to commencement of construction works. This will include measures to comply with relevant legislation, guidance and best practice measures and in line with CIRIA guidance including that in CIRIA document C532 Control of Water Pollution from Construction Sites. Guidance for Consultants and Contractors (CIRIA, 2001).

14.5.7 If piling is required for the construction of any structures such as bridge abutments then a piling risk assessment in line with Environment Agency guidance (Environment Agency, 2006) may be required. This would be of most relevance for areas of piling where contaminated land is identified. Other below-ground works would be considered and risk assessed in a similar way.

14.5.8 If temporary de-watering is required in order for construction activities to take place, such as for cuttings or borrow pits, a dewatering risk assessment would be performed, for example by following the hydrogeological impact appraisal for dewatering abstractions (Environment Agency, 2007). If the hydrogeological impact appraisal suggests significant impacts could be experienced away from the site area being de-watered, then temporary mitigation could be required. During construction, several actions can be taken to mitigate the potential impacts to groundwater users. These measures could include, but are not limited to, the following:

- lowering of groundwater abstraction pumps below the temporary revised groundwater table
- re-drilling of water well(s) where water user abstraction wells are not deep enough to accommodate pump lowering

- water recycling practices whereby dewatered groundwater is recycled into the aquifer, maintaining groundwater contributions to groundwater users
- the provision of alternative water supplies during construction (for example from a road tanker)

Flood risk

14.5.9 Recommended mitigation for potential loss of floodplain storage due to construction activities would include siting construction works outside of the floodplain, where practicable. Where this is not practicable, temporary floodplain compensation could be required to offset storage losses.

14.5.10 Construction areas and temporary compounds would be designed to avoid impacts on flow paths.

14.5.11 Temporary culverts and other drainage channels would be designed to avoid loss of conveyance and thereby prevent impacts to upstream flood risk.

14.5.12 Temporary drainage and attenuation would be designed to accommodate any temporary increases in volumes of runoff due to increased impermeable area for haul roads and compounds.

Operation

Surface water quality

14.5.13 At present specific mitigation for water quality has not been identified but the outline drainage design proposes the use of ponds for attenuation of flows for some drainage catchments which would also provide water quality benefits. The extent and nature of mitigation required for water quality impacts will be identified through the assessments for routine runoff and accidental spillage risk using the Highways England Water Risk Assessment Tool (HEWRAT). The results of the HEWRAT assessment will identify the mitigation required which may include additional treatment.

Fluvial geomorphology

14.5.14 For all aspects of the water environment, compliance with best practice and CIRIA guidance is required with specific regard to culvert and outfall design standards.

Groundwater

14.5.15 If drainage systems that discharge to ground are proposed during the operation of the Proposed Scheme (subject to outcome of GI results and feasibility of using infiltration techniques), groundwater level information will be used to inform drainage design as high groundwater levels could undermine the performance of drainage features, or discharges could lead to increased risk from groundwater flooding.

14.5.16 While controlled discharge of runoff from the Proposed Scheme to ground would be preferred (subject to the outcome of the ground investigation), re-use of existing infrastructure and groundwater pollution risk control mean it is currently envisaged that discharge to surface water via attenuation ponds would likely be the main drainage mechanism. As such, significant impacts from road drainage on the groundwater environment would be reduced. However, under low flow conditions there is potential for road drainage to seep from the stream beds to ground and groundwater. An appropriate groundwater risk assessment (in accordance with guidance in DMRB LA 113) will inform mitigation to be incorporated into the drainage design.

14.5.17 Winter hydrometric monitoring data will be obtained where possible, notably if features that use infiltration techniques such as soakaways or infiltration ponds are likely to be installed within the study area or SPZ areas. Winter monitoring data will be used to determine the unsaturated zone thickness between the base of such features and highest groundwater levels. Groundwater monitoring will take place throughout the winter of 2020/21 as part of the GI works.

14.5.18 The collection of site specific groundwater level monitoring data will determine if the Proposed Scheme cuttings would permanently or seasonally intercept groundwater. If groundwater intercepted the base of the proposed cuttings, then permanent passive or active groundwater management measures would be required. These measures could include, but not be limited to, the installation of perimeter drains and dewatering pumping wells.

14.5.19 If groundwater controls were to be required for features such as cuttings, there is the possibility that the local groundwater receptors could be impacted. If impacts were determined to be significant, then mitigation measures could include, but not be limited to, the following:

- lowering of groundwater abstraction pumps below the revised groundwater table
- re-drilling of water well(s) where water user abstraction wells are not deep enough to accommodate pump lowering
- water recycling practices whereby dewatered groundwater is recycled into the aquifer, maintaining groundwater contributions to groundwater users or features such as GWDTEs

Flood risk

14.5.20 To mitigate new watercourse crossings affecting flood flows and resulting in loss of floodplain, structures for new watercourse crossings would be designed to be outside of the floodplain where reasonably practicable. Where this is not possible, clear span structures will be considered to reduce the potential effects. Where floodplains would be affected, compensation areas could be required to offset these losses.

14.5.21 A drainage design will be developed for all new areas, with an allowance for climate change. Discharge to ground (subject to outcome of GI results and feasibility of using infiltration techniques) will be considered as mitigation for a permanent increase in discharge rate and volume of surface water runoff caused by an increase in impermeable areas. Where this is not possible, road runoff would be attenuated using attenuation ponds.

14.5.22 Mitigation for loss of floodplain due to new infrastructure being located within the floodplain could include the provision of flood compensation areas, upgrading of structures to improve conveyance, and improving defences to prevent increases in flood risk.

14.6 Description of the likely significant effects

Surface water quality

14.6.1 Without mitigation, significant effects would be likely to occur upon those watercourses which receive runoff from the road network which could lead to impacts upon water quality and flows. However, it is likely that mitigation could be provided as part of the Proposed Scheme in order to comply with environmental quality standards and the requirements of DMRB.

14.6.2 Significant effects relating to water quality could occur during construction without mitigation; however, the implementation of the CEMP and best practice measures would likely result in no significant effects.

Fluvial geomorphology

14.6.3 Significant impacts (either direct or residual) would be unlikely following the implementation of mitigation measures. Potential for any significant effects from the Proposed Scheme will be identified in further stages of the assessment and mitigation measures designed as required.

Groundwater

14.6.4 Given the sensitivity and importance of the environmental attributes in the study area, including potential GWDTEs and groundwater abstractions, the potential impacts from changes to groundwater levels and flows and pollution from accidental spillages and routine runoff are all considered to be potentially significant if appropriate and adequate mitigation (as outlined in section 14.5) is not implemented during both the construction and operational phases. However, it is anticipated that with mitigation measures in place the Proposed Scheme would not have a significant residual effect on the groundwater environment.

WFD

14.6.5 With appropriate mitigation in place, significant impacts (either direct or residual) on WFD water bodies would be unlikely; however, due to the nature and scale of the works, a detailed compliance assessment will be undertaken, as described in Appendix K.

Flood risk

14.6.6 As the Proposed Scheme crosses a number of main rivers it is likely that some loss of floodplain would occur. It is anticipated that with mitigation it is unlikely that there would be any residual significant effects on flood risk.

14.6.7 Mitigation will be incorporated to comply with Government guidance, legislation and DMRB standards which would result in no significant effects. The nature and extent of mitigation required will be determined through the FRA and drainage strategy.

14.7 Assessment methodology

14.7.1 Discussions have been held with the Environment Agency in October 2019 and July 2020, and the proposed assessment methodologies agreed for flood risk, geomorphology, groundwater, water quality and WFD.

DMRB LA 113 gives guidance on the assessment and management of the impacts that new construction, improvement, technology and maintenance projects may have on the water environment.

Surface water quality

14.7.2 The guidance contains a Simple level assessment methodology for assessing the five aspects of the water environment:

- effects of routine runoff on surface waters (previously known as Method A)
- assessing the effects of a scheme on GWDTEs
- effects of routine runoff on groundwater (previously known as Method C)
- pollution impacts from spillages (previously known as Method D)
- assessing flood impacts (previously known as Methods E and F)

14.7.3 The assessment criteria for assessing the value of water environment receptors and the magnitude of impacts are included in Appendix C. The significance of effects will be assessed in line with DMRB LA 104 (see chapter 5).

14.7.4 The assessment of the impact of the Proposed Scheme on surface water quality at outfalls will follow the Highways England Water Resources Assessment Tool (HEWRAT) methodology. Data used for the HEWRAT assessment will be derived from the drainage strategy.

14.7.5 Q95 low flow values will be derived from gauging station data available on the NFRA website or a simple desk-based assessment using readily available data.

Fluvial geomorphology

14.7.6 Additional guidance to be used for the assessment for fluvial geomorphology includes:

- C786 Culvert Design and Operation Guide (CIRIA, 2019)
- C753 SuDS Manual (CIRIA, 2015)
- C763 River Weirs Guide (CIRIA, 2016)
- Scottish Environment Protection Agency (SEPA) Good Practice Guide: Outfall and Intake (SEPA, 2019)
- SEPA Good practice guide: River crossings (SEPA, 2010)

14.7.7 A simple geomorphology assessment will be carried out, which will include a desk-based study using the sources outlined in section 14.3 and potential field survey to support the desk-study, if practicable.

14.7.8 Field surveys, if practicable, will involve non-invasive river reconnaissance surveys where a qualified fluvial geomorphologist will identify geomorphic features and processes along the channel to inform the EIA. As there is no prescriptive methodology in terms of river reconnaissance surveys, all observations will be based on the professional judgement of a qualified fluvial geomorphologist.

14.7.9 A preliminary WFD assessment has been undertaken in parallel to this scoping assessment and is included in Appendix K. This has concluded that a detailed WFD compliance assessment will be required. The WFD compliance assessment will determine whether any elements of the Proposed Scheme could risk WFD water body deterioration and will also detail potential mitigation and benefits that could be incorporated in order to enable no likely deterioration. The following guidance documentation will be referred to during the assessment:

- Water Framework Directive assessment operating instruction (Environment Agency, 2019)
- Water Framework Directive Advice Note 18 (Planning Inspectorate, 2017)

Groundwater

14.7.10 Data to be used (in addition to those listed in section 14.3) for the assessment of impacts to groundwater will include:

- Environment Agency 'Water Quality Archive'
- Environment Agency licensed water abstractions and permitted discharges
- Environment Agency pollution incidents
- Unlicensed groundwater abstractions (obtained from the local authority)
- Results from the site specific GI, including groundwater level monitoring data and groundwater quality data
- Results from walkover surveys to determine the groundwater dependency of potential GWDTEs

14.7.11 The assessment to determine the significance of effects for the groundwater environment will largely be by qualitative assessments based on professional judgement. This will include establishing a conceptual site model as outlined in Appendix A of DMRB LA 113 to include details of:

- groundwater flow directions
- depth to groundwater
- aquifer layering and hydraulic characteristics
- groundwater quality
- groundwater interaction with surface water and GWDTEs

14.7.12 The conceptual site model will be used to determine how the construction and operation of the Proposed Scheme could impact on identified groundwater receptors and how impacts could vary over time with the different phases of work.

14.7.13 If required from the qualitative assessment, simple calculations to identify potential zones of influence and drawdown from cuttings or borrow pits will be undertaken to better define the effects of dewatering or mitigation measures required.

14.7.14 In relation to the potential impacts on GWDTEs, Highways England's GWDTE screening assessment methodology (DMRB LA 113, Appendix B) will be used. This takes a stepped, risk based approach which establishes linkages between potential impacts from the road development on the hydrogeological regime and a GWDTE. The simple assessment determines whether there is a hydrogeological link with the GWDTE. If a potential GWDTE can be clearly scoped out because of no linkage in the conceptual site model, then the GWDTE will not be considered further. If the conceptual site model indicates that there could be a plausible link then the groundwater dependency of each site will be identified as described in DMRB LA 113. DMRB LA 113 Section 3.19 states: "*where scoping concludes the potential for a likely significant effect on a GWDTE, a simple assessment shall be undertaken*". This simple assessment will be undertaken at the PEIR stage. More detailed assessment and the design of mitigation will then be undertaken if potential for significant effects are identified.

14.7.15 To assess the impacts from operational discharges or spillages to ground or small streams, Highways England's HEWRAT methodology (DMRB LA 113, Appendices C and D) will be used to determine the potential for significant effects and if further mitigation is needed. The methods are based on the 'source-pathway-receptor' pollutant linkage principle. The key factors affecting the persistence and movement of pollutants within the pathway from discharge to the water table are determined and a scoring system is used to determine the overall risk (high, medium or low). This will help to identify which parameters are associated with the greatest risk and therefore where more detailed assessment or mitigation would be most usefully targeted.

14.7.16 The proposed qualitative assessment and simple calculations are considered adequate to assess the impacts of groundwater dewatering. No groundwater modelling for the Proposed Scheme is proposed.

14.7.17 The ES will be supported by a groundwater baseline appendix, providing baseline data, GWDTE assessment and impact calculations (if required).

14.7.18 By utilising the above methodology, this will satisfy NNNPS policy requirements in relation to groundwater (see section 14.1).

Flood risk

14.7.19 A FRA will be undertaken for the Proposed Scheme. The FRA will be produced in accordance with the technical guidance to the National Planning Policy Framework (NPPF). The FRA will demonstrate compliance with the requirements of the NPPF, specifically, that the Proposed Scheme will:

- remain operational and safe for users in times of flood
- result in no net loss of floodplain storage

- not impede water flows
- not increase flood risk elsewhere

14.7.20 The flood risk design criteria and requirements for the FRA have been agreed and will be further developed through consultation with the Environment Agency, the LLFA (Essex County Council) and other relevant stakeholders.

14.7.21 The scope of the FRA will include:

- assessment of flood risk to the Proposed Scheme due to fluvial, surface water and groundwater flood risk, as well as the potential for flooding from water retaining, water supply or drainage infrastructure
- assessment of change in flood risk from all sources
- hydraulic modelling of main rivers where significant impacts are envisaged
- hydraulic modelling of minor watercourses where significant impacts are envisaged
- design of mitigation measures to prevent adverse impact on flood risk
- the completion of the Sequential and Exception Tests

14.7.22 Hydraulic modelling of the major watercourses in the study area is being progressed to confirm baseline fluvial flood risk, inform the design process and will be used to assess the impact of the Proposed Scheme. Early liaison has been undertaken with the Environment Agency to review the baseline hydraulic models.

14.7.23 Data sources (in addition to those listed in section 14.3) that will be used to inform the assessment include:

- Hydraulic modelling developed for the Proposed Scheme assessment for main rivers and minor watercourses where significant impacts are envisaged
- Groundwater Flooding Susceptibility (British Geological Survey) dataset

14.8 Assessment assumptions and limitations

14.8.1 The scoping report has been produced at an early stage in the Proposed Scheme where the designs, proposed construction methodology and phasing are still in development and currently unavailable. As such, the assessment may change as the design evolves.

14.8.2 At this stage, the assessment has been based on readily available web-based data sources and technical judgement. Early hydraulic modelling has been progressed and these results have been used where available. The Envirocheck report (Landmark Information Group, 2016) may be outdated so data which may be out of date will be supplemented with data received from requests to organisations such as the Environment Agency.

14.8.3 Topographic surveys have been undertaken to inform hydraulic modelling but no site walkover surveys have been completed to date to inform the assessment of impact. The current intention is to undertake site walkover (non-intrusive) surveys to inform the assessment of impact. The ground investigation will inform the assessment of hydrogeological impacts.

14.8.4 The assessment is currently based on a scheme boundary with only outline details on road design or construction activities. Construction activities including site compound activities, the use of access tracks and/or haul roads have been assumed and may change depending on design evolution. Also, highway structures, such as road crossings and outfalls are still in the early stages of design, and therefore, identified impacts have been based on impacts which may change as design details progress.

14.8.5 Drainage surveys are currently ongoing to confirm existing drainage assets and their location.

Surface water quality

14.8.6 Q95 values assigned to watercourses have been estimated using readily available NRFA data.

14.8.7 It is not considered appropriate at this stage to identify each of the numerous un-named watercourses or ponds as individual receptors. Based upon the criteria for establishing importance in DMRB LA 113 the un-named watercourses and ponds have all been assigned the same level of importance. Ponds and un-named watercourses are unlikely to be more than low importance. However, a precautionary approach has been taken and therefore all are assessed as medium. Watercourses flowing through a site designated for nature conservation purposes may be valued higher; in these cases professional judgement is applied.

Groundwater

14.8.8 As indicated in the baseline text, for groundwater a number of data sets still need to be obtained. At this stage this includes more detail of the licensed groundwater abstractions, the presence of any unlicensed groundwater abstractions (those less than 20m^3/day) and further details of potential GWDTEs to determine the actual groundwater dependency of these features. For the purposes of scoping, it has assumed that these groundwater receptors will be present and they will be included in the assessment of impacts. Data requests have been made to the Environment Agency and local authorities to obtain these data. The locations of permitted discharges to ground or groundwater also needs to be established.

14.8.9 This scoping report has been produced prior to reporting of GI results. An assessment of data from the GI will be included in the PEIR if available at that time. Assessment of the data will determine the impact on the groundwater regime.

14.8.10 It is still to be determined which locations would be utilised for borrow pits. This is to be decided following receipt of GI information indicating which locations would provide the most suitable material. Depending on which borrow pit is selected, then there is the potential for greater or lesser impacts on the groundwater environment.

14.8.11 Controlled discharge to ground using infiltration techniques would be the preferred drainage option (subject to outcome of GI results and feasibility of using infiltration techniques). Any discharges to ground (which may be via unlined ditches or ponds, filter drains etc) may require groundwater risk assessment.

Flood risk

14.8.12 Information regarding baseline flood risk has predominantly been obtained from desk-based sources but has also utilised our hydraulic modelling results where available. Baseline fluvial flood risk has been considered based on the Environment Agency's Flood Map for Planning (Environment Agency 2020). Whilst this provides flood risk associated with main rivers, the risk of flooding from ordinary watercourses has not been accounted for. For this scoping report the RoFSW mapping is considered to give a reasonable representation of the risk associated with ordinary watercourses.

14.8.13 The hydraulic modelling used for the Flood Map for Planning is likely to be broad scale modelling in places and therefore unlikely to always give an accurate representation of flood risk. It also does not incorporate an allowance for climate change. Hydraulic modelling will be completed by Highways England to inform the identification of flood risk on Main Rivers in the study area and to inform the FRA. The hydraulic modelling will include the appropriate allowances for climate change.

14.8.14 Information regarding baseline susceptibility to groundwater flooding has been obtained from the relevant SFRAs and does not take into account any ground investigation.

15. Climate change

15.1 NNNPS requirements

15.1.1 The National Networks National Policy Statement (NNNPS) sets out the Government's policies to deliver the development of Nationally Significant Infrastructure Projects (NSIP) on the national road and rail networks in England. The Secretary of State (SoS) uses the NNNPS as the primary basis for making decisions on Development Consent Order (DCO) applications.

15.1.2 Key policy from the NNNPS relevant to this aspect includes:

- Paragraph 4.40 states that new national networks infrastructure should typically be long-term investments which should remain operational over many decades, in the face of a changing climate. Therefore, applications should consider the impacts of climate change when planning location, design, build and operation.
- Paragraph 4.42 states that applications should consider the potential impacts of climate change, over the estimated lifetime of the new infrastructure, using the latest UK Climate Projections available at the time, and that any environmental statement which is prepared should identify appropriate mitigation or adaptation measures.
- Paragraph 4.43 states that applications should demonstrate that there are no critical features of the design of new national networks infrastructure which may be seriously affected by more radical changes to the climate beyond that projected in the latest set of UK climate projections.
- Paragraph 5.17 states that applicants need to consider carbon impacts as part of the appraisal of scheme options and to describe an assessment of any likely significant climate factors within the Environmental Statement. The NNNPS states that it is very unlikely that the impact of a road project will, in isolation, affect the ability of the Government to meet its carbon reduction targets. However, the NNNPS requires that applicants should provide both evidence of the carbon impacts of a scheme and an assessment of these impacts against the Government's carbon budgets.
- Paragraph 5.19 outlines the need for appropriate climate mitigation measures to be implemented, in both design and construction of a road scheme, so that the associated carbon footprint is not unnecessarily high.

15.2 Study area

15.2.1 In line with the Design Manual for Roads and Bridges (DMRB) LA 114 Climate (Highways England, 2019), different study areas are required to be defined for each matter considered. As such, the following study areas are defined:

- Greenhouse gas (GHG) emissions resulting from the consumption of materials (i.e. embodied carbon), their transportation and construction activities associated with both permanent and temporary works - the study area comprises the construction footprint of the Proposed Scheme, including compounds and temporary land take (where materials would be used and construction activities would occur), and the region of the East of England (from where the majority of materials are likely to be sourced and transferred to the construction site).

- GHG emissions resulting from operation and maintenance - the study area comprises the footprint of the permanent works for the Proposed Scheme (where energy would be consumed for infrastructure operation (e.g. lighting) and maintenance would be undertaken).
- GHG emissions resulting from operational road users - the study area comprises the road network included within the Traffic Reliability Area (TRA) of the traffic model developed for the Proposed Scheme (as shown in figure 6.1).
- The Proposed Scheme's vulnerability to climate change - the study area comprises the construction footprint of the Proposed Scheme, including compounds and temporary land take.

15.2.2 The Proposed Scheme design and boundary is shown on figure 1.1 (Appendix A).

15.3 Baseline conditions

Baseline sources

15.3.1 For the purposes of this scoping report, baseline conditions have been established with reference to the following information sources:

- Carbon dioxide (CO_2) emissions at a UK, regional and county level - UK local authority and regional CO_2 emissions national statistics: 2005-2018 (BEIS, 2020)
- Current climate data for England and the East of England region - HadUK-Grid regional observations dataset v1.0.1.0 for the "climate normal" period of 1981-2010 (Met Office et al., 2019)
- Projected climate data for the East of England - UK Climate Projections 2018 (UKCP18), under the high emissions scenario (i.e. Receptor Concentration Pathway 8.5 (RCP8.5)) and for a 50% probability of occurrence (Met Office, 2020)
- Climate extreme indices - State of the UK Climate 2017: Supplementary Report on Climate Extremes (Met Office, 2018)
- Historical flooding events and areas at flood risk – see chapter 14, road drainage and water environment
- Potential geological hazards e.g. subsidence, landslides – British Geological Survey GeoIndex and GeoClimate UKCP09 Open (BGS, 2020)

Baseline information

GHG emissions

15.3.2 With regard to baseline conditions, DMRB LA 114 indicates that:

- GHG emissions without the project shall be identified for the current and future (Do Minimum) baseline scenarios
- the boundary of the baseline GHG emissions should include current operational maintenance GHG emissions and operational road user GHG emissions
- the baseline GHG emissions should be consistent with the study area outlined for the project

15.3.3 At the time of writing, no quantitative information was available on current baseline operational maintenance or operational road user GHG emissions within the study areas defined in section 15.2. Therefore, in order to understand current baseline GHG emissions going forwards, current baseline operation road user and operational maintenance GHG emissions will be estimated, or collated where existing information is available (e.g. GHG emissions estimated by, or on behalf of, Highways England for current baseline maintenance activities associated with the existing assets). This will be reported in the Preliminary Environmental Information Report (PEIR) and Environmental Statement.

15.3.4 In the absence of current baseline information relevant to the study area for the Proposed Scheme, baseline conditions have been established for the purposes of this scoping report with reference to estimated CO_2 emissions by source within Essex (as shown in table 15.1). Data are also presented for England and the East of England region to provide context. These data are derived from the UK National Atmospheric Emissions Inventory (NAEI) and the Department for Business, Energy & Industrial Strategy (BEIS) national statistics of energy consumption for local authority areas (BEIS, 2020).

15.3.5 Estimated CO_2 emissions within Essex in 2018 totalled 7,103 kilotonnes (kt), representing approximately 21.9% of total estimated CO_2 emissions within the East of England and 2.5% of total estimated CO_2 emissions within England.

15.3.6 Road transport CO_2 emissions are estimated to comprise a significant proportion of the total CO_2 emissions within Essex (49%), the East of England (43%) and England (36%). A-roads, including the A12 of which the Proposed Scheme would form part of, are estimated to contribute approximately 20% of the total CO_2 emissions within Essex and the East of England, and 16% of the total CO_2 emissions within England.

15.3.7 In total, road transport emissions within Essex are estimated to contribute 24.9% of total road transport CO_2 emissions within the East of England and 3.4% of total road transport CO_2 emissions in England. Of this contribution, approximately 50% is considered potentially attributable to road traffic emissions from the Strategic Road Network (SRN) within Essex.

Table 15.1: England, East of England and Essex CO_2 emissions estimates by source (2018)

Emission source	Estimated 2018 CO_2 emissions					
	England		East of England		Essex	
	kt	% of total	kt	% of total	kt	% of total
Industry and commercial electricity	34,138	12%	3,607	11%	678	10%
Industry and commercial gas	29,742	11%	3,120	10%	472	7%
Large industrial installations	20,560	7%	584	2%	37	1%
Industrial and commercial 'other fuels'	12,726	5%	1,799	6%	332	5%
Agriculture	3,512	1%	366	1%	66	1%

Emission source	Estimated 2018 CO_2 emissions					
	England		East of England		Essex	
	kt	% of total	kt	% of total	kt	% of total
Industry and commercial total	**100,678**	**36%**	**9,476**	**29%**	**1,586**	**22%**
Domestic electricity	20,718	7%	2,498	8%	611	9%
Domestic gas	52,145	19%	5,458	17%	1,380	19%
Domestic 'other fuels'	6,360	2%	923	3%	162	2%
Domestic total	**79,223**	**28%**	**8,879**	**27%**	**2,152**	**30%**
Road transport (A roads)	44,021	16%	6,595	20%	1,424	20%
Road transport (motorways)	26,441	9%	2,786	9%	801	11%
Road transport (minor roads)	31,371	11%	4,471	14%	1,221	17%
Diesel railways	1,607	1%	146	0%	14	0%
Transport other	1,960	1%	308	1%	52	1%
Transport total	**105,399**	**38%**	**14,305**	**44%**	**3,512**	**49%**
Land use, land-use change, and forestry (LULUCF) net emissions	-5,341	-2%	-214	-1%	-147	-2%
Total	**279,960**	**-**	**32,447**	**-**	**7,103**	**-**

Vulnerability

15.3.8 With regard to baseline climate impacts DMRB LA 114 indicates that:

- the assessment of a project's vulnerability to climate change shall use published historical regional weather data to demonstrate the current climate impacts on a study area
- recent weather patterns and extreme weather events should be identified to provide an indication of how the project will account for climate change in the immediate future (i.e. during construction)
- historical events as a result of weather patterns and extreme weather events (i.e. landslides after heavy rainfall) shall be identified to provide an indication of past vulnerability

15.3.9 As such, baseline climate data for the East of England are summarised in table 15.2, based on data for the most recent 'climate normal' period available from the Met Office (i.e. 1981-2010). These data have been compared to similar data for England as a whole, which indicate that:

- the climate in the East of England region is warmer compared to the rest of England, throughout the year, with the most sizeable differences recorded during summertime

- the climate in the East of England region is drier compared to the rest of England, throughout the year, with the greatest difference in precipitation being in wintertime

Table 15.2: Baseline climate data (1981 – 2010) for England and the East of England region

Climate variable	Period	England	East of England	Difference
Daily maximum temperature (°C)	Annual	13.4	14.2	+0.8
	Winter	7.1	7.3	+0.2
	Spring	12.7	13.4	+0.7
	Summer	20.1	21.3	+1.2
	Autumn	13.9	14.6	+0.7
Daily minimum temperature (°C)	Annual	5.9	6.1	+0.2
	Winter	1.3	1.4	+0.1
	Spring	4.4	4.7	+0.3
	Summer	10.9	11.4	+0.5
	Autumn	6.8	7.1	+0.3
Daily mean temperature (°C)	Annual	9.6	10.2	+0.6
	Winter	4.2	4.3	+0.1
	Spring	8.5	9.0	+0.5
	Summer	15.5	16.3	+0.8
	Autumn	10.3	10.9	+0.6
Mean accumulated precipitation (mm)	Annual	855	622	-233
	Winter	230	146	-84
	Spring	181	137	-44
	Summer	194	160	-34
	Autumn	250	179	-71

15.3.10 An overview of historical and more recent extreme weather conditions recorded in the East of England is presented in table 15.3, based on data contained within the State of the UK Climate 2017: Supplementary Report on Climate Extremes (Met Office, 2018). These data indicate that:

- maximum temperatures in the East of England region are higher than across England as a whole, and appear to be increasing
- the duration of 'warm spells' is shorter in the East of England region than across England as a whole (potentially as a result of coastal influences on meteorology), however they appear to be increasing
- the duration of 'cold spells' and number of 'icing days' are lower in the East of England region than across England as a whole, and appear to be decreasing
- rainfall from 'extremely wet days' is lower in the East of England region than across England as a whole, but appears to be increasing

- maximum '5-day precipitation' is lower in the East of England region than across England as a whole, and appears to be decreasing
- the 'longest dry spell' is longer in the East of England region than across England as a whole, and appears to be decreasing

Table 15.3: Summary of climate extremes for England and the East of England region

Climate variable	Period	England	East of England	Difference
Highest maximum temperature [a]	1981-2010	28.3	29.9	+1.6
	2008-2017	28.5	30.3	+1.8
Warm spell duration index (days) [b]	1981-2010	10.0	8.8	-1.2
	2008-2017	15.0	13.2	-1.8
Cold spell duration index (days) [c]	1981-2010	2.8	2.8	0.0
	2008-2017	2.0	1.0	-1.0
Number of icing days [d]	1981-2010	2.5	2.0	-0.5
	2008-2017	1.9	1.0	-0.9
Rainfall from extremely wet days (mm) [e]	1981-2010	69.3	56.8	-12.5
	2008-2017	72.0	53.2	-18.8
Maximum 5-day precipitation (mm) [f]	1981-2010	67.3	53.1	-14.2
	2008-2017	65.7	51.8	-13.9
Longest dry spell (days) [g]	1981-2010	22.2	24.5	+2.3
	2008-2017	20.1	22.2	+2.1

[a] Highest daily maximum temperature recorded during the month

[b] Count of days with at least 6 consecutive days when daily maximum temperature is above the 90th percentile centred on a 5-day window for the base period of 1961-1990

[c] Count of days with at least 6 consecutive days when daily minimum temperature is below the 10th percentile centred on a 5-day window for the base period of 1961-1990

[d] Number of days when the daily minimum temperature is below 0ºC

[e] Total rainfall falling on days with daily rainfall total in excess of the 99th percentile of daily rainfall

[f] Highest value of rainfall accumulated over 5 days

[g] Largest number of consecutive days with < 1 mm rainfall

15.3.11 As detailed in section 14.3 of chapter 14, road drainage and the water environment, based on the Environment Agency's Historic Flood Map, a number of historical flood events have occurred within 1km of the Proposed Scheme, indicating a past vulnerability to flooding. These historical events are related with fluvial flooding and are closely aligned with the Flood Zone 2 extent. Internet searches and Highways England HADDMS (Highways Agency Drainage Data Management System) indicate a number of flooding events have occurred on the A12 in the vicinity of the Proposed Scheme, which appear to have affected road users.

15.3.12 Other historical events relating to tidal, surface water, fluvial and sewer flooding are also reported in chapter 14, however, these relate to the wider area in which the Proposed Scheme is located, rather than the A12 itself, and therefore are not directly indicative of past vulnerability.

15.3.13 Based on GeoIndex (BGS, 2020), no historical landslide events are recorded in the vicinity of the Proposed Scheme, and therefore no such past vulnerability has been identified at this point.

15.3.14 No records were available at the time of writing regarding past incidences of subsidence within the footprint of the Proposed Scheme.

Receptors

15.3.15 In line with the DMRB LA 114, the following receptors have been identified:

- With regard to GHG emissions:
  - UK carbon budgets (as a proxy for the global climate)
- With regard to the Proposed Scheme's vulnerability to climate change:
  - receptors associated with the construction process (including the workforce, plant and machinery)
  - the assets and their operation, maintenance and refurbishment (e.g. road pavement surfaces, structures, earthworks and drainage, technology assets, soft estate)
  - end-users (e.g. members of the public or commercial operators using the Proposed Scheme)

Future baseline

GHG emissions

15.3.16 At the time of writing, no quantitative information on future baseline GHG emissions is available. Therefore, in order to understand future baseline conditions for assessment purposes, GHG emissions will be estimated for the following as part of the PEIR and Environmental Statement:

- Operational road user GHG emissions within the study area defined in section 15.2 for the Do-Minimum scenario over a 60-year appraisal period from the Proposed Scheme opening year, as required by DMRB LA 114. This future Do-Minimum scenario will incorporate, as far as practicable, projections relating to the future decarbonisation of road transport, guided by the Department for Transport's (DfT's) projections for the uptake of low emission and electric vehicles and decarbonisation of the UK electricity grid.
- Operational maintenance GHG emissions within the study area defined in section 15.2 for the Do-Minimum scenario over a 60-year appraisal period from the Proposed Scheme opening year, as required by DMRB LA 114.

Vulnerability

15.3.17 Projected changes in climate for the East of England region, under the UKCP18 high emissions scenario and for a 50% probability of occurrence, are presented in table 15.4 for the periods 2020 – 2049, 2050 – 2079 and 2079 – 2099 (i.e. covering the 60-year appraisal period from the Proposed Scheme opening year advised by DMRB LA 114).

Table 15.4: Future climate projections for the East of England region

Climate variable	Projected change under the high emissions scenario (i.e. RCP8.5) and for a 50% probability of occurrence		
	2020 – 2049 (2030s)	2050 – 2079 (2060s)	2070 – 2099 (2080s)
Temperature			
Summer daily maximum temperature (°C)	+1.5	+3.4	+5.2
Winter daily minimum temperature (°C)	+0.9	+2.1	+3.1
Mean annual daily temperature (°C)	+1.1	+2.4	+3.6
Precipitation			
Summer mean accumulated rainfall (mm)	-11.6%	-25.3%	-34.5%
Winter mean daily accumulated (mm)	+4.8%	+11.9%	+19.1%

15.3.18 Based on the UKCP18 data for the East of England region for the period up to 2099, under the high emissions scenario and for a 50% probability of occurrence, maximum summer and minimum winter daily temperatures are projected to increase by up to 5.2°C and 3.1°C, respectively, whereas mean daily rainfall is projected to increase by up to 19.1% during winter and decrease by up to 34.5% during summer.

15.3.19 Overall, climatic changes in the region of the Proposed Scheme are projected to result in increasingly wetter and warmer winters and drier and warmer summers.

15.3.20 Based on GeoIndex (BGS, 2020) and particularly the GeoClimateUKCP09 dataset, subsidence is considered "*probable*" under "*average*" soil humidity conditions for the 2030s onwards.

Value of receptors

15.3.21 The receptors relevant to climate are outlined in the baseline information above. In the absence of specific guidance in DMRB LA 114 on the valuation of receptors with regard to climate impacts, all receptors are considered to be of equally high value.

15.4 Potential impacts

Construction

GHG emissions

15.4.1 GHG emissions would be generated during the construction phase as a result of the following activities, in alignment with modules A1 to A5 of the 'before use' life cycle stage identified in Publicly Available Specification (PAS) 2080:2016 Carbon Management in Infrastructure (BSI, 2016):

- embodied GHG emissions associated with the required raw materials (product stage (modules A1 – A3))
- transport of materials to the construction site (construction process stage (module A4))

- transport of waste from the construction site and subsequent treatment (construction process stage (module A5))
- transport of construction workers, on-site staff and visitors to and from the construction site (construction process stage (module A5))
- operation of construction plant and on-site activities (construction process stage (module A5))
- on-site consumption of fuel, electricity and water (construction process stage (module A5))
- GHG emissions mobilised by vegetation or soil losses (construction process stage (module A5))

15.4.2 Substantial increases in GHG emissions could potentially impact the global climate as a result of the cumulative impact of GHG emissions on climate change. Furthermore, as discussed in section 15.6, the UK Government has set a number of legally binding carbon budgets over different time periods, which it is required to meet. Increases in GHG emissions, should they be of sufficient magnitude, could potentially impact on the ability of Government to meet these carbon reduction targets in combination with other GHG emissions from across the UK, including other road schemes.

15.4.3 Whilst quantitative estimates of baseline and construction related GHG emissions relating to the Proposed Scheme are not currently available, due to the scale and extent of the proposed construction activities, it is expected that construction phase GHG emissions would increase by more than 1% compared to the baseline scenario (i.e. GHG emissions and energy use associated with existing maintenance activities). In accordance with DMRB LA 114, therefore, the potential impacts on climate associated with GHG emissions during the construction of the Proposed Scheme are scoped in for further assessment.

15.4.4 As per paragraph 2.3 of DMRB LA 114, GHG emissions associated with decommissioning of the Proposed Scheme (i.e. modules C1 to C4 of the 'end of life' life cycle stage identified in PAS 2080 (BSI, 2016)) are excluded from the assessment due to the length of the operational phase of the Proposed Scheme's assets.

Vulnerability

15.4.5 As identified in table 15.3, the East of England region appears to have experienced increasing temperatures and precipitation events of higher intensity in recent years. Furthermore, the projected changes in climate variables over the relatively short term (2020 – 2049) shown in table 15.4, suggest these trends will potentially continue, resulting in further increases in temperatures (especially during summer, +1.5°C) and precipitation during winter (+4.8%). Table 15.5 identifies climate related impacts on receptors during construction, including temporary works, which could potentially occur as a result of these changes.

Table 15.5: Potential impacts resulting from climate effects during construction

Climate effect	Receptor	Potential impacts
Increased temperatures, including prolonged periods of hot weather	Construction workforce	Health risks to construction workers associated with increased potential for dust generation and dispersal. Health risks to construction workers associated with higher working temperatures, such as dehydration and sunstroke.
Increased precipitation, including intense periods of rainfall	Construction workforce	Increased risk of flooding of temporary works areas, including construction compounds.
	Geotechnics	Risks to slope stability associated with changes in pore water pressure. Risk of scour and erosion of earthworks.
	Soft estate	Increased risk of contamination of waterbodies due to flooding of construction areas / compounds or through runoff.
	Scheme operator	Increased risk of disruption to supply of materials and goods required to support construction activities. Increased risk of delay to construction programme, and associated costs incurred (e.g. if staff are unable to travel to / access site due to flooding).

15.4.6 Based on the impacts described in table 15.5, the vulnerability of construction activities associated with the Proposed Scheme to climate impacts is scoped in for further assessment.

Operation

GHG emissions

15.4.7 GHG emissions during the operational phase of the Proposed Scheme would be associated with:

- maintenance and operation of the road infrastructure - through consumption of energy (e.g. through petrol or diesel combustion and use of electricity) and materials to support activities such as the repair and replacement of lighting and structures (including fencing) and highway resurfacing
- consumption of energy (e.g. through petrol and diesel combustion and use of electricity) by motorised vehicles using the road infrastructure - the Proposed Scheme has the potential to alter traffic volumes, composition and flows on the local road network, both positively and negatively, which could act to alter the magnitude of road traffic emissions
- ongoing changes in the emissions / sequestration balance within the scheme footprint associated with changes in land use, for example, through changes in the spatial extents and management of carbon sinks such as woodland

15.4.8 These emissions have the potential to impact the global climate and, should they be of sufficient magnitude, the UK Government's ability to meet legally binding carbon budgets in combination with other GHG emissions from across the UK.

15.4.9 Whilst traffic data are not currently available to understand changes in road traffic conditions as a result of the Proposed Scheme, based upon traffic modelling undertaken at previous stages, it is considered likely that the following criteria will be met or exceeded on a number of road links as a result of the operation of the Proposed Scheme:

- change of more than 10% in Annual Average Daily Traffic (AADT) flow
- change of more than 10% in Heavy Duty Vehicles (HDV)
- change in daily average speed of more than 20kph

15.4.10 In accordance with DMRB LA 114, the potential impacts on climate associated with GHG emissions during the operation of the Proposed Scheme are therefore scoped in for further assessment.

Vulnerability

15.4.11 As identified in table 15.4, projected changes in climate variables over the longer term suggest that substantial increases in temperature, especially during summer (+5.2^{o}C), and precipitation during winter (+19.1%) have the potential to occur in the East of England region. Table 15.6 sets out how changes in temperature and precipitation could affect receptors during operation of the Proposed Scheme, including infrastructure elements (e.g. structures, earthworks, drainage, road surfacing, lighting and signage, soft estate), end users, scheme operators and maintenance workers.

15.4.12 It should be noted that chapter 14 has identified sewerage infrastructure, flood defence failure, ground water, surface water and fluvial flooding as potential risks, which suggest a potential vulnerability of the Proposed Scheme to these issues.

Table 15.6: Potential impacts resulting from climate effects during operation

Climate effect	Receptor	Potential impacts
Increased precipitation, particularly in winter	Earthworks	Increased scour and erosion of earthworks. Risks to slope stability associated with changes in water levels/pore pressure.
	Pavements	Stress on road surfaces (i.e. degradation of macrotexture and reduction of texture depth, wearing away of asphalt compromising support layers).
	Soft estate	Risks to long term viability of landscape planting.
	Structures	Risk of scour to foundations.
	End users	Disruption of access to highway infrastructure as a result of flooding. Increased risk / frequency of accidents.
	Scheme operator	Increased costs associated with increased maintenance / renewal requirements.
	Maintenance workforce	Challenges for maintenance regime.

Climate effect	Receptor	Potential impacts
Increased average and peak temperatures	Pavements	Stress on road surfaces (i.e. degradation of macrotexture and reduction of texture depth, wearing away of asphalt compromising support layers).
	Structures	Stress on structures as a result of thermal loads applied to superstructure.
	Scheme operator	Increased costs associated with increased maintenance requirements.
	Technology	Overheating and subsequent failure.

15.4.13 The impacts described in table 15.6 are considered to have the potential to be significant (in the absence of appropriate mitigation). The vulnerability of the Proposed Scheme to climate change during its operation is therefore scoped in for further assessment.

Summary of scope

15.4.14 Table 15.7 summarises the proposed scope for the climate aspect.

Table 15.7: Summary of climate scope

Matter	Sub-matter	Scoped in - construction	Scoped in - operation
GHG emissions	Product stage (embodied carbon in construction materials)	✓	✓[a]
	Transport of construction materials to site	✓	✓[a]
	Fuel consumption (on-site plant and machinery)	✓	✓[a]
	Fuel consumption (all staff vehicles)	✓	✓[a]
	Electricity, natural gas and water consumption	✓	✓
	Transportation, treatment and disposal of waste materials	✓	✓[a]
	Land use change and forestry	✓	✓
	Road users	N/A	✓
Vulnerability of scheme to climate change	Changes in seasonal precipitation and temperature	✓	✓
	Increased frequency of extreme precipitation and temperature events	✓	✓

[a] During maintenance activities (including repair, replacement and refurbishment).
N/A: Not applicable

15.5 Design, mitigation and enhancement measures

GHG emissions

15.5.1 DMRB LA 114 indicates that all projects should seek to minimise GHG emissions to contribute to the UK's target for a net reduction in carbon emissions.

15.5.2 The following options will therefore be considered when identifying potential opportunities to reduce GHG emissions (in the order of priority shown):

- Avoid / prevent:
  - maximise the potential for re-using and refurbishing existing assets to reduce the extent of new construction required, and explore alternative whole life lower carbon options to deliver the project objectives (e.g. design modifications which result in the consumption of fewer materials)
  - identify through project and delivery programmes opportunities to influence road user GHG emissions
- Reduce:
  - apply whole life lower carbon and reduced resource consumption solutions (including construction methodologies, technologies, materials and products) to reduce resource consumption during the construction, operation, and at end of life
- Remediate:
  - identify, assess and integrate measures to further reduce carbon through on or off-site offsetting or sequestration

15.5.3 Indicative opportunities to reduce the magnitude of GHG emissions associated with construction activities include:

- reduce the use of resources, and maximise the use renewables or materials with recycled or secondary content to reduce the amount of carbon embodied in the construction materials
- reduction of import and export of fill and materials
- using lower carbon and more energy efficient construction plant and machinery such as hybrid electric, hydrogen or alternative lower carbon fuels

15.5.4 Indicative opportunities to reduce the magnitude of GHG emissions associated with the maintenance of the Proposed Scheme include:

- designing, specifying and constructing the scheme with a view to increasing the operational lifespan of surfaces and structures and reducing the need for maintenance
- employing modular construction techniques to reduce on-site maintenance requirements and / or allow the use of lower carbon replacements in the future
- making adequate provision to support the use of low emission vehicles where appropriate

- specifying high efficiency and low emission mechanical and electrical equipment such as LED lighting and signal gantries
- maintaining equipment using current best practice techniques

15.5.5 The creation and enhancements of additional ecological habitats and / or tree planting could also potentially be used to offset some GHG emissions through natural sequestration.

Vulnerability

15.5.6 Up-to-date design and construction standards, along with good engineering practice, are expected to be applied to the design and construction of the Proposed Scheme. The use of such adaption measures, which will be embedded in the design of the Proposed Scheme, is expected to secure the resilience of the Proposed Scheme for its whole lifecycle.

15.5.7 Specific mitigation measures identified as being relevant to the construction stage include:

- modular design and off-site construction, to reduce on-site construction activities where it is practicable to do so
- installing site compound drainage that has sufficient capacity to withstand extreme precipitation events (potentially even re-using this water (e.g. for dust suppression) to reduce overall water consumption)
- undertaking additional inspections of material stockpiles and structures during and following extreme weather events (e.g. floods, heatwaves, storms) to ensure stability and incorporating such measures into materials management plans
- proactively managing work patterns / automating work to avoid human exposure to extreme temperatures and, where this is not possible, the provision of appropriate personal protective equipment (e.g. sun cream) and facilities (e.g. cool rooms and shade) for workers during high temperature periods
- allowing sufficient time within the construction programme to accommodate a reduction of risks to site operatives, plant and machinery and other elements of the scheme associated with periods of high temperature and prolonged periods of heavy precipitation

15.5.8 The following mitigation measures would potentially help reduce the vulnerability of the Proposed Scheme to climate effects during operation:

- developing the Proposed Scheme design (in particular the drainage system) with reference to Environment Agency and Local Lead Flood Authority guidance regarding peak rainfall (including appropriate climate change allowances)
- avoid or reduce the positioning of permanent structures within channels or within the floodplain and provision of flood compensation storage
- slope stabilisation measures (ideally low impact measures, which avoid the use of concrete)
- designing and specifying pavement construction, expansion joints and other elements which are resilient to projected increases in peak summer temperatures

- designing and specifying pavement construction, drainage systems, embankments and other elements with a view to projected changes in precipitation characteristics as well as increased variability of ground conditions (wetting and drying)
- proactively planning the need for and location of material stockpiles etc., with regard to weather forecasts and the potential for extreme weather events (e.g. as part of materials management plan)
- specifying regular inspection of drainage infrastructure, materials and structures to identify any deterioration along with additional inspections after extreme weather events

15.6 Description of the likely significant effects

GHG emissions

15.6.1 In December 2015, the Paris Agreement, a global climate agreement, was adopted. The central aim of the Paris Agreement, which was ratified and entered into force in November 2016, is to strengthen the global response to the threat of climate change by keeping the rise in average global temperature this century well below 2ºC above pre-industrial levels, and to pursue efforts to limit the temperature increase even further to 1.5 ºC. The UK was one of the 160 countries which signed this agreement.

15.6.2 The UK's response to meeting its commitments under the Paris Agreement resulted in an amendment to the Climate Change Act 2008, within which the UK Government has committed to reduce emissions by at least 100% of 1990 levels (net zero) by 2050.

15.6.3 To meet this carbon reduction target, the UK Government has set five-yearly carbon budgets, which currently run until 2032. They restrict the amount of GHG the UK can legally emit in a five-year period.

15.6.4 The Proposed Scheme has the potential to result in an increase in GHG emissions as a result of its construction and operational phase emissions. Whilst any increase in GHG emissions can be considered a negative impact, due to the cumulative effect of GHG emissions on the global climate, the magnitude of any increase in GHG emissions as a result of the Proposed Scheme is considered unlikely to have a material impact on the ability of Government to meet its carbon reduction targets (as advised by the NNNPS and LA 114). As such, the effect of the Proposed Scheme on GHG emissions is considered unlikely to be significant.

15.6.5 It is noted, however, that the Committee on Climate Change (CCC) will publish its recommendation on the level of the sixth carbon budget in December 2020. The sixth carbon budget, required under the Climate Change Act, will provide ministers with advice on the volume of GHGs the UK can emit during the period 2033-2037. Most importantly, it will set the path towards the UK's 2050 net-zero emissions target, as the first carbon budget to be set into law following that commitment. As such, the sixth carbon budget will be substantially lower than the third, fourth and fifth UK carbon budgets set to-date.

15.6.6 However, whilst the estimated change in GHG emissions as a result of the Proposed Scheme will be larger in relative terms compared to the forthcoming sixth carbon budget than to the fifth carbon budget, for example, the estimated change in GHG emissions as a result of the Proposed Scheme within the sixth carbon budget period will still be extremely small relative to this budget. As such, it is not expected that the impact of the Proposed Scheme will materially hinder the UK Government from meeting the sixth carbon budget.

Vulnerability

15.6.7 The climate assessment will identify how the project can be adapted to protect it from future climate change in order to reduce any potential impacts so as to be not significant.

15.7 Assessment methodology

GHG emissions

15.7.1 An assessment of the net change in GHG emissions associated with the Proposed Scheme against UK government carbon budgets (in metric tonnes of carbon dioxide equivalent (tCO_{2e})) will be undertaken in accordance with DMRB LA 114, and as required by the NNNPS. As the construction and operational phases of the Proposed Scheme would extend over multiple carbon budget periods, GHG emissions will be reported against each relevant carbon budget, for the construction and operation phases respectively. An assessment will then be made, based on professional judgement, as to whether increases in GHG emissions as a result of the Proposed Scheme would have a material impact on the ability of the UK Government to meet its carbon reduction targets (and would therefore potentially be significant).

15.7.2 GHG emissions associated with the Proposed Scheme will be estimated using the following methods and data sources, as summarised in table 15.8:

- Embodied carbon and construction activities - using the Highways England Carbon Tool v.2.3, based on the bill of quantities, mass haul, enabling works activities and waste management plans for the Proposed Scheme and anticipated construction activities and processes.
- If there is likely to be substantial tree planting or losses as a result of the Proposed Scheme – using the Woodland Carbon Code Carbon Calculation Spreadsheet.
- If there is likely to be substantial land use changes or changes to the carbon stock as a result of the Proposed Scheme – using appropriate emission and sequestration factors such as those reported by Natural England (Natural England, 2012) and changes in the areas of various land uses.
- Operational road users – using the methodology set out in the Transport Analysis Guidance (TAG) Data Book (DfT, 2020) and traffic data for the Do-Minimum and Do-Something scenarios in the Opening Year and Design Year of the Proposed Scheme. Emissions would then be interpolated between the Opening Year and Design Year, and assumed to remain constant thereafter, in order to estimate GHG emissions over the assumed 60-year life span of the Proposed Scheme. The TAG Data Book approach is proposed to be used (as opposed to Highway's

England's speed band emission factors, for example) so as to take account of more recent vehicle fleet composition projections and GHG emissions associated with the electricity consumed by electric vehicles.

- Operational electricity consumption – using electricity emission factors (BEIS, 2020) and estimated electricity consumption by year.
- Embodied carbon and operational maintenance and asset replacement activities – using the Highways England Carbon Tool v.2.3 and assumptions regarding likely maintenance activities.

Table 15.8: Summary of GHG emissions estimation methods by source

Emissions source	Emission estimation methodology	Data sources
Product stage (embodied carbon in construction materials)	Highways England Carbon Tool (v.2.3)	Estimated types and quantities of materials / items (including mass haul and soil stabilisation assumptions)
Transport of construction materials to site		Estimated distances from suppliers to site
Energy consumption (on-site plant and machinery)		Anticipated type, number, power rating, load and operating hours of construction plant
Energy consumption (staff vehicles)		Estimated distances travelled to / from site
Electricity, gas and water consumption (construction)		Anticipated on-site electricity, gas and water consumption
Transportation, treatment and disposal of waste materials		Estimated type, quantities, disposal method and transportation distances
Maintenance activities		Assumptions regarding likely maintenance activities and frequencies
Replacement of assets at end of design life		Design life of assets to calculate number of replacement cycles within the study reference period
Land use change and forestry	Natural England; Carbon storage by habitat: Review of the evidence of the impacts of management decisions and condition of carbon stores and sources (NERR043) Woodland Carbon Code Carbon Calculation Spreadsheet (v2.3, May 2020)	Type and area of land use lost / gained Number of trees, type and planting / management plans.
Electricity consumption (operation)	Electricity emission factors (BEIS, 2020)	Anticipated electricity consumption (e.g. for lighting)
Road users	TAG Databook (DfT, 2020)	Modelled traffic data

15.7.3 Whilst the assessment will primarily be guided by DMRB LA 114, reference will also be made, where relevant and appropriate to do so, to the following:

- Assessing Greenhouse Gas Emissions and Evaluating their Significance (IEMA, 2017)
- PAS 2080: Carbon Management in Infrastructure (BSI, 2016)
- Woodland Carbon Code Carbon Calculation Guidance (WCC, 2018)
- Highways England Carbon Tool Guidance (Highways England, 2020)

Vulnerability

15.7.4 For the assessment of the Proposed Scheme's vulnerability to climate impacts, the following will be included, in line with DMRB LA 114, and as required by the NNNPS:

- detailed receptor identification for the construction and operation phase, in liaison with the Proposed Scheme design team
- analysis of current and projected baseline climate conditions, at a finer resolution than presented herein, utilising appropriate UKCP18 datasets in order to identify any likely significant climate changes and likely project exposure to these changes
- identification of adaptation measures for any significant impacts, in liaison with the Proposed Scheme design team and relevant environmental discipline specialists

15.7.5 Once the climate change impacts have been identified, a qualitative risk assessment of those impacts on the identified receptors will be undertaken with reference to the indicative framework set out in Table 3.39a (likelihood categories) and Table 3.39b (measure of consequence) of DMRB LA 114 (replicated in Appendix C).

15.7.6 The likelihood and consequence of each impact will then be combined in the form of a matrix to subsequently identify the significance of each impact as per Table 3.31 (significance matrix) of DMRB LA 114 (replicated in table 15.9).

Table 15.9: Evaluation of significance

		Measure of likelihood / sensitivity				
		Very Low	Low	Medium	High	Very High
Measure of consequence	Very large	Not significant	Significant	Significant	Significant	Significant
	Large	Not significant	Not significant	Significant	Significant	Significant
	Moderate	Not significant	Not significant	Significant	Significant	Significant
	Minor	Not significant	Not significant	Not significant	Not significant	Not significant
	Negligible	Not significant	Not significant	Not significant	Not significant	Not significant

15.7.7 For the construction phase, a qualitative description of disruption risk will be reported.

15.7.8 Where appropriate, the assessment approach will also consider the principles set out in the Institute of Environmental Management and Assessment (IEMA) Environmental Impact Assessment Guide to: Climate Change Resilience & Adaptation (IEMA, 2020).

15.8 Assessment assumptions and limitations

15.8.1 In line with DMRB LA 114, a proportionate approach will be applied to capture the principal contributing factors associated with GHG emissions, as such, some minor sources of GHG emissions may not be considered. Should any specific emission sources, for which emissions could potentially be estimated, be excluded from the assessment of GHG emissions, justification will be provided.

15.8.2 A small number of assumptions will need to be made within the assessment when estimating GHG emissions (e.g. regarding likely maintenance activities and frequencies). Wherever assumptions are made, however, this will be made clear, and justification provided as to the assumptions made wherever possible.

15.8.3 Limited data may be available regarding GHG assumptions associated with existing operational electricity consumption and operational maintenance activities. Assumptions may therefore need to be made to estimate Do-Minimum GHG emissions associated with these activities. Should assumptions need to be made, these assumptions will be consistent, as much as possible, with those made for the Do-Something scenario (where relevant) so as to provide as direct a comparison of Do-Minimum and Do-Something GHG emissions as possible.

15.8.4 Assumptions regarding the composition of the national vehicle fleet (in particular the proportion of electric vehicles in the fleet) have the potential to have a substantial influence on estimated operational road user GHG emissions. It is recognised, however, that there is uncertainty in the composition of the national vehicle fleet in future years, particularly in response to future government policy (e.g. the proposed ban on the sale of petrol and diesel cars and vans). Whilst the assumptions regarding fleet composition contained within the TAG Data Book are considered the most robust estimates currently available, it is proposed that emission calculations will also be undertaken for a ‘more optimistic’ and a ‘less optimistic’ scenario, to illustrate the sensitivity of estimated operational road user GHG emissions to these assumptions. It is proposed that the ‘less optimistic’ scenario would use the latest version of Highway’s England’s speed band emission factors (which are based on version 9.0 of Defra’s Emission Factors Toolkit), whilst the ‘more optimistic’ scenario would be based on ‘Scenario 7: shift to zero emission vehicles’ of DfT’s Road Traffic Forecasts 2018 (DfT, 2018), which assumes approximately 97% of light duty vehicle movements are made by electric vehicles by 2050.

15.8.5 There are inherent uncertainties in the UKCP18 climate projections, however, the use of data for the high emissions scenario is likely to have provided a more conservative assessment of potential climatic changes.

16. Assessment of cumulative effects

16.1 Introduction

16.1.1 This chapter sets out the scope of the cumulative effects assessment (CEA) that will be completed as part of the Environmental Statement (ES). The CEA will be undertaken following the guidance outlined in Planning Inspectorate (PINS) Advice Note Seventeen: Cumulative Effects Assessment (Version 2, August 2019).

16.1.2 In general terms, cumulative effects result from multiple actions on receptors over time and are generally additive or interactive (synergistic) in nature. They can also be considered as effects resulting from incremental environmental, social or economic impacts caused by other past, present or reasonably foreseeable actions together with a scheme. Cumulative effects can occur during both construction and operation of a scheme.

16.1.3 For the purposes of the CEA, the following types of cumulative effects will be considered:

- Inter-project effects – this relates to the combined action of a number of different projects, in combination with the project being assessed, on a single resource/receptor. With inter-project effects there is the potential for additive or interactive (synergistic) effects on a single resource/receptor. The assessment of inter-project effects is the focus of this chapter.

16.1.4 The intra-project effects, which refer to the combined effects of a single project and the interrelationship between a number of different environmental aspects (e.g. between ecology and hydrology, population and health) upon a single resource/receptor, will be reported within the individual environmental aspect chapters of the ES, as required.

16.2 Legislative and policy background

16.2.1 The requirement for cumulative effects assessment for Nationally Significant Infrastructure Projects (NSIP) under the Planning Act 2008 (as amended) are set out in the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 ('the EIA Regulations').

16.2.2 In the EIA Regulations, Schedule 3 paragraph 1(b) refers to the selection criteria for screening Schedule 2 development, and states that *'the characteristics of development must be considered with particular regard to…(b) the cumulation with other existing development and/or approved development'*. Schedule 3 paragraph 3(g), which relates to the types and characteristics of the potential impact, also requires *'(g) the cumulation of the impact with the impact of other existing and/or approved development'* to be taken into account. The EIA Regulations expand the definition set out in Annex III of the Directive, which simply refers to 'the cumulation with other projects'.

16.2.3 In relation to the information for inclusion in an ES, Schedule 4 paragraph 5 of the EIA Regulations requires *'A description of the likely significant effects of the development on the environment resulting from, inter alia: (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'* and *'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.'*

16.2.4 The need to consider cumulative effects in planning and decision making is also set out in planning policy, in particular the National Policy Statements for National Networks (NNNPS). NNNPS under point 4.3 stipulates that *'…in considering any proposed development, and in particular, when weighing its adverse impacts against its benefits, the Examining Authority and the Secretary of State should take into account:*

- *its potential adverse impacts, including any longer-term and cumulative adverse impacts, as well as any measures to avoid, reduce or compensate for any adverse impacts.'*

16.2.5 The NNNPS under point 4.16 stipulates that *'…When considering significant cumulative effects, any environmental statement should provide information on how the effects of the applicant's proposal would combine and interact with the effects of other development (including projects for which consent has been granted, as well as those already in existence)'*. In this instance this would comprise 'other existing development and/or approved development' which is taken to include existing developments and existing plans and projects that are 'reasonably foreseeable'.

16.2.6 The NNNPS under point 4.17 also states that the Examining Authority should *'consider how significant cumulative effects and the interrelationship between effects might as a whole affect the environment, even though they may be acceptable when considered on an individual basis with mitigation measures in place.'*

16.2.7 The NNNPS under point 4.55 also stipulates that *'the effects of existing sources of pollution in and around the project are not such that the cumulative effects of pollution when the proposed development is added would make that development unacceptable, particularly in relation to statutory environmental quality limits.'*

16.3 Cumulative effects assessment methodology

Intra-project cumulative effects

16.3.1 Intra-project effects will be presented in respective aspect chapters for receptors which could be affected by more than one environmental aspect. Where a receptor has been identified as only experiencing one effect or where only one environmental aspect has identified effects on that receptor there is no potential for intra-project effects to occur.

16.3.2 The intra-project cumulative effects will only be identified where more than one environmental aspect chapter of the ES has identified a residual effect on an individual or group of receptors. The combined intra-project cumulative effects assessed as moderate or above (adverse or beneficial) will be deemed to be significant.

16.3.3 The study area for the assessment of intra-project cumulative effects for the Proposed Scheme reflects the study areas (also termed as the spatial Zone of Influence (ZOI)) identified within relevant aspect chapters of the ES (refer to table 16.1). The interrelationship between the different environmental aspects and the pertinent intra-project cumulative effects will be reported within the relevant environmental aspect chapters of the ES, and will not be covered further in the CEA.

Inter-project cumulative effects

16.3.4 In terms of assessing inter-project cumulative effects the Design Manual for Roads and Bridges (DMRB) LA 104, Environmental Assessment and Monitoring (Highways England, 2019) notes that the CEA should report on:

1) road projects which have been confirmed for delivery over a similar timeframe
2) other development projects with valid planning permissions or consent orders, and for which EIA is a requirement
3) proposals in adopted development plans with a clear identified programme for delivery

16.3.5 For the purposes of this CEA, it is considered that the categories of development identified in DMRB LA 104 would cover existing plans and projects that are ‘reasonably foreseeable’, and as such to be reported on in the ES as per point 4.16 of the NNNPS. However, it should also be noted that the PINS Advice Note Seventeen (2019) lists broader types of developments to be included in the CEA than the DMRB LA 104 guidance, as it lists developments which have been submitted for planning but have yet to be determined (see table 16.3), and it also does not restrict it to planning applications for which EIA is a requirement. This has been taken into account in the methodology to be applied for this CEA.

16.3.6 DMRB LA 104 notes that the assessment of cumulative effects shall:

1) establish the zone of influence of the project together with other projects
2) establish a list of projects which have the potential to result in cumulative impacts
3) obtain further information and detail on the list of identified projects to support further assessment

16.3.7 In addition, DMRB LA 104 notes that there are no defined limits or criteria for selecting the list of projects for cumulative assessment and professional judgement using Annex III of the EIA Directive should be applied and justification provided for developments selected (and excluded). Furthermore, DMRB LA 104 notes that the temporal and spatial scope, together with characteristics of the identified projects, are key considerations in identifying projects that require further assessment as part of the CEA.

16.3.8 Therefore, given the above, the proposed CEA methodology captures the guidance outlined in DMRB together with the staged approach and broader interpretation set out in PINS Advice Note Seventeen (2019), and is outlined in further detail below.

Stage 1: Establish the zones of influence and long list of other development

16.3.9 Stage 1 has been provisionally undertaken as part of the scoping exercise for this Environmental Scoping Report to inform the Scoping Opinion. ZOIs have been determined for each aspect and relevant matters according to the reasoning set out in table 16.1. A preliminary long list of 'other existing development and/or approved development' which fall within one or more of the ZOIs has been developed and is presented in the matrix in Appendix L.3. It should be noted that the ZOIs vary according to environmental aspects and matters. Therefore, some developments on the long list would be included in further stages of the CEA for some environmental aspects and matters, but not for others.

16.3.10 The traffic modelling will take into account future developments in the future traffic flow forecasts as part of its core scenario modelling. The air quality and noise assessments for operational effects will be based on the traffic core scenario as part of their standard methodologies so the assessments presented in these two aspect chapters are inherently cumulative. Therefore, operational air and noise will not be included within the CEA chapter of the ES to avoid duplication, and the ZOI for operational noise and air quality effects are not defined in table 16.1 below.

16.3.11 Additional aspects which have not had a ZOI defined include:

- Material assets and waste – assessment reported in the aspect chapter considers the influence of constructing the Proposed Scheme on national material recovery targets, regional recycled aggregate targets, sub-regional minerals sterilisation and regional landfill capacity; and therefore does not require further assessment in the CEA.
- Climate – assessment reported in the aspect chapter considers the Proposed Scheme's potential to affect the global climate (as a result of changes in Greenhouse Gas (GHG) emissions) and the effect of changes in climate on the Proposed Scheme itself, and therefore does not require further assessment in the CEA. Furthermore, the Institute of Environmental Management and Assessment (IEMA) Environmental Impact Assessment Guide to: Climate Change Resilience & Adaptation (June 2020) advises that the extent to which climate exacerbates or ameliorates the effects of a Proposed Scheme on the environment 'in-combination' effects should be considered. The IEMA guidance advises that the 'in-combination assessment' (where climate has the potential to exacerbate or conversely diminish the effect of an existing impact of a Proposed Scheme) is best analysed in the existing environmental aspect chapters of an ES and is suited to using traditional significance criteria from the respective chapters.

Table 16.1: Criteria for determining the zone of influence for the CEA for each environmental aspect

Environmental aspect	Zone of Influence	Reasoning
Air quality	Construction dust – 200m of all construction activity. Construction traffic emissions – 200m of Affected Road Network (to be determined during PCF Stage 3). Operational emissions – n/a (refer to paragraph 16.3.10).	Based on relevant guidance (DMRB LA 105) – refer to chapter 6, section 6.2.
Cultural heritage	Setting of designated heritage assets (construction and operation) – 1km from provisional order limits. Designated and non-designated heritage assets and their settings (operation and construction) – 300m from provisional order limits.	Based on relevant guidance (DMRB LA 106) – refer to chapter 7, section 7.2.
Landscape	Construction and operation effects – 2km from provisional order limits.	Based on professional judgement and landscape and visual survey – refer to chapter 8, section 8.2. 2km for scoping to set landscape context, potentially reducing to 1km for ES following generation of Zone of Theoretical Visibility, agreement of representative viewpoints with relevant local authorities and field verification as views of the Proposed Scheme are unlikely to be significant beyond 1km due to distance and intervening features.
Biodiversity	General construction and operation effects – 2km from provisional order limits. European sites – • 2km for European sites • 30km where bats are a qualifying feature of the European site • Where there is a hydrological connectivity between the Proposed Scheme and the European sites • Mobile species specific distances (refer to Habitats Regulations Assessment (HRA)). Protected and notable species (to be further refined on completion of surveys).	Based on relevant guidance (DMRB LA 108) and likely significant effects – refer to chapter 9, section 9.2.
Geology and soils	Construction and operational effects on geology and soil receptors – 250m from provisional order limits.	Based on relevant guidance and professional judgement (in the absence of a defined study area in DMRB LA 109) – refer to chapter 10, section 10.2. It is not considered likely that significant effects would arise beyond this distance.

Environmental aspect	Zone of Influence	Reasoning
Noise and vibration	Construction noise – 300m from provisional order limits. Construction vibration – 100m provisional order limits. Operational noise – n/a (refer to paragraph 16.3.10). Operation vibration - scoped out.	Based on relevant guidance (DMRB LA 111) – refer to chapter 12, section 12.2. Operational vibration scoped out in accordance with DMRB LA 111.
Population and health	Construction and operation land use and community health effects – 600m from provisional order limits. Construction and operation effects on physical activity opportunities – 10km from provisional order limits.	Refer to chapter 13, section 13.2. Based on DMRB LA 112, LA 111, LA 105 and professional judgement that likely significant effects on land use and population health from noise, air quality, visual intrusion and local disruption would be typically up to 600m. Based on DfT guidance that cycle commutes are typically up to 10km and therefore cumulative impacts from major developments and changes to cycling accessibility within this range are potentially significant to health and sustainable transport policy objectives.
Water environment	Groundwater, Geomorphology, Water Framework Directive (WFD) and Water quality (operation and construction) – 1km from provisional order limits. Flood risk (operation and construction) – 2km from provisional order limits.	Based on professional judgement – refer to chapter 14, section 14.2.

16.3.12 The following local planning authorities are within 2km of the provisional order limits: Essex County Council (ECC), Colchester Borough Council (CBC), Maldon District Council (MDC) and, Braintree District Council (BDC). A further four local planning authorities fall marginally within the 10km ZOI for population and human health. These are Suffolk County Council (SCC), Babergh District Council (BaDC), Uttlesford District Council (UDC) and Tendring District Council (TDC). The search for 'other existing development and/or approved development' for the preliminary long list has included a review of:

- Planning applications registered with the relevant Local Planning Authorities (Town and Country Planning Act 1990) since January 2016, including:
  - development with planning consent and under construction (but not completed);
  - extant planning consent (consent granted and not expired, but construction has not commenced);
  - planning applications currently under consideration by the Local Planning Authority; and
  - screening / scoping opinions currently under consideration by the Local Planning Authority (which may indicate a planning application is forthcoming)
- Development allocations proposed in an approved or emerging (with at least a draft having been submitted to the Planning Inspectorate) Local Plan.

- Nationally Significant Infrastructure Projects listed on the Planning Inspectorate's register of projects (Planning Act 2008) including:
  - where the developer has advised the Planning Inspectorate in writing that they intend to submit an application in the future;
  - where an application has already been made to the Planning Inspectorate and is undergoing the development consent process; and
  - where a proposal has been decided.
- Development of transport systems authorised by Transport and Works Act Order (TWAO) (Transport and Works Act 1992) including:
  - applications currently under consideration by the Secretary of State; and
  - Made Orders.
- Hybrid Bills currently before parliament.
- Reserved matter applications and discharge of conditions – these have been reviewed for cases where although the planning application to which they relate may pre-date 2016, they indicate large scale developments which are being brought forward in phases and so there is potential for temporal overlap with the Proposed Scheme.

16.3.13 The PINS Advice Note Seventeen (2019) does not specify any criteria to be considered before selecting other developments for the long list at Stage 1, other than being within a relevant ZOI for CEA. However, it is considered that the inclusion of all minor planning applications into the long list would not be proportionate and these have therefore been excluded from the preliminary long list prior to Stage 1. The exclusion of minor developments is justified on the basis that these would be developments of not more than local significance and are highly unlikely to give rise to cumulative effects of a scale that would be environmentally significant over and above the Proposed Scheme in isolation.

16.3.14 Therefore, for the preliminary long list (Appendix L.3) only planning applications which meet the criteria set out in table 16.2 have been included and it is the intention to apply these criteria for future reviews of the long list as the CEA is developed and updated for the ES.

Table 16.2: Selection criteria for other development to be included in the Stage 1 long list

Buffer from provisional order limits	Long list selection criteria	Reasoning
10 km	Nationally Significant Infrastructure Projects (NSIP) and Major Large Development (i.e. developments comprising >50 units (residential), >2000 m^2 of floor space (employment uses) or >2 ha site area (other).	The 10km distance is applied for the population and human health ZOI in consideration of strategic priorities for increasing cycling. Only developments meeting this scale are sufficient to inform reasoned judgements on potential cumulative effects on cycling activity and associated health benefits.
2 km	All Major Development (development with >10 dwellings, >1,000 m^2 of floor space or site area between 1 and 2 ha).	This will avoid the inclusion of small scale projects such as building conversions and single dwellings which would in any case be sifted out prior to Stage 2 (identifying the short list).

16.3.15 All developments identified in the preliminary long list have been categorised into Tier 1 to 3 development stages based on the PINS Advice Note Seventeen guidance (refer to table 16.3).

16.3.16 Stage 1 of the CEA involves screening the developments in the long list to set out which of the various environmental aspects' ZOIs they fall within, and therefore which environmental aspects are relevant considerations in the CEA process for each of the developments.

16.3.17 In some cases a development will not been taken through to Stage 2 because although it falls within a ZOI, the nature of the development is not relevant in terms of being likely to affect the environmental factors for which that ZOI has been determined. This is particularly the case for the population and human health ZOI where 10km has been applied in consideration of the potential population effects of increasing cycling infrastructure. Many of the developments in the long list are unlikely to have any notable influence on cycling numbers and while they may be within the 10km ZOI, they are not relevant to the CEA.

Table 16.3: Criteria for determining tier of development for CEA (adapted from PINS advice note seventeen)

Tier	Development Status	
Tier 1	Under construction.	Decreasing level of available data 
	Permitted applications whether under the Planning Act 2008 (PA2008) or other regimes (including the Town and Country Planning Act (TCPA)), but not yet implemented.	
	Submitted applications whether under the PA2008 or other regimes (including the TCPA), but not yet determined.	
Tier 2	Projects on the Planning Inspectorate's Programme of Projects where a scoping report has been submitted.	
	Projects that have requested a scoping opinion from the relevant local planning authority and is accompanied with a scoping report.	
Tier 3	Projects on the Planning Inspectorate's Programme of Projects where a scoping report has not been submitted.	
	Identified in the relevant Development Plan (and emerging Development Plans - with appropriate weight being given as they move closer to adoption) recognising that there will be limited information available on the relevant proposals.	
	Identified in other plans and programmes (as appropriate) which set the framework for future development consents/approvals, where such development is reasonably likely to come forward.	
	Projects that have requested a screening opinion from the relevant local planning authority. It is important to recognise that screening opinion requests are not always reported on the planning portal.	

16.3.18 As noted above, Stage 1 has been provisionally undertaken to inform the Scoping Opinion. The preliminary long list will be reviewed further to take account of feedback through the Scoping Opinion and will be updated and reported in the Preliminary Environmental Information Report. Subsequent reviews and updates will be undertaken to account for feedback as part of the pre-application statutory consultation and any additional development applications or allocations made during the interim period. A cut-off point for adding new development applications to the long list will be required to allow sufficient time for completion of the CEA process and compilation of the ES prior to the submission for development consent. This is likely to be two to three months following the completion of pre-application statutory consultation. A further update to the long list will be made during the pre-Examination period to allow for an up-to-date record of relevant 'other existing development and/or approved development' to be available should questions arise during the Examination.

Stage 2: Identify a short list of other development for CEA

16.3.19 The next stage of the CEA is to create a short list of 'other existing development and/or approved development'. This will involve taking the developments screened in from Stage 1 and determining if there is potential to give rise to significant effects in combination with the Proposed Scheme. Professional judgement will be used to identify whether potential cumulative impacts are likely to be significant, with consideration to the inclusion / exclusion criteria set out in table 16.4.

16.3.20 Only likely significant effects will be taken forward to the next stages of the CEA, rather than every potential interaction. The matrix in Appendix L.1 will be used to record the outcome of Stage 2 and document the short list of development. Justification will be provided in the matrix to assist in providing a clear record of 'other existing development and/or approved development' considered and the decision making process taken with respect to including / excluding development from further assessment.

Table 16.4: CEA Stage 2 exclusion criteria

Consideration	Criteria
Temporal scope	Other development with overlapping construction (2023-2027) and operational periods (2027-2042) to the Proposed Scheme will be considered further. Other development with temporal scopes outside these periods will not be short-listed for the CEA.
Scale and nature of development	Development identified as Schedule 1 and 2 developments in the EIA Regulations will be considered further. Other development not identified as Schedule 1 or 2 development will not be short-listed for the CEA unless after reviewing it against criteria in Schedule 3 of the EIA Regulations it is considered that it has characteristics by which there is a likelihood of significant effects when considered in cumulation with other development.
Sensitivity of the receiving environment	Where there are potential source-pathway-receptor linkages between other development and the Proposed Scheme, cumulative effects will be considered further. Other development with no clear source-pathway-receptor linkage will not be short-listed for the CEA.

16.3.21 The CEA shortlisting process will be reviewed and updated where necessary to take account of stakeholder engagement and feedback from the pre-application statutory consultation, as well as updates made to the long list as described above.

Stage 3: Information gathering

16.3.22 The CEA will rely on the environmental assessment information being published as part of the planning applications or planning documents for the 'other existing developments and/or approved developments'. This data will be obtained from ongoing engagement with the relevant local authorities, from the local authority planning application searches and Local Plan websites (TCPA applications), the Planning Inspectorate's website, and other relevant interactive sources to inform the CEA. The cut-off point for environmental information to inform the CEA will be within two weeks of the cut-off point for identifying 'other existing developments and/or approved developments' for the long list as described for Stage 1. This is to allow for reviewing the short list in Stage 2 against any new developments added to the long list. Key details from the information gathering exercise will be captured and presented in the matrix format included in Appendix L.2.

Stage 4: Assessment

16.3.23 The CEA will be undertaken by a competent EIA practitioner and working with all aspect assessors reviewing the relevant planning material and drawing links to potential effects with the Proposed Scheme. Matrix 2 from the PINS Advice Note Seventeen guidance will be completed to record the results of this assessment process (refer to Appendix L.2). The competence of the EIA practitioner and other assessors involved in the preparation of the CEA (i.e. in terms of their suitable experience, qualifications and professional memberships) will be set out in the ES.

Assessment of significance

16.3.24 DMRB LA 104 (Highways England, 2019) states that the significance should be determined by the extent to which the impacts can be accommodated by the resource.

16.3.25 For the purpose of the CEA, the value of a resource and magnitude of impact is determined according to the criteria set within the environmental aspect chapters. The significance of effect will then be carried forward from the environmental aspect chapters to identify the significance of cumulative effects with other developments. Where an effect is moderate or above (adverse or beneficial), it will be deemed to be 'significant'. Effects will be identified as short-term or long-term, permanent or temporary and adverse or beneficial. Mitigation measures will be considered, and the residual significance of the effects will be assessed.

16.3.26 Typical descriptors of significance are outlined in table 16.5 and is based on the guidance detailed in DMRB LA 104 (Highways England, 2019). These descriptors have been supplemented with additional criteria for each level of significance to provide the further differentiation.

Table 16.5: Determining significance of cumulative effects

Significance	Effect
Very large (adverse or beneficial)	• Effects at this level are material in the decision-making process. • Where the balance of the effects of the Proposed Scheme or combined effects of the Proposed Scheme in association with other 'other existing development and/or approved development' upon an individual or collection of environmental receptors would be very highly significant (adverse or beneficial). • Effects would be permanent and far reaching, affecting the integrity of receptors or resources of very high value.
Large (adverse or beneficial)	• Effects at this level are likely to be material in the decision-making process. • Where the balance of the effects of the Proposed Scheme or combined effects of the Proposed Scheme in association with 'other existing development and/or approved development' upon an individual or collection of environmental receptors would be highly significant (adverse or beneficial). • Effects would be: - permanent and far reaching, affecting the integrity of receptors or resources of high value - noticeable permanent effects on a receptor of very high value
Moderate (adverse or beneficial)	• Effects at this level can be considered to be material decision-making factors. • Where the balance of the effects of the Proposed Scheme or combined effects of the Proposed Scheme in association with 'other existing development and/or approved development' upon an individual or collection of environmental receptors would be significant (adverse or beneficial). • Effects would be: - permanent and far reaching, affecting the integrity of receptors or resources of medium value - localised and/or temporary for receptors of high or very high value
Slight (adverse or beneficial)	• Effects at this level are not material in the decision-making process. • Where the balance of the effects of the Proposed Scheme or combined effects of the Proposed Scheme in association with 'other existing development and/or approved development' upon an individual or collection of environmental receptors would be noteworthy but not significant (adverse or beneficial). • Effects would be: - permanent and far reaching affecting the integrity of receptors or resources of low value - localised and/or temporary for receptors of medium value
Neutral	• No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error. • Where the beneficial or adverse effects of the Proposed Scheme or the combined effects of the Proposed Scheme in association with 'other existing development and/or approved development' would balance.

16.3.27 The above significance descriptors have also been aligned with the considerations included within the PINS Advice Note Seventeen (2019), which outline that the CEA will also give due consideration to the following factors when determining significance:

- the duration of effect, i.e. will it be temporary or permanent
- the extent of effect, e.g. the geographical area of an effect

- the type of effect, e.g. whether additive (loss of two pieces of woodland of 1ha, resulting in 2ha cumulative woodland loss) or synergistic (two discharges combine to have an effect on a species not affected by discharges in isolation)
- the frequency of the effect
- the 'value' and 'resilience' of the receptor affected
- the likely success of any mitigation required

16.3.28 The above process will be captured in the cumulative effects assessment matrices in Appendix L.1 and Appendix L.2 in accordance with PINS Advice Note Seventeen.

Assumptions and limitations

16.3.29 The key difficulties in any CEA relate to the level of detail available in relation to 'other existing development and/or approved development' and the reliance that needs to be made on environmental assessments carried out by others. For those applications at earlier stages of development or those for which EIA has not been undertaken, professional judgement and knowledge of the study area will be employed to consider the receptors or resources that may be affected by the Proposed Scheme and the 'other existing development and/or approved development' in question. In these circumstances environmental assessment will not be undertaken for these 'other existing development and/or approved development' and the CEA will rely on EIA and other environmental assessment material that has been made available by the developers for the 'other existing development and/or approved development'.

16.3.30 There is a tendency for variation in terminology used between different EIAs. For example, one project may use 'major positive' while another may use 'large beneficial'. Therefore some interpretation may be needed by the EIA practitioner undertaking the CEA, to allow for comparison of effects from different developments.

16.3.31 There are differences in what Local Planning Authorities report and include on their planning portals. As part of the progression of updating the long list of developments there will be a reliance on the relevant host Local Planning Authorities to advise on developments deemed to be suitable for inclusion in the CEA and also to provide supporting documentation / details relating to these identified developments.

16.3.32 Only planning applications submitted since January 2016 have been considered on the basis that it is likely that older ones will have been completed prior to the Proposed Scheme commencement and are therefore unlikely to give rise to cumulative effects. The exception is for some identified reserved matters applications which indicate large-scale planning applications pre-dating 2016 are yet to have commenced.

16.3.33 The long list and the short list will be reviewed and updated during the pre-application period up to the time when assessment work must cease to allow time for the preparation and review of the ES. A clear record of the final review date will be provided within the CEA chapter. However, the long list will be reviewed again up until the actual point of submission of the application for development consent to allow for any new allocations and applications that emerge during that intervening time period to be screened and an addendum updating the CEA can be prepared to support the Examination, if required.

16.3.34 Planning applications which have been refused will not be taken forward to Stage 2 on the assumption that it is most likely they will not be pursued. However, these will be reviewed prior to completion of the CEA to check for any successful appeals which may have been made during the intervening period. In such cases, these applications will be considered further in the CEA in the same way that any new planning applications which have come forward will be reviewed.

16.4 Assessment of inter-project cumulative effects

16.4.1 The assessment is currently at the preliminary stage of identifying the long list of developments to be considered as part of the assessment of inter-project cumulative effects.

16.4.2 Following the identification of the long list and refined short list of developments an assessment of potential impacts and inter-project cumulative effects with ‘other existing development and/or approved development’ on the surrounding environment and receptors (during construction and operation) will be undertaken. This will follow the methodology outlined in section 16.3 including the completion of the matrices outlined in Appendices L.1 and L.2 to align with the guidance set out in the PINS Advice Note Seventeen (2019).

17. Summary of assessment scope

17.1 Aspects scoped into the assessment

17.1.1 Table 17.1 summarises the environmental aspects that have been scoped into the EIA as well as the specific matters that will be assessed in the Environmental Statement.

17.2 Aspects scoped out of the assessment

17.2.1 The construction and operation of the Proposed Scheme would not introduce any source of radiation and would only generate limited amounts of heat from technology. The assessment of heat and radiation is therefore not considered relevant to the Proposed Scheme and has been scoped out of further assessment.

17.2.2 No further environmental aspects have been scoped out of the assessment in their entirety.

17.2.3 Certain matters of environmental aspects have been scoped out of the assessment, as shown in table 17.1. In summary, these are:

- Effects on historic landscape types (HLT) during the operational phase (chapter 7) – historic landscapes would only be sensitive to the potential for increases in the way in which sound and noise currently contribute to their heritage value. Using the criteria for the assessment of impacts set out in Appendix C, this would not be on a scale that would result in significant effects. Based on this, impacts on HLT during operation are scoped out.
- Ecological sites of special scientific interest (SSSI) and national nature reserves (NNR) (chapter 9) – there are no ecological SSSI or NNR within 2km of the Proposed Scheme, therefore SSSI and NNR are scoped out of further assessment.
- Dormouse (chapter 9) – dormouse have yet to be identified within the study area during field survey with the desk study suggesting that the nearest dormouse presence is over 2km from the Proposed Scheme. This suggests that dormouse are likely to be absent from the study area and are therefore scoped out of further assessment.
- Invasive and non-native plant and animal species (INNS) (chapter 9) – given the negligible value assigned to INNS, invasive species are scoped out of further assessment in the EIA, however, they will be considered in relation to legislative compliance.
- Geological sites of special scientific interest (chapter 10) – effects to the Marks Tey Brickpit SSSI are unlikely, as this lies outside of the footprint of the Proposed Scheme. There could be linkages between the site and sources of contamination exposed during construction, such as from dust or leachate, but this could be avoided through standard best practice methods and is unlikely to be significant. Marks Tey SSSI is therefore scoped out of the assessment.

- Effects on soils during the operational phase (chapter 10) – no additional impacts are predicted on soils during the operational phase. Temporary effects arising during construction on soil quality are unlikely to persist into operation assuming that best practice mitigation measures are applied. Operational effects on soils are therefore scoped out of further assessment.
- Effects on the health of site users and the general public during the operational phase (chapter 10) – contamination within the Proposed Scheme area would have been removed during construction reducing the potential for contact with contaminated soil. Furthermore, implementing appropriate site-specific risk assessments and method statements would reduce exposure. This is likely to have a negligible magnitude of impact, resulting in a slight effect on human health. Therefore, human health for site users has been scoped out of the assessment.
- Effects on groundwater and surface water from contaminated land during the operational phase (chapter 10) – during the operational stage, potential contaminated land linkages would have been broken due to the construction of the road, therefore no additional impacts are predicted in relation to water receptors. Operational effects on surface water and groundwater from contaminated land are therefore scoped out of further assessment.
- Effects from material assets and waste during the operational phase (chapter 11) – DMRB LA 110 specifies that the assessment should only report on the first year of operational activities (opening year). Any construction phase effects overlapping within this period will be captured within the construction phase assessment. It is assumed that the assessment of any environmental impacts and effects associated with material assets and waste during any large scale future maintenance, renewal, or improvement works, would be undertaken by Highways England's East of England Delivery Contractor(s) (or equivalent) in accordance with the requirements of DMRB LA 110.
- Effects from traffic vibration during the operational phase (chapter 12) – DMRB LA 111 states that operational vibration should be scoped out of the assessment methodology as a maintained road surface will be free of irregularities so operational vibration will not have the potential to lead to significant adverse effects. It is considered that there is nothing within the initial design of the Proposed Scheme that would change this assumption.

Table 17.1: Aspects and matters scoped into the environmental assessment

Aspect	Matters to assess	Scoped in - construction	Scoped in - operation
Air quality	Construction dust receptors (human and ecological)	✓	*n/a*
	Human health receptors	✓	✓
	Designated ecological sites	✓	✓
	PCM compliance risk	✓	✓
Cultural heritage	Archaeological remains	✓	✓
	Historic buildings	✓	✓
	Historic landscape	✓	×

Aspect	Matters to assess	Scoped in - construction	Scoped in - operation
Landscape	Effects on local landscape character that would potentially be directly or indirectly affected	✓	✓
	Visual effects	✓	✓
Biodiversity	European designated sites (SAC, SPA and Ramsar)	✓	✓
	SSSI and NNR	×	×
	Local Nature Reserves	✓	✓
	Local Wildlife Sites	✓	✓
	Ancient Woodland Inventory sites and ancient woodland habitat	✓	✓
	Priority habitats	✓	✓
	Notable vascular plants	✓	✓
	Badger	✓	✓
	Bats	✓	✓
	Birds – breeding, wintering and schedule 1 species (including barn owl)	✓	✓
	Dormouse	×	×
	Freshwater fauna (fish, macro-invertebrates and white-clawed crayfish)	✓	✓
	Great crested newt	✓	✓
	Otter	✓	✓
	Reptiles	✓	✓
	Terrestrial invertebrates	✓	✓
	Water vole	✓	✓
	Priority species	✓	✓
	INNS – plants and animals	×	×
Geology and soils	Geology (SSSI)	×	×
	Soils	✓	×
	Human health (site users/general public)	✓	×
	Human health (construction/maintenance workers)	✓	✓
	Human health (residential properties near landfill sites)	✓	✓
	Groundwater and surface water from contaminated land	✓	×
Material assets and waste	Materials assets	✓	×
	Waste	✓	×
Noise and vibration	Construction noise	✓	*n/a*
	Construction vibration	✓	*n/a*
	Operational traffic noise	*n/a*	✓
	Operational traffic vibration	*n/a*	×

Aspect	Matters to assess	Scoped in - construction	Scoped in - operation
Population and health	Population and housing	✓	✓
	Community land and assets	✓	✓
	Development land and business	✓	✓
	Agricultural land holdings	✓	✓
	Walkers, cyclists and horse riders	✓	✓
	Human health	✓	✓
Road drainage and the water environment	Surface water quality	✓	✓
	Fluvial geomorphology	✓	✓
	Groundwater	✓	✓
	Flood risk	✓	✓
	WFD compliance	✓	✓
Climate change	GHG emissions from the product stage (embodied carbon in construction materials)	✓	✓[a]
	GHG emissions from transport of construction materials to site	✓	✓[a]
	GHG emissions from fuel consumption (on-site plant)	✓	✓[a]
	GHG emissions from fuel consumption (workers vehicles)	✓	✓[a]
	GHG emissions from electricity and water consumption	✓	✓
	GHG emissions from transportation, treatment and disposal of waste materials	✓	✓[a]
	GHG emissions from land use change and forestry	✓	✓
	GHG emissions from road users	*n/a*	✓
	Vulnerability of scheme to climate change from changes in seasonal precipitation and temperature	✓	✓
	Vulnerability of scheme to climate change from increased frequency of extreme precipitation and temperature events	✓	✓

[a] During maintenance activities (including repair, replacement and refurbishment).

Acronyms

Abbreviation	Term
µg	Microgram
AADT	Annual Average Daily Traffic
ADMS	Atmospheric Dispersion Modelling
AEP	Annual Exceedance Probability
AIA	Arboricultural Impact Assessment
ALC	Agricultural Land Classification
AONB	Area of Outstanding Natural Beauty
AQMA	Air Quality Management Area
AQO	Air Quality Objective
ARN	Affected Road Network
AWP	Aggregates Working Party
BaDC	Babergh District Council
BAP	Biodiversity Action Plan
BDC	Braintree District Council
BEIS	Department for Business, Energy & Industrial Strategy
BGS	British Geological Survey
BIS	Department of Business Innovation & Skills
BMV	Best and Most Versatile
BNL	Basic Noise Level
BOCN	Barn Owl Conservation Network
BRE	Building Research Establishment
BS	British Standard
BSI	British Standards Institute
CAMS	Catchment Abstraction Management Strategy
CBBGC	Colchester Braintree Borders Garden Community
CBC	Colchester Borough Council
CCC	Chelmsford City Council
CEA	Cumulative Effects Assessment
CEMP	Construction Environmental Management Plan
C&D	Construction and Demolition
CIRIA	Construction Industry Research and Information Association
CITB	Construction Industry Training Board
CL:AIRE	Contaminated Land: Applications in Real Environments
CLR 11	Contaminated Land Report 11
CMLI	Chartered Member of the Landscape Institute

Abbreviation	Term
CMS	Conceptual Site Model
CNEB	Chelmsford North East Bypass
CO_2	Carbon Dioxide
CoCP	Code of Construction Practice
COPD	Chronic Obstructive Pulmonary Disease
CPRE	Campaign to Protect Rural England
CRTN	Calculation of Road Traffic Noise
CWS	County Wildlife Site
dB	Decibel
DBA	Desk Based Assessment
DCLG	Department of Housing, Community and Local Government
DCO	Development Consent Order
Defra	Department for Environment, Food and Rural Affairs
DfRE	Design for Resource Efficiency
DfT	Department for Transport
DLL	District Level Licensing
DM	Do-Minimum
DMFY	Do-Minimum Future Year scenario
DMOY	Do-Minimum Opening Year scenario
DMRB	Design Manual for Roads and Bridges
DS	Do-Something
DSFY	Do-Something Future Year scenario
DSOY	Do-Something Opening Year scenario
EA	Environment Agency
EAR	Environmental Assessment Report
EAST	Early Assessment and Sifting Tool
ECC	Essex County Council
eDNA	Environmental DNA
EEAWP	East of England Aggregate Working Party
EFC	Essex Field Club
EIA	Environmental Impact Assessment
ELC	European Landscape Convention
EMP	Environmental Management Plan
END	Environmental Noise Directive
ENVIS	Environmental Information System
EQS	Environmental Quality Standard
ES	Environmental Statement

Abbreviation	Term
EU	European Union
EUPHA	European Public Health Association
EWTBRC	Essex Wildlife Trust Biological Record Centre
FRA	Flood Risk Assessment
GCN	Great Crested Newt
GEML	Great Eastern Main Line
GHG	Greenhouse Gases
GI	Ground Investigation
GIR	Ground Investigation Report
GLVIA3	Guidelines for Landscape and Visual Impact Assessment
GWDTE	Groundwater Dependent Terrestrial Ecosystem
HADDMS	Highways Agency Drainage Data Management System
HAPMS	Highways England Pavement Management System
HER	Historic Environment Record
HEWRAT	Highways England Water Risk Assessment Tool
HDV	Heavy Duty Vehicles
HGV	Heavy Goods Vehicles
HLT	Historic Landscape Type
HMS	Habitat Modification Score
HQS	Habitat Quality Score
HRA	Habitats Regulations Assessment
IDB	Internal Drainage Board
IEMA	Institute of Environmental Management and Assessment
INNS	Invasive Non-Native Species
IROPI	Imperative Reasons of Over-Riding Public Interest
JNCC	Joint Nature Conservation Committee
Kt	Kilotonne
LAA	Local Aggregates Assessment
LAQM	Local Air Quality Management
LAR	Local Access Road
LCA	Landscape Character Area
LCRM	Land Contamination Risk Management
LGS	Local Geological Site
LLFA	Lead Local Flood Authority
LNR	Local Nature Reserve
LOAEL	Lowest Observed Adverse Effect Level
LRV	Local Road Verge

Abbreviation	Term
LULUCF	Land Use, Land-Use Change, and Forestry
LV	Limit Values
LVIA	Landscape and Visual Impact Assessment
LWS	Local Wildlife Site
MAGIC	Multi Agency Geographic Information for the Countryside
MCA	Mineral Consultation Area
MDC	Maldon District Council
MLP	Minerals Local Plan
MMP	Materials Management Plan
MPA	Minerals Planning Authority
MSA	Mineral Safeguarding Area
Mt	Megatonne
Mtpa	Million Tonnes per Annum
NAEI	National Atmospheric Emissions Inventory
NCA	National Character Area
NCN	National Cycle Network
NIA	Noise Important Area
NNNPS	National Networks National Policy Statement
NNR	National Nature Reserves
NO_2	Nitrogen Dioxide
NOx	Nitrogen Oxides
NOMIS	National Online Manpower Information System (only 'NOMIS' is now used)
NPPF	National Planning Policy Framework
NPSE	Noise Policy Statement for England
NRFA	National River Flow Archive
NRR	National Risk Register
NSIP	Nationally Significant Infrastructure Project
NTS	Non-Technical Summary
NVZ	Nitrate Vulnerable Zones
OAR	Options Appraisal Report
ONS	Office for National Statistics
OS	Ordnance Survey
PAQAP	Project Air Quality Action Plan
PAS	Publicly Available Specification
PCF	Project Control Framework
PCM	Pollution Climate Mapping (model)

Abbreviation	Term
PEIR	Preliminary Environmental Information Report
PINS	Planning Inspectorate
PM_{10}	Particulate matter 10 micrometres or less in diameter
PRA	Preferred Route Announcement
PRoW	Public Right of Way
PSSR	Preliminary Sources Study Report
PSYM	Predictive System for Multimetrics
PWS	Private Water Supplies
RBMP	River Basin Management Plan
RCP	Receptor Concentration Pathway
RDWE	Road Drainage and the Water Environment
RHS	River Habitat Survey
RIGS	Regionally Important Geological Site
RIS	Road Investment Strategy
RoFSW	Risk of Flooding from Surface Water
RPA	Root Protection Area
RSP	Responsible Sourcing Plan
SAC	Special Area of Conservation
SAR	Standardised Admissions Ratio
SCC	Suffolk County Council
SEPA	Scottish Environment Protection Agency
SFRA	Strategic Flood Risk Assessment
SMR	Standardised Mortality Ratio
SNRHW	Stable Non-Reactive Hazardous Wastes
SOAEL	Significant Observed Adverse Effect Level
SoCC	Statement of Community Consultation
SoS	Secretary of State
SPA	Special Protection Area
SPI	Species of Principle Interest
SPZ	Source Protection Zone
SRN	Strategic Roads Network
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage System
SWMP	Site Waste Management Plan
TAR	Technical Appraisal Report
TAG	Transport Analysis Guidance
tCO_2e	Tonnes of Carbon Dioxide Equivalent

Abbreviation	Term
TCPA	Town and Country Planning Act
TDC	Tendring District Council
TPO	Tree Preservation Order
TRA	Traffic Reliability Area
TRaCs	Transitional and Coastal water bodies
UDC	Uttlesford District Council
UKCP	United Kingdom Climate Projections
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UXO	Unexploded Ordnance
WCA	Waste Consultation Area
WCH	Walkers, Cyclists and Horse Riders
WCHAR	Walking, Cycling and Horse-Riding Assessment and Review
WFD	Water Framework Directive
WHO	World Health Organization
WRAP	Waste and Resources Action Programme
ZOI	Zone of Influence
ZTV	Zone of Theoretical Visibility

Glossary

Term	Definition
Active travel	Travelling to specific destinations (e.g. work or school) by active modes such as walking or cycling.
Additive (cumulative effects assessment)	Where similar types of impact from a scheme or different developments affect a receptor at the same time and in a similar way e.g. loss of two pieces of woodland of 1ha, resulting in 2ha cumulative woodland loss overall.
Affected road network (ARN)	All roads that trigger the traffic screening criteria and adjoining roads within 200m.
Aggregates	Minerals which are used primarily to support the construction industry including soft sand, sand and gravel, and crushed rock.
Air quality management area (AQMA)	An area declared by a local authority which has been determined will exceed the relevant air quality strategy objective.
Air quality threshold	Generic term to represent the relevant pollutant averaging period and concentration value described by the air quality strategy objectives or EU limit values.
Ambient noise	Ambient noise is the total sound in a given situation at a given time usually composed of sound from many sources, near and far.
Arboriculturist	Person who has, through relevant education, training and experience, gained expertise in the field of trees in relation to construction (BS5837 Trees in Relation to Design, Demolition and Construction – Recommendations).
Aspect	This refers to an environmental topic (e.g. air quality, biodiversity, noise etc.).
A-weighting	In addition to its non-linear amplitude response, the human ear has a non-linear frequency response; it is less sensitive at low and high frequencies and most sensitive in the mid-range frequencies.
Barn owl roost	A barn owl's home.
Baseline	In EIA, 'baseline conditions' are the environmental conditions in existence before the occurrence of an impact from a development i.e. they are the existing conditions that would be affected.
Bat roost	A bat's home.
Bed substrate	The material that rests at the bottom of a stream and along the channel margins.
Best overall environmental outcome	A departure from the waste hierarchy which delivers better overall environmental outcomes.
Bill of quantities	A document containing details on the volumes of excavated arisings from, and materials required for, a development. Also 'Schedule of Rates'.
Basic noise level (BNL) calculations	BNL calculations are undertaken by using traffic flow, speed and HGV percentage to calculate a reference noise emission from the road link, as set out in CRTN.
Borrow pit	A temporary mineral working to supply material for a specific construction project.
Carapace	The hard upper shell of a crustacean.
Carbon budgets	UK GHG targets over defined periods of time.

Term	Definition
Carbon emissions	Shorthand for emissions of any of the seven GHGs that contribute to climate change.
Characteristics (landscape)	Elements or combination of elements, which make a particular contribution to distinctive character.
Climate	Long-term weather conditions prevailing over a region.
Cold spell duration index	Count of days with at least six consecutive days when daily minimum temperature is below the 10th percentile as defined above (annual resolution).
Committed development	A development that has full or outline planning permission, or is allocated in an adopted development plan.
Conservation area	An area designated under section 69 of the Planning (Listed Building and Conservation Areas) Act 1990 as being an area of special architectural or historic interest, the character or appearance of which it is desirable to preserve or enhance.
Construction, demolition and excavation	Arisings and waste from the demolition of buildings and structures, site preparation and clearance, remediation, excavation and construction activities.
Construction materials	Primary, recycled / secondary and renewable sources of materials required for constructing a project.
Cumulative effects	Effects upon the environment that result from the incremental impact of an action when added to other past, present or reasonably foreseeable actions. Each impact by itself may not be significant but can become a significant effect when combined with other impacts.
Decibel	The unit of measurement used for sound pressure levels and noise levels quoted in decibels (dB). The decibel scale is logarithmic rather than linear; the threshold of hearing is zero decibels while, at the other extreme, the threshold of pain is about 130 decibels. These limits are seldom experienced and typical levels lie within the range of 30 dB(A) (a quiet night time level in a bedroom) to 90 dB(A) (at the kerbside of a busy road).
Design Manual for Roads and Bridges (DMRB)	Provides standards, advice notes and other documents relating to the design, assessment and operation of trunk roads, including motorways in the United Kingdom.
Development Consent Order (DCO)	Introduced by the Planning Act in 2008, a DCO is the means of obtaining permission for developments categorised as Nationally Significant Infrastructure Projects (NSIP).
Discharge	The volume of flow passing a point in a given time period.
Disposal (waste)	Any operation which is not recovery, even where the operation has as a secondary consequence the reclamation of substances or energy.
Do-Minimum	The scenario that represents the situation that would occur without the project in operation, which includes committed developments.
Do-Something	The scenario that represents the situation that would occur with the project in operation, which includes committed developments.
Drainage network	The streams, rivers, lakes and other water bodies that form a particular drainage basin. NB: This would not include the surface water drainage network that drains water from the carriageway

Term	Definition
Effect	Term used to express the consequence of an impact. The significance of effect is determined by correlating the magnitude of the impact with the importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria.
Embodied carbon	Carbon (GHG) emissions associated with energy consumption and chemical processes during the extraction, transport and / or manufacture of construction materials or products.
End of first life	The point at which an asset is no longer useful in the capacity for which it was originally intended.
Enhancement	A beneficial measure that is over and above what is required to mitigate the adverse effects of a project.
Environmental Impact Assessment (EIA)	Environmental Impact Assessment. A process by which information about environmental effects of a proposed development is collected, assessed and used to inform decision making. For certain projects, EIA is a statutory requirement.
Environmental Statement	A document produced in accordance with the EIA Directive as transported into UK law by the EIA Regulations to report the results of an EIA.
Eutrophic	A waterbody rich in nutrients and supporting dense vegetation cover associated with low levels of dissolved oxygen leading to loss of aquatic life.
Examining Authority	The person(s) appointed by the Secretary of State (SoS) to assess the Development Consent Order application and make a recommendation to the SoS.
Exception Test	The Exception Test is set out in the National Planning Policy Framework (NPPF). If the Sequential Test identifies that a proposed development is not 'appropriate' the Exception Test is used to demonstrate and ensure that flood risk to people and property will be managed satisfactorily, while allowing necessary development to go ahead in situations where suitable sites at lower risk of flooding are not available.
Features (landscape)	Particularly prominent, "eye-catching" elements or characteristic components (i.e. tree clumps, church towers, or wooded skylines).
First study area (material assets and waste)	Project footprint (including temporary land take) for which consent is being sought. The area within which construction materials will be consumed (used / deployed), and waste generated (including temporary compounds and storage areas etc.).
Floodplain	A floodplain is flat, or nearly flat, land adjacent to a stream or river, stretching from the banks of its channel to the base of the enclosing valley walls and (under natural conditions) experiences periods of flooding.
Flood risk	The exposure, vulnerability and hazard associated with flooding.
Flood zone	Flood zones refer to the probability of river and sea flooding, ignoring the presence of defences. Flood zone 3 shows the area that could be affected by a 1 in 100 year (1% chance) flood event. Flood zone 2 shows the area that could be affected by a major flood (1 in 1000, or 0.1% chance). Flood zone 1 shows areas that are very unlikely to experience flood (<0.1%).
Flow dynamics	The manner in which flow behaves, i.e., turbulent flows, non-energetic and laminar flows.
Fluvial geomorphology	The scientific study of the form and function of rivers and the interaction between streams and the landscape around them.

Term	Definition
Geoarchaeology	The application of earth science principles and techniques to the understanding of the archaeological record
Geology	The physical structure, substance and history of the earth (rocks and minerals).
Greenhouse gases (GHG)	A gaseous compound that absorbs infrared radiation and traps heat in the atmosphere. Greenhouse gases are usually expressed in terms of carbon dioxide equivalent (CO_2e).
Groundwater dependent terrestrial ecosystem	Wetlands which critically depend on groundwater flows and/or chemistry.
Hazardous waste	Defined in line with Article 3(2) of the Waste Framework Directive (Council Directive 2008/98/EC) as: 'waste which displays one or more of the hazardous properties listed in Annex III' of the Directive.
Health inequalities	The unfair and avoidable differences in health across the population, and between different groups within society.
Heritage assets	The historic environment assets such as archaeological remains, historic buildings and historic landscapes which have archaeological, architectural, artistic or historic value.
Highways England	Highways England is the public body that operates, maintains and improves England's motorways and major A roads.
Holt	An otter's home.
Inert waste	Waste which meets one or more of the following criteria: 1) that does not undergo any significant physical, chemical or biological transformations; 2) that does not dissolve, burn or otherwise physically or chemically react, biodegrade or adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or harm to human health; and 3) where its total leachability and pollutant content and the ecotoxicity of its leachate are insignificant and, in particular, do not endanger the quality of any surface water or groundwater. See Directive 1999/31/EC and Council Decision 2003/33/EC.
Institute of Environmental Management and Assessment (IEMA)	A professional body for environmental managers and EIA professionals.
Intra-project effects (interrelationship of effects)	The combined action of a number of different environmental topic specific effects upon a single resource/receptor.
Inter-project cumulative effects	The combined action of a number of different projects, in combination with the project being assessed, on a single resource/receptor.
Key construction material	Construction materials which, by weight, constitute the majority of material required to deliver the scheme.
L_{A10}	The A-weighted sound level, in dB, that is exceeded 10% of the time.
$L_{A10,18hr}$	The noise level, in dB, that is exceeded 10% of the time between 06:00 and 24:00.

Term	Definition
L_{Aeq}	The equivalent continuous sound level (L_{Aeq}) is the level of a notional steady sound, which at a given position and over a defined period of time, would have the same A-weighted acoustic energy as the fluctuating noise.
L_{night}	The equivalent continuous sound level $L_{Aeq,8hr}$ for the period 23:00 to 07:00 hours. This is derived from the $L_{A10,18hr}$ using the TRL conversion method TRL PR/SE/451/02.
Land bank	The stock land with planning permissions but where minerals development has yet to take place.
Landfill capacity	The known, forecast or estimated remaining landfill void space, either regionally or nationally. Landfill capacity is generally measured in cubic metres.
Landscape	An area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors. European Landscape Convention (ELC) 2000. About the relationship between people and place. Inclusive, covering natural, rural, urban, and peri-urban areas and applies not only to special or designated landscapes or countryside but to everyday or degraded landscapes. 'A resource that results from the way that different components of our environment - natural and cultural - interact together and are perceived. (GLVIA3).
Landscape architect	Competent expert to mean: 1) Chartered Member of the Landscape Institute (CMLI) or; 2) member of a recognised equivalent landscape professional body.
Landscape character	A distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another, rather than better or worse. (GLVIA3)
Landscape character area (LCA)	Single unique areas which are the discrete geographical areas of particular landscape type. (GLVIA3)
Landscape character assessment	Process of identifying and describing variation in character of the landscape - the unique combination of elements and features that make landscapes distinctive - to assist in managing change in the landscape. (GLVIA3)
Landscape character type	Distinct types of relatively homogeneous landscape, generic in nature but share broadly similar combinations of geology, topography, drainage patterns, vegetation and historical land use and settlement pattern, and perceptual and aesthetics attributes. (GLVIA3)
Landscape component	Interplay of physical, natural and cultural factors of our surroundings.
Landscape effects	The consequence of an impact (expressed as the 'significance of effect') on the landscape as a resource in its own right. (GLVIA3)
Landscape elements	Individual parts of the landscape include physical influences (geology, soils, landform, drainage, and water bodies); land cover (different types of vegetation, patterns, and types of tree cover); and human influences (land use and management, character of settlements of buildings, and pattern and type of fields and enclosure). (GLVIA3)
Landscape quality (or condition)	Measure of the physical state of the landscape based on judgements, which can include typical character represented in individual areas, integrity of the landscape, and condition of individual elements. (GLVIA3)

Term	Definition
Landscape receptor	Defined aspect of the landscape resource that potentially could be affected by the project.
Landscape resource	Natural and physical attribute (i.e. soils vegetation).
Landscape sensitivity	Applied to specific landscape receptors, combining judgements of the susceptibility of the receptor to the specific type of change proposed and the value related to the receptor. (GLVIA3)
Landscape and visual impact assessment (LVIA)	A "... tool used to identify and assess the significance of and the effects of change resulting from... a project on both the landscape as a resource and on people's views and visual amenity." (GLVIA3)
Listed building	A building or structure designated under section 69 of the Planning (Listed Building and Conservation Areas) Act 1990 as being of special architectural or historic interest.
Local Nature Reserves (LNR)	Sites that are designated by the local authority under Section 21 of the National Parks and Access to the Countryside Act 1949 for nature conservation which have wildlife or geological features that are of special interest locally.
Longest dry spell	Largest number of consecutive days with < 1 mm rainfall (annual resolution).
Long-term (in relation to noise assessment)	Noise change based on the +15-year assessment (for example Do-minimum opening year scenario (DMOY) against Do-minimum future year scenario (DMFY) and DMOY against Do-something future year scenario (DSFY)).
Magnitude	The scale, size or degree of change (impact) to the environment from an action upon it.
Main river	A watercourse shown as such on the Main River Map, and for which the Environment Agency has responsibilities and powers. Main river designation is not an indication of size, although it is often the case that they are larger than ordinary watercourses.
Material impact	An event/outcome that is a key decision making consideration.
Matter	This relates to sub-topics of an environmental aspect (e.g. designated sites, protected species, etc.).
Maximum 5-day precipitation	Highest value of rainfall accumulated over 5 days (monthly resolution).
Meandering channel	A single channel that follows a winding course, with a sinuosity ratio typically over 1.5.
Mineral resource	Natural concentrations of minerals in or on the Earth's crust that are or may become of economic interest because they are present in such form, quality and quantity that there is the potential for eventual economic extraction. Generally, a mineral resource is known to exist within the boundaries outlined by BGS geological mapping.
Mineral safeguarding sites	Operational extraction sites or mineral sites specifically identified / allocated in strategic planning documents as those that will be mined or extracted.
Mineral specific sites	Areas with viable mineral resources within which the landowners are willing to allow mineral development, and which granting of planning permissions may be more likely to be actable in planning terms that in a preferred area.
Mineral Planning Authority	The mineral planning authority is the county council (in 2-tier parts of the country), the unitary authority, or the national park authority responsible for planning control of minerals development.

Term	Definition
Mineral preferred area	Areas of known resources where planning permission might reasonably be anticipated providing the proposals are environmental acceptable or appropriate conditions can be applied to mitigate adverse impacts.
Mineral area of search	A broad area within which mineral sites are sought for development.
Mineral safeguarding area	An area designated by a Mineral Planning Authority which covers known deposits of minerals which are desired to be kept safeguarded from unnecessary sterilisation by non-mineral development.
Mineral consultation area	Geographical area, based on a Mineral Safeguarding Area, where the district or borough council should consult the Mineral Planning Authority for any proposals for non-minerals development.
Mitigation	The action of reducing the severity and magnitude of change (impact) to the environment. Measures to avoid, reduce, remedy or compensate for significant adverse effects.
National Network National Policy Statement (NNNPS)	The NPS for National Networks (NNNPS) sets out *"the need for, and the Government's policies to deliver development of nationally significant infrastructure projects on the national road and rail networks"*.
National Policy Statement (NPS)	National Policy Statements (NPS) are produced by Government. They give reasons for the policy set out in the statement and must include an explanation of how the policy takes account of Government policy relating to the mitigation of, and adaptation to, climate change.
Nationally Significant Infrastructure Project (NSIP)	Major infrastructure developments in England and Wales, such as proposals for power plants, large renewable energy projects, new airports and airport extensions, and major road projects, as set out in the Planning Act (2008). See entry for Development Consent Order.
Natural England	A public body responsible for ensuring that England's natural environment is protected and improved.
Natural resources	Any physical, tangible and valued element of the natural environment (e.g. soil, land, water and biodiversity).
Noise modelling	Software to predict noise levels. NOTE: This can be undertaken either by specialist software to provide a 3D representation of the project and nearby noise sensitive receptors or a simple spreadsheet.
Noise monitoring	Measurement of noise levels.
Noise sensitive receptor	Receptors which are potentially sensitive to noise. NOTE: Examples include dwellings, hospitals, healthcare facilities, education facilities, community facilities, END quiet areas or potential END quiet areas, international and national or statutorily designated sites, public rights of way and cultural heritage assets.
NOMIS	NOMIS is a service provided by the Office for National Statistics, ONS, providing free access to detailed and up-to-date UK labour market statistics from official sources.
Non-hazardous waste	Waste that is neither classified as inert nor hazardous.
Opening year	The first year of operation.
Ordinary watercourse	All watercourses that are not designated as a main river, and which are the responsibility of LLFA or, where they exist, IDB. Note that ordinary watercourse does not imply a "small" river, although it is often the case that ordinary watercourses are smaller than main rivers.

Term	Definition
Peat resource	Existing or potential peat extraction sites.
Permitted reserves	Sites where planning permission has been granted for development but where extraction has still to take place or is not yet completed. It may cover the whole or part of a site.
Phase 1 habitat survey	A rapid system for the recording of semi-natural vegetation and other wildlife habitats first published by the Joint Nature Conservancy Council in 1990.
Planform	The birds-eye view of the channel and the form of the channel from that perspective.
Planning Inspectorate (PINS)	The Planning Inspectorate for England and Wales is an executive agency of the Ministry of Housing, Communities and Local Government with responsibility to make decisions and provide recommendations and advice on a range of land use planning-related issues including operating the planning process for Nationally Significant Infrastructure Projects.
Pools and riffles	Periodic undulations in bed elevation where relatively shallow, coarse grained riffles are separated by deeper pools.
Preliminary sources study report	A combination of desk study and site reconnaissance, the purpose of which is to develop an initial conceptual site model.
Preparing for reuse (material assets and waste)	Checking, cleaning or repairing operations, by which products or components of products that have become waste are prepared so that they can be re-used without any other pre-processing.
Prevention (material assets and waste)	Measures taken before a substance, material or product has become waste, that reduce: 1) the quantity of waste, including through the re-use of products or the extension of the life span of products; 2) the adverse impacts of the generated waste on the environment and human health; or 3) the content of harmful substances in materials and products.
Primary materials	Physical substances from non-renewables sources, i.e. those that cannot or will not be replaced in short (non-geological) periods of time. Also referred to as 'virgin' materials.
Principal aquifer	Deposits that have high intergranular and/or fracture permeability meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.
Propagules	A vegetative structure which can become detached from a plant and give rise to a new plant.
Protected species mitigation licence	The licence issued to permit an activity affecting protected species that would otherwise be an offence.
Proximity principle	The requirement to treat and/or dispose of wastes in reasonable proximity to their point of generation.
Public right of way (PRoW)	A widely known right to cross private land is known as a 'right of way'. If this is a right granted to everyone it is a 'public right of way'.
Rainfall from extremely wet days	Total rainfall falling on days with daily rainfall total in excess of the 99th percentile of daily rainfall (annual resolution).
Ramsar site	Wetlands of international importance designated under the Ramsar Convention 1971.

Term	Definition
RCP 8.5	RCP 8.5 refers to the concentration of carbon that delivers global warming at an average of 8.5 watts per square meter across the planet. The RCP 8.5 pathway delivers a temperature increase of about 4.3˚C by 2100, relative to pre-industrial temperatures.
Reach (water environment)	A length of river along which the channel controls are sufficiently uniform to allow a fairly consistent morphological structure to be maintained.
Realignment (water environment)	The artificial straightening of a river channel to accommodate structures, flood control, or navigation.
Receptor	A defined individual environmental feature usually associated with population, fauna and flora that have potential to be impacted by a development.
Recovery (material assets and waste)	Any operation, the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy.
Recycling	Any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. Recycling includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for back filling operations.
Recycled aggregates	Aggregates that are typically derived from reprocessing materials previously used in construction, such as road planings, railway ballast, crushed concrete or masonry from construction and demolition activities.
Region (material assets and waste)	The defined geographical areas or physical extents of the second study area. For the purposes of this aspect, the recommended physical extent is the former East of England Planning Region.
Registered park and garden	Gardens, grounds and other planned open spaces with historical significance. Registration is a 'material consideration' in the planning process.
Residual effect	The predicted consequential change on the environment from the impacts of a development after mitigation.
Re-use (material assets and waste)	Any operation by which products or components that are not waste are used again for the same purpose for which they were conceived.
Riparian zone	The corridor of land which runs along the banks of a river channel. If vegetated, it is known as the vegetated riparian zone.
Runoff	The movement of water above and below the surface.
Salmonid water	Rivers which would support a sustainable fish population dominated by salmonid species.
Scheduled monument	Scheduled monuments are protected by law designated under the Ancient Monuments and Archaeological Areas Act 1979 and are, by definition, of national importance.
Scoping	The process of identifying the issues to be addressed by an environmental impact assessment process. It is a method of ensuring that an assessment focuses on the important issues and avoids those that are considered unlikely to be significant.

Term	Definition
Secondary A aquifer	Deposits that comprise permeable layers that can support local water supplies and may form an important source of base flow to rivers or wetland ecosystems.
Secondary B aquifer	Deposits with mainly lower permeability layers that may store and yield limited amounts of groundwater.
Secondary undifferentiated aquifer	Deposits where it is not possible to apply either a secondary A or B definition because of the variable characteristics of the rock type.
Secondary materials / aggregates	Useful by-products from manufacturing or industrial processes. Secondary aggregates are typically by-products of industrial and other processes. These can be subdivided into manufactured and natural aggregates, depending on their source and can include materials such as pulverised fuel ash, ground granulated blast furnace slag, furnace bottom ash, incinerator bottom ash, recycled glass etc. Both secondary and recycled aggregates offer appropriate engineering specifications to allow them to replace primary aggregates.
Second study area (material assets and waste)	1) Feasible sources and availability of construction materials required to construct the main elements of a project. 2) Suitable recovery and waste management infrastructure that could accept arisings and/or waste generated by a project.
Sense of place	The essential character and spirit of an area (genius loci - spirit of the place).
Sensitivity	Receptor or resource environmental value.
Sequential Test	The Sequential Test is set out in the National Planning Policy Framework (NPPF). The Sequential Test ensures that a sequential approach is followed to steer new development to areas with the lowest probability of flooding. Following application of the Sequential Test, Planning Practice Guidance identifies the circumstances when the Exception Test should be applied.
Sett	A badger's home.
Setting (cultural heritage)	The setting of an asset is the surroundings in which a place is experienced, while embracing an understanding of perceptible evidence of the past in the present landscape.
Setting (landscape)	Contribution of the surroundings to the appearance of an area or feature and the interrelationship of the area or feature to the wider context and sense of place.
Shared use path	Shared footway/cycleway usually segregated from roads.
Short-term (in relation to noise assessment)	Noise change based on parallel assessment year (for example do-minimum opening year scenario (DMOY) against do-something opening year scenario (DSOY)).
Significance	A measure of the importance, or gravity, of the environmental effect, defined by significance criteria specific to the environmental aspect.
Sinuosity (water environment)	The degree in which a channel meanders, a sinuous channel generally has a sinuosity ratio between 0 and 1.5.
Site arisings	Construction, demolition, excavation and other arisings generated from within a project boundary, during both construction, and operation and maintenance phases.
Site of Special Scientific Interest (SSSI)	Site designated as being of special interest for its flora, fauna or geological or physiographical features and protected under the Wildlife and Countryside Act 1981.

Term	Definition
Social capital	The networks of relationships among people who live and work in a particular society, enabling that society to function effectively.
Social determinant of health	Personal, social, economic and environmental factors which determine the health status of individuals and communities.
Soil	An assemblage of mineral particles and/or organic matter which includes variable amounts of water and air (and sometimes other gases).
Source protection zone (SPZ)	Zones around groundwater sources used for potable supply or food processing, including wells, boreholes and springs, which show the level of risk to the source from contamination.
Special Area of Conservation (SAC)	An area which has been identified as being important for a range of vulnerable habitats, plant and animal species within the EU and is designated under the Habitats Directive.
Special Protection Area (SPA)	A site designated under the Birds Directive due to its international importance for the breeding, feeding, wintering, or the migration of, rare and vulnerable species of birds.
Speed band	A range of categories for which outputs from the traffic model are grouped into to describe their emissions.
Spraint	An otter's dung.
Stable non-reactive hazardous waste	Hazardous waste, the leaching behaviour of which will not change adversely in the long-term, under landfill design conditions or foreseeable accidents: in the waste alone (for example, by biodegradation); under the impact of long-term ambient conditions (for example, water, air, temperature or mechanical constraints); by the impact of other wastes (including waste products such as leachate and gas).
Standardised admissions ratio (SAR)	The SAR is a health measure that allows a comparison of hospital admissions data between areas, whilst accounting for differences in population structures (i.e. age profile) between those areas. It is calculated by using admissions data from a standard population to estimate the number of admissions expected in the study population. The estimate is then compared with the actual (observed) number of admissions and multiplied by 100 to yield the SAR. If the observed admissions are the same as the expected admissions the SAR will be 100. An SAR greater than 100 indicates that admissions are higher than would be expected for the age structure in the study population. An SAR less than 100 indicates it is lower than expected.
Standardised mortality ratio (SMR)	The SMR is a health measure that allows a comparison of mortality data between areas, whilst accounting for differences in population structures (i.e. age profile) between those areas. It is calculated from mortality data using the same approach as for the SAR.
Sterilise (material assets and waste)	Substantially constrain / prevent existing and potential future use and extraction of mineral resources, typically by constructing infrastructure over or adjacent to a deposit.
Strava Global Heatmap	A web-based source of information activities undertaken by users of the Strava fitness app (www.strava.com). The heatmap shows 'heat' made by aggregated, public activities over the last two years. The heatmap is updated monthly.
Susceptibility	Ability of a defined landscape or visual receptor to accommodate the specific proposed change without negative consequences. (GLVIA3)

Term	Definition
Synergistic	Where different types of impact affect a receptor and interact to increase their combined significance e.g. two discharges combine to have an effect on a species not affected by discharges in isolation.
Traffic reliability area (TRA)	Defined in DMRB LA 105 Air Quality (Highways England, 2019) as the "*area covered by the traffic model, that the competent expert for traffic has identified as reliable for inclusion in an environmental assessment*".
Unproductive strata	Deposits which are largely unable to provide usable water supplies and are unlikely to have surface water and wetland ecosystems dependent on them.
Value (landscape)	Relative value or importance of a landscape's quality, special qualities including perceptual aspects such as scenic beauty, tranquillity, or wildness, cultural associations or other conservation issues. (GLVIA3)
Visual amenity	Overall enjoyment of a particular area, surroundings, or views in terms of people's activities - living, recreating, travelling through, visiting, or working. (GLVIA3)
Visual receptor	Individuals and/or defined groups of people who potentially could be affected by a project. (GLVIA3)
Visual sensitivity	Visual experience, be it sensitivity to light or visual clutter.
Vulnerability (climate change)	The degree to which a system/asset is exposed and resilient to adverse effects of climate change.
Walkers, cyclists and horse riders (WCH)	A term to describe users of the highway who do not travel by motorised vehicles e.g. pedestrians, cyclists or horse riders.
Warm spell duration index	Count of days with at least six consecutive days when daily maximum temperature is above the 90th percentile as defined above (annual resolution).
Waste	Defined in line with Article 3(1) of the Waste Framework Directive (Council Directive 2008/98/EC) as: 'any substance or object which the holder discards or intends or is required to discard'. Waste is commonly split into the following classifications: Inert, Hazardous and Non-hazardous: waste that is classified neither as inert nor hazardous.
Waste classification	As part of waste Duty of Care, waste holders must classify their waste: before it is collected, disposed of or recovered; to identify the controls that apply to the movement of the waste; to complete waste documents and records; to identify suitably authorised waste management options; and to prevent harm to people and the environment. Technical Guidance WM3 'Waste Classification - Guidance on the classification and assessment of waste' provides guidance on waste classification in the UK. It is a comprehensive reference manual for anyone involved in producing, managing and regulating waste. Appendix A of WM3 includes the waste classification codes, also referred to as LoW (List of Waste) or EWC (European Waste Catalogue) codes.
Waste consultation area	Geographical area, based on existing waste infrastructure sites, where the district or borough council should consult the Mineral Planning Authority for any proposals for non-minerals development.

Term	Definition
Waste holder	The Duty of Care applies to anyone who imports, produces, carries, keeps, treats, disposes of, or are a dealer or broker that has control of, controlled waste (commonly referred to as a "waste holder"). Waste holders are a: 1) waste producer – any person whose activities produce waste. It also includes permitted operations or exempt facilities that produce waste as part of their activities. If you carry out a waste operation that changes the nature or composition of the waste, you are regarded as a producer of the waste. Waste producers play a key role under the duty of care requirements as they are in the best position to identify the nature and characteristics of the waste. 2) waste carrier – any person, who normally and regularly collects, carries or transports waste in the course of any business or with a view to profit, including those that produce and transport their own waste. 3) waste dealer – any person, business or organisation that buys waste with the aim of subsequently selling it, including in circumstances where the dealer does not take physical possession of the waste. 4) waste broker – any person, business or organisation that arranges waste transportation and management of waste on behalf of another party, such as organisations contracting out waste collection services. 5) waste manager – any person involved in the collection, transport, recovery or disposal of controlled waste, including the supervision of these operations, the after-care of disposal sites and actions taken as a dealer or broker.
Waste infrastructure	Facilities that handle, treat/prepare for reuse, recycle and dispose (landfill) of waste.
Water Framework Directive (WFD)	The Water Framework Directive (Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy) is an EU directive which commits EU member states to achieve good qualitative and quantitative status of all water bodies (including marine waters up to one nautical mile from shore).
Zone of theoretical visibility (ZTV)	Map produced (usually digitally) to specific criteria to illustrate the area(s) from which a project can theoretically be visual.

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Appendix A. Figures

Figure 1.1 – Scheme Location Plan

Figure 6.1 – Air Quality Assessment Study Area

Figure 6.2 – Air Quality Monitoring

Figure 6.3 – Air Quality Key Environmental Constraints

Figure 7.1 – Cultural Heritage Assets

Figure 7.2 – Cultural Heritage Historic Landscape Classification

Figure 8.1 – Key Landscape Constraints

Figure 8.2 – Local Landscape Character Areas

Figure 8.3 – Zone of Theoretical Visibility and Representative Viewpoints

Figure 9.1 – Biodiversity Designated Sites

Figure 9.2 – Biodiversity Important Habitats

Figure 10.1 – Geology and Soils Land Contamination Constraints Plan

Figure 11.1 – Minerals and Waste Infrastructure and Designations

Figure 12.1 – Expected Operational Noise Study Area and Proposed Noise Monitoring Locations

Figure 13.1 – Population and Health Context Study Area

Figure 14.1 – Water Environment Features

Figure 14.2 – Surface Water Flood Risk

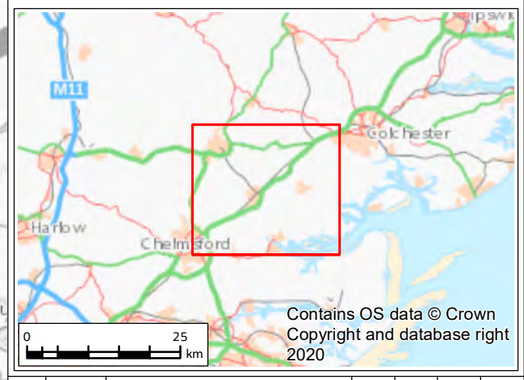
Figure 14.3 – Potential Groundwater Receptors

Figure 14.4 – Aquifer Designations

FIGURE 1.1

Legend

- Proposed Scheme Alignment
- Provisional Order Limits



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P02	12/10/20	Final	ML	SM	SM	SG

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Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
SCHEME LOCATION PLAN
SHEET 1 OF 1

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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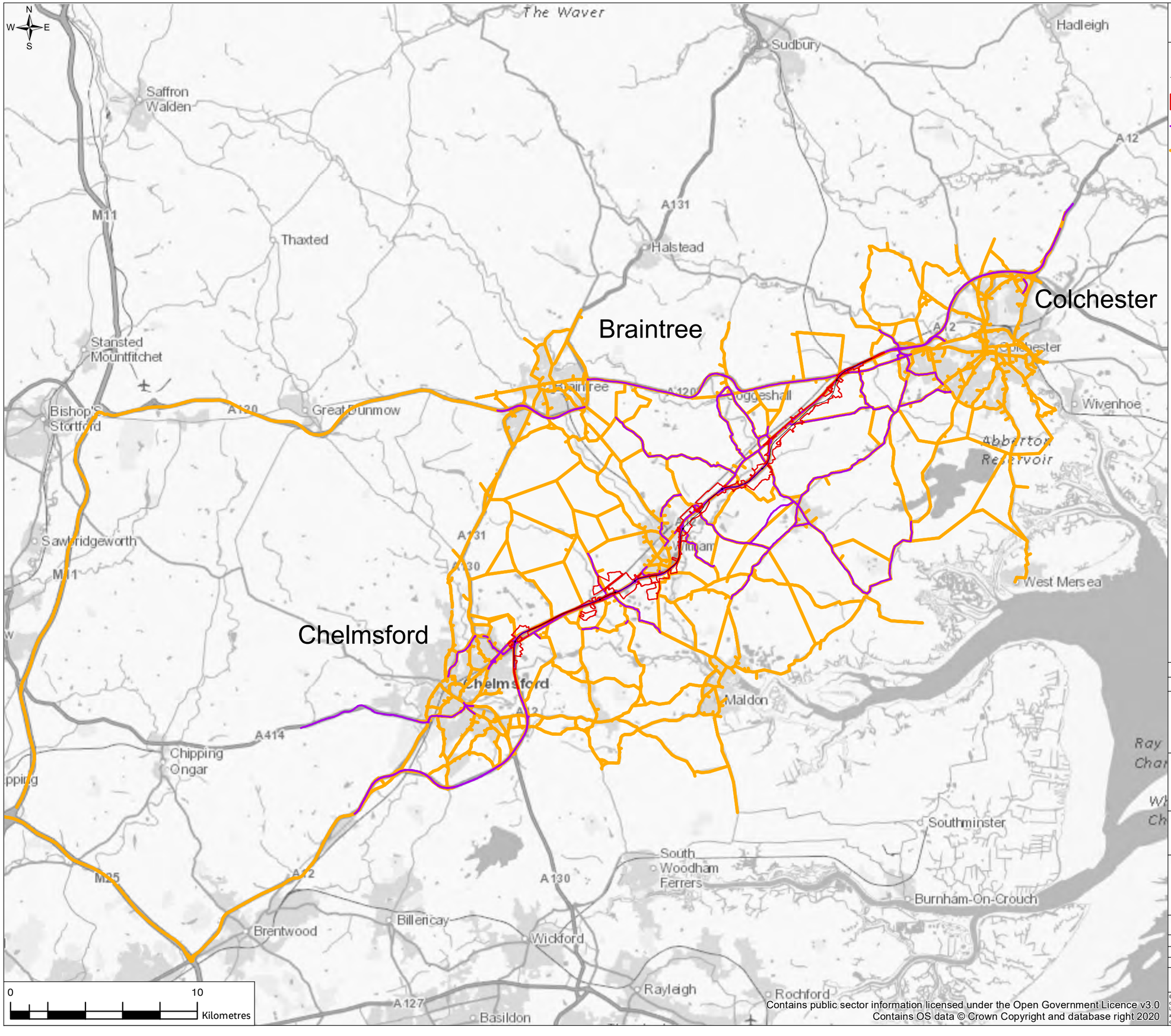
Jacobs No.	B229H130	
Client No.	HE551497	Rev P02

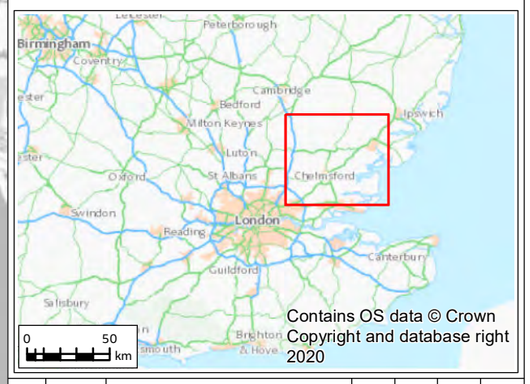
Drawing Number: HE551497-JAC-EGN-SCHW-SK-GI-0001

FIGURE 6.1



Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- PCF2 Affected Road Network
- Indicative Traffic Reliability Area



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Drawing Title: ENVIRONMENTAL SCOPING REPORT
AIR QUALITY
ASSESSMENT STUDY AREA
SHEET 1 OF 1

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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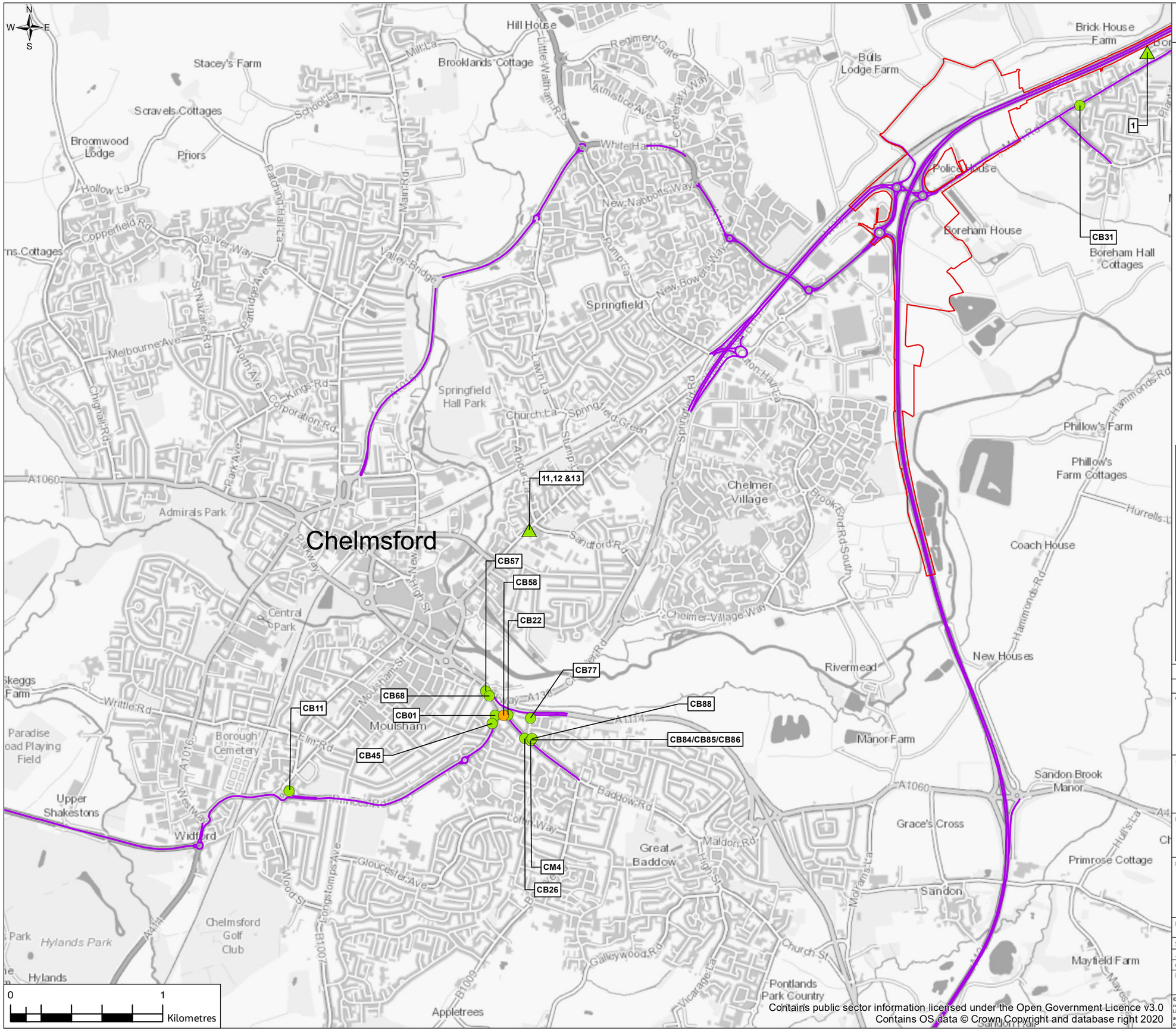
Drawing Number: HE551497-JAC-EAQ-SCHW-SK-GI-0001

FIGURE 6.2



Legend

- Provisional Order Limits
- PCF2 Affected Road Network

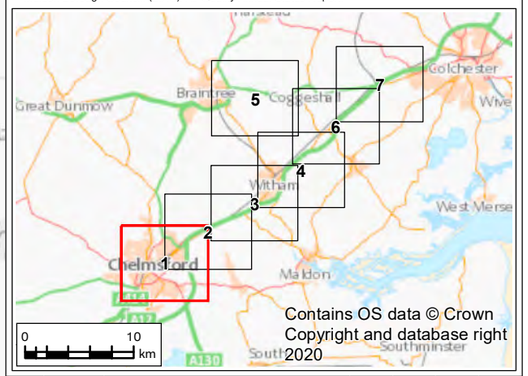
Local Authority Monitoring: 2018 annual mean NO_2 (µg/m³)

- < 36
- < 40
- >= 40

Highways England Monitoring: 2018 annual mean NO_2 (µg/m³)

- < 36
- < 40
- >= 40

Local Authority monitoring data extracted from:
- Braintree Borough Council. (2019). Air Quality Annual Status Report;
- Chelmsford Borough Council. (2019). Air Quality Annual Status Report;
- Colchester Borough Council. (2019). Air Quality Annual Status Report;
- Maldon Borough Council. (2019). Air Quality Annual Status Report.



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Drawing Title: ENVIRONMENTAL SCOPING REPORT
AIR QUALITY
MONITORING
SHEET 1 OF 7

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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FIGURE 6.2

Legend

- Provisional Order Limits
- PCF2 Affected Road Network

Local Authority Monitoring: 2018 annual mean NO_2 (µg/m³)

- < 36
- < 40
- >= 40

Highways England Monitoring: 2018 annual mean NO_2 (µg/m³)

- < 36
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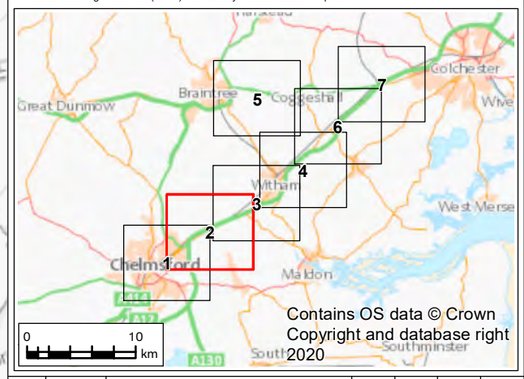

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Drawing Title: ENVIRONMENTAL SCOPING REPORT
AIR QUALITY
MONITORING
SHEET 2 OF 7

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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Drawing Number: HE551497-JAC-EAQ-SCHW-SK-GI-0003

0 1 Kilometres

FIGURE 6.2

Legend

- Provisional Order Limits
- PCF2 Affected Road Network

Local Authority Monitoring: 2018 annual mean NO_2 (µg/m³)

- < 36
- < 40
- >= 40

Highways England Monitoring: 2018 annual mean NO_2 (µg/m³)

- < 36
- < 40
- >= 40

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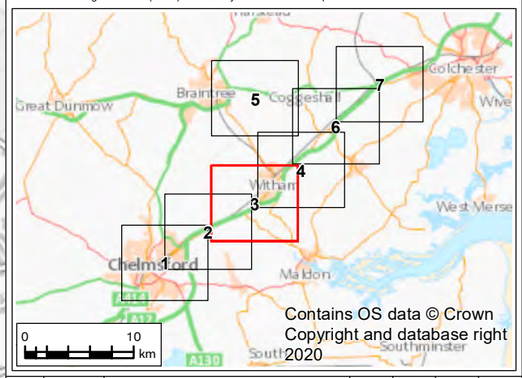

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Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
AIR QUALITY
MONITORING
SHEET 3 OF 7

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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Jacobs No.	B229H130	
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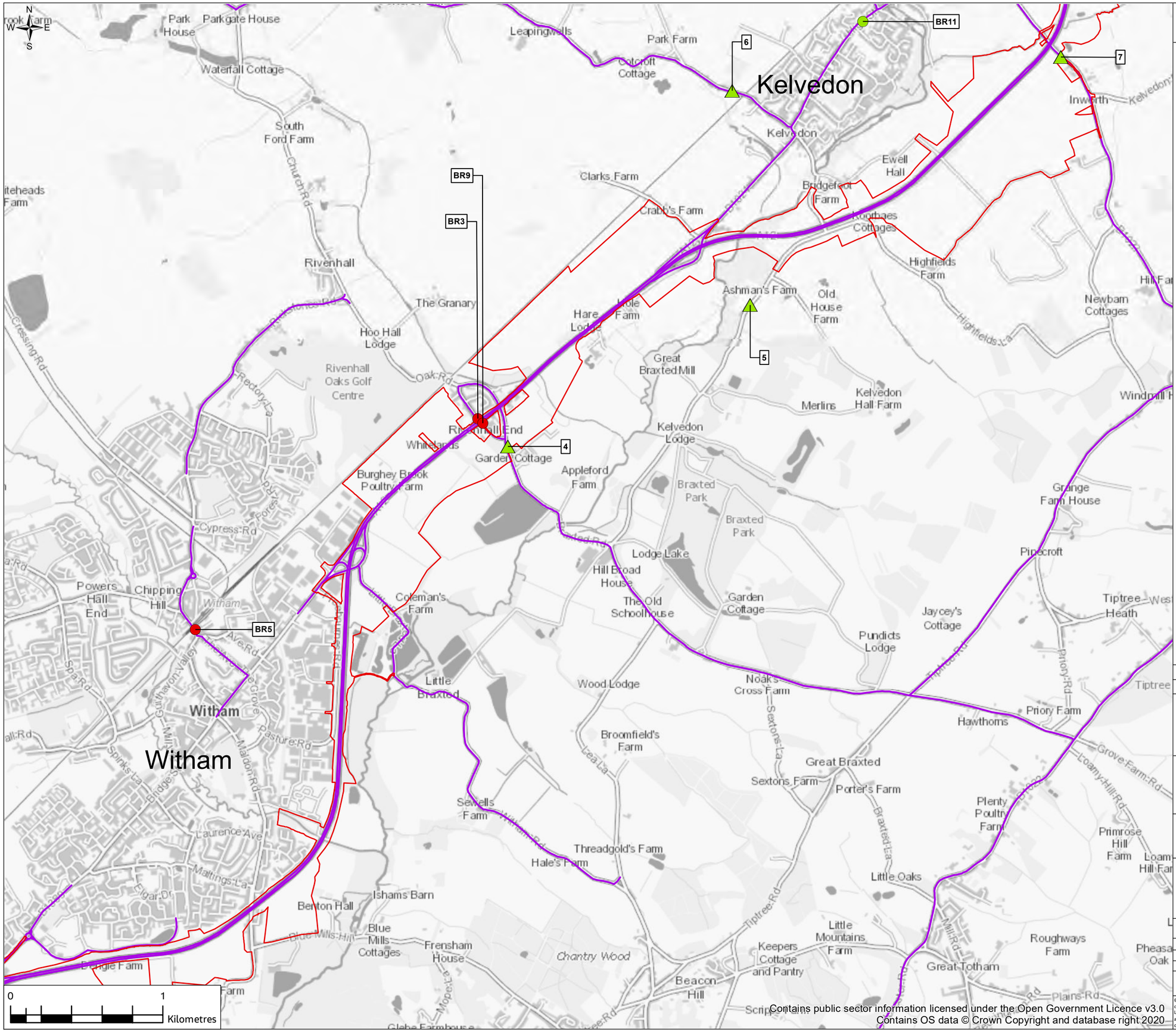
Drawing Number: HE551497-JAC-EAQ-SCHW-SK-GI-0004

0 1 Kilometres

FIGURE 6.2



Legend

- Provisional Order Limits
- PCF2 Affected Road Network

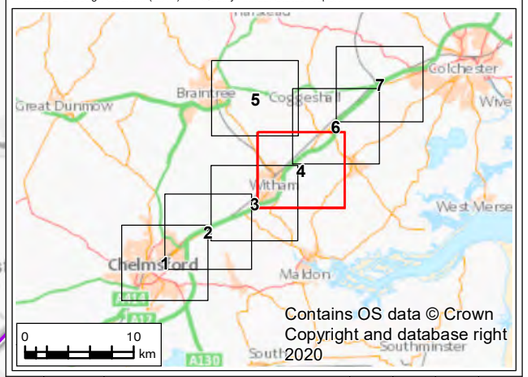
Local Authority Monitoring: 2018 annual mean NO_2 (µg/m³)

- < 36
- < 40
- >= 40

Highways England Monitoring: 2018 annual mean NO_2 (µg/m³)

- < 36
- < 40
- >= 40

Local Authority monitoring data extracted from:
- Braintree Borough Council. (2019). Air Quality Annual Status Report;
- Chelmsford Borough Council. (2019). Air Quality Annual Status Report;
- Colchester Borough Council. (2019). Air Quality Annual Status Report;
- Maldon Borough Council. (2019). Air Quality Annual Status Report.



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Designer: Jacobs
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6 Cherry Orchard Road, Croydon, CR9 6BE, UK.
Tel: +44 (0)20 8686 8212 Fax: +44 (0)208 681 2499
www.jacobs.com

Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
AIR QUALITY
MONITORING
SHEET 4 OF 7

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

Scale @ A3	1:24000	DO NOT SCALE
Jacobs No.	B229H130	
Client No.	HE551497	Rev P02

Drawing Number: HE551497-JAC-EAQ-SCHW-SK-GI-0005

FIGURE 6.2

Legend

- Provisional Order Limits
- PCF2 Affected Road Network

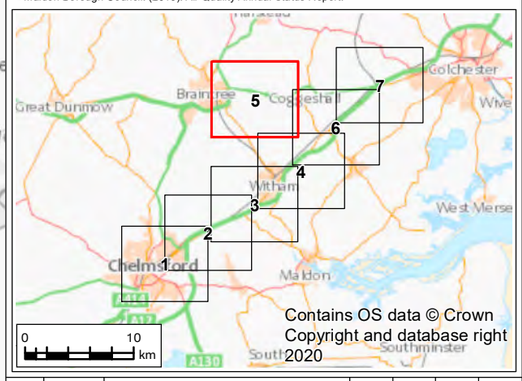
Local Authority Monitoring: 2018 annual mean NO_2 (µg/m³)

- < 36
- < 40
- >= 40

Highways England Monitoring: 2018 annual mean NO_2 (µg/m³)

- < 36
- < 40
- >= 40

Local Authority monitoring data extracted from:
- Braintree Borough Council. (2019). Air Quality Annual Status Report;
- Chelmsford Borough Council. (2019). Air Quality Annual Status Report;
- Colchester Borough Council. (2019). Air Quality Annual Status Report;
- Maldon Borough Council. (2019). Air Quality Annual Status Report.



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Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
AIR QUALITY
MONITORING
SHEET 5 OF 7

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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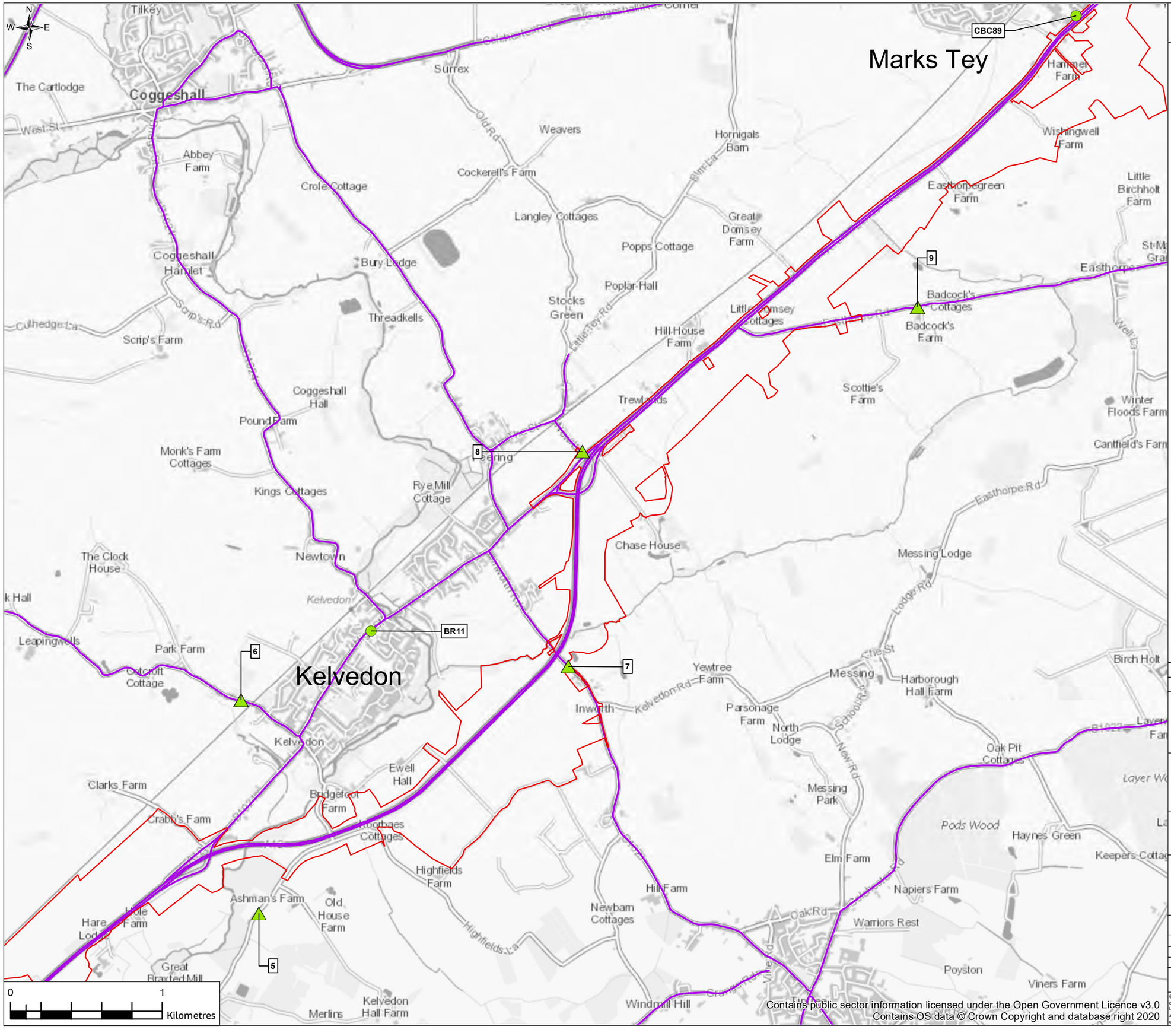
Jacobs No.	B229H130	
Client No.	HE551497	Rev P02

Drawing Number: HE551497-JAC-EAQ-SCHW-SK-GI-0006

0 1 Kilometres

FIGURE 6.2



Legend

- Provisional Order Limits
- PCF2 Affected Road Network

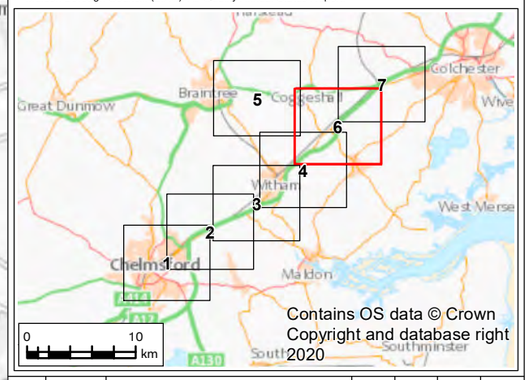
Local Authority Monitoring: 2018 annual mean NO_2 ($\mu g/m^3$)

- < 36
- < 40
- >= 40

Highways England Monitoring: 2018 annual mean NO_2 ($\mu g/m^3$)

- < 36
- < 40
- >= 40

Local Authority monitoring data extracted from:
- Braintree Borough Council. (2019). Air Quality Annual Status Report;
- Chelmsford Borough Council. (2019). Air Quality Annual Status Report;
- Colchester Borough Council. (2019). Air Quality Annual Status Report;
- Maldon Borough Council. (2019). Air Quality Annual Status Report.



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Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
AIR QUALITY
MONITORING
SHEET 6 OF 7

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

Scale @ A3	1:24000	DO NOT SCALE
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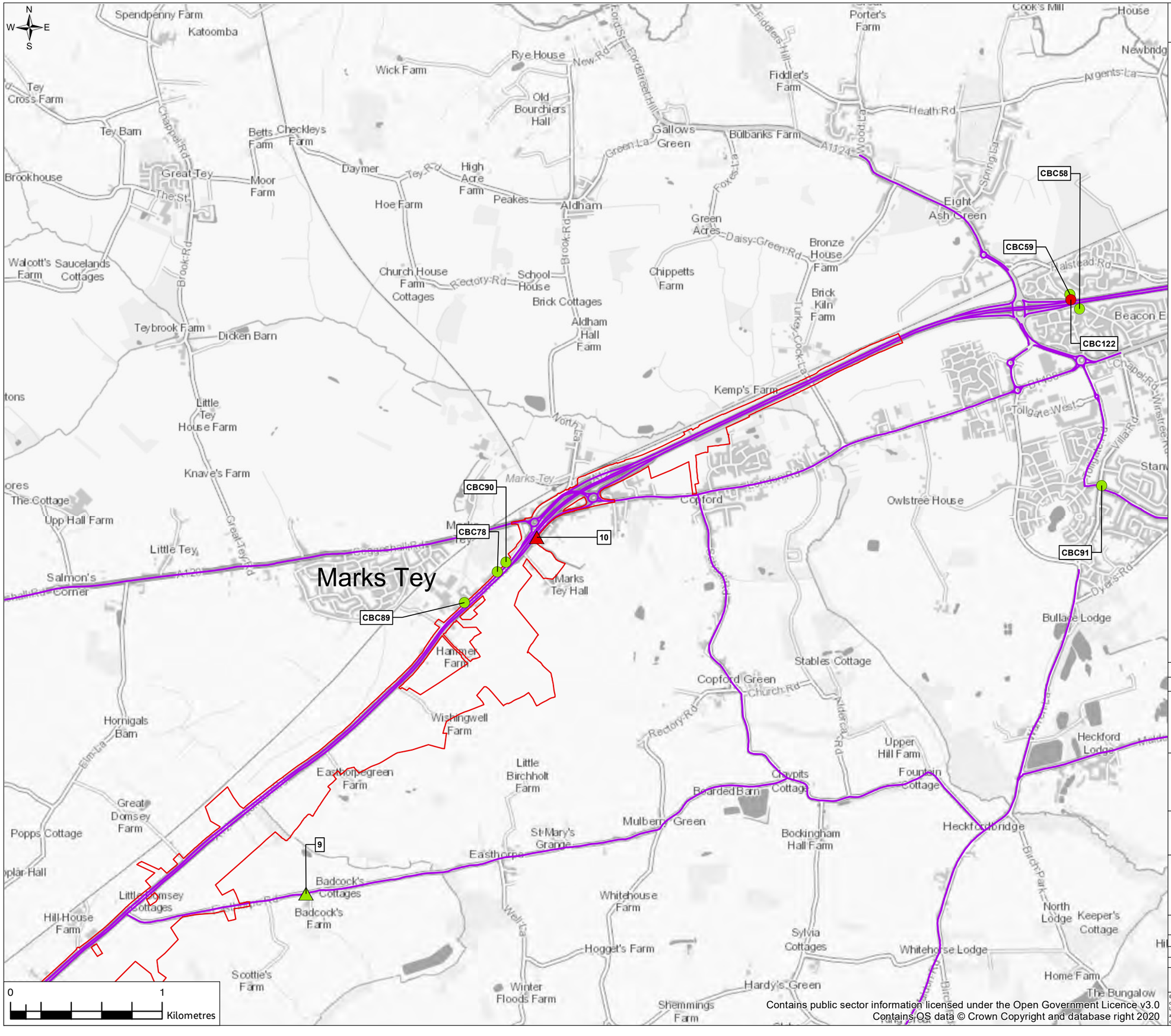
Client No.	HE551497	Rev P02

Drawing Number: HE551497-JAC-EAQ-SCHW-SK-GI-0007

FIGURE 6.2



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Legend

- Provisional Order Limits
- PCF2 Affected Road Network

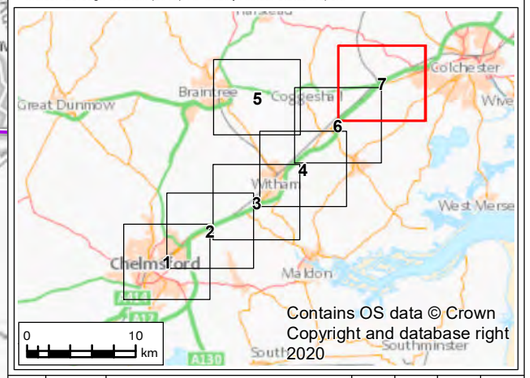
Local Authority Monitoring: 2018 annual mean NO_2 (µg/m³)

- < 36
- < 40
- >= 40

Highways England Monitoring: 2018 annual mean NO_2 (µg/m³)

- < 36
- < 40
- >= 40

Local Authority monitoring data extracted from:
- Braintree Borough Council. (2019). Air Quality Annual Status Report;
- Chelmsford Borough Council. (2019). Air Quality Annual Status Report;
- Colchester Borough Council. (2019). Air Quality Annual Status Report;
- Maldon Borough Council. (2019). Air Quality Annual Status Report.



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Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
AIR QUALITY
MONITORING
SHEET 7 OF 7

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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Client No.	HE551497	Rev P02

Drawing Number: HE551497-JAC-EAQ-SCHW-SK-GI-0008

FIGURE 6.3

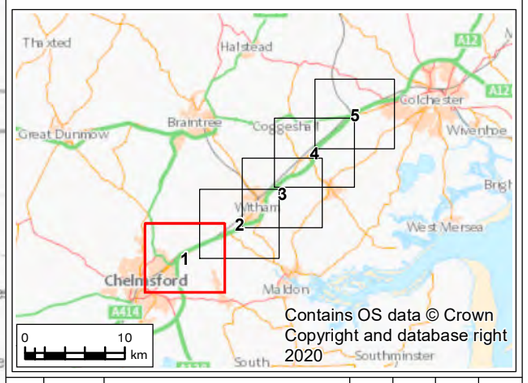
Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- PCF2 Affected Road Network
- Indicative Traffic Reliability Area
- PCM Census Links
- RAMSAR
- Site of Special Scientific Interest (SSSI)
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)
- Ancient Woodland
- Air Quality Management Area (AQMA)
- Local Nature Reserves (LNR)
- Local Wildlife Sites
- PCF2 Human Health Receptors (within 200m of ARN)

Human Dust Receptors

Distance from Provisional Order Limits

- 0 - 50m
- 50 - 100m
- 100 - 200m



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Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
AIR QUALITY
KEY ENVIRONMENTAL CONSTRAINTS
SHEET 1 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

Scale @ A3	1:26000	DO NOT SCALE
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Client No.	HE551497	Rev P02

Drawing Number: HE551497-JAC-EAQ-SCHW-SK-GI-0009

0 1 Kilometres

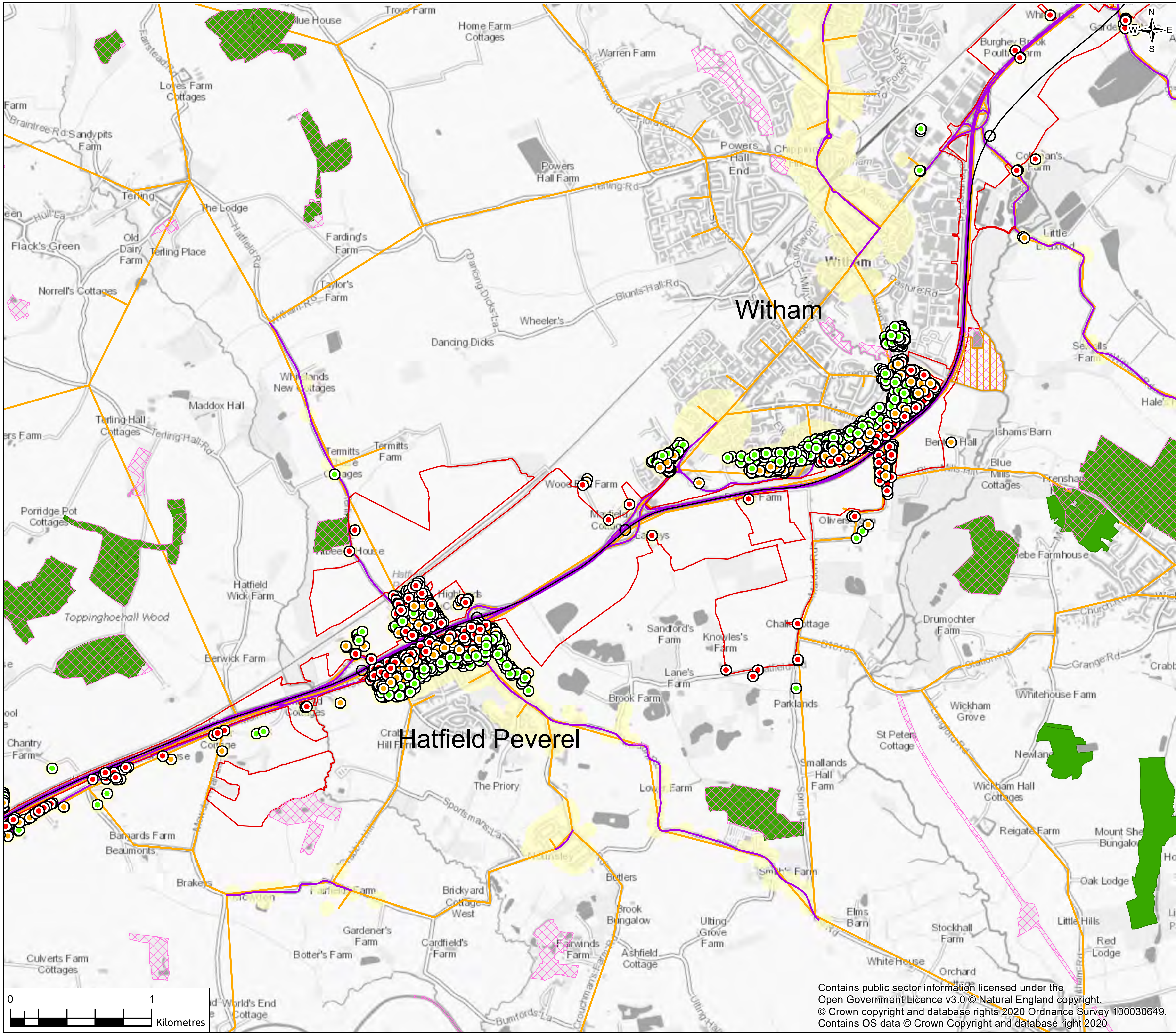

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FIGURE 6.3

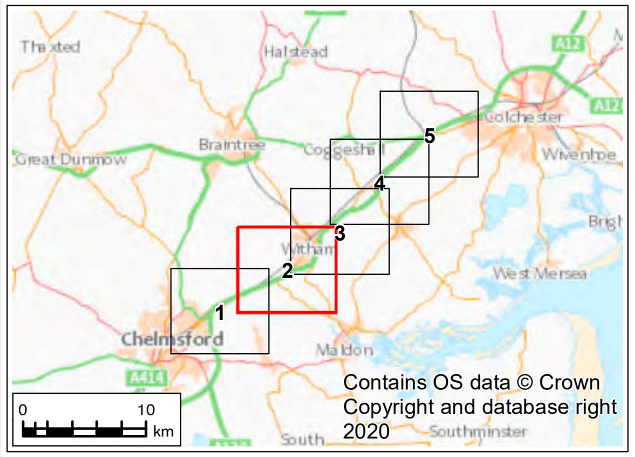
Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- PCF2 Affected Road Network
- Indicative Traffic Reliability Area
- PCM Census Links
- RAMSAR
- Site of Special Scientific Interest (SSSI)
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)
- Ancient Woodland
- Air Quality Management Area (AQMA)
- Local Nature Reserves (LNR)
- Local Wildlife Sites
- PCF2 Human Health Receptors (within 200m of ARN)

Human Dust Receptors

Distance from Provisional Order Limits

- 0 - 50m
- 50 - 100m
- 100 - 200m



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www.jacobs.com

Client: highways england

Project
A12 CHELMSFORD TO A120 WIDENING SCHEME

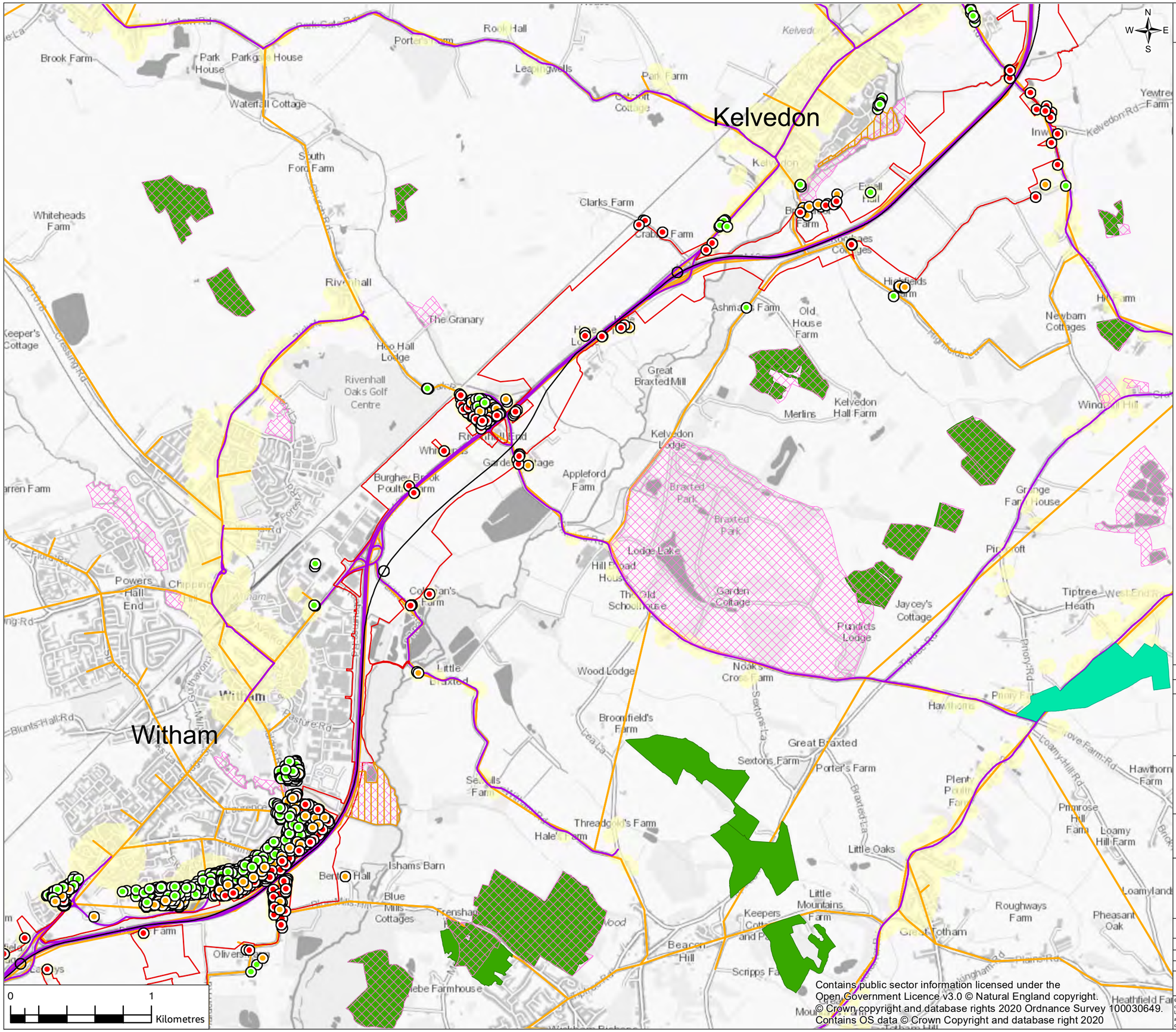
Drawing Title
ENVIRONMENTAL SCOPING REPORT
AIR QUALITY
KEY ENVIRONMENTAL CONSTRAINTS
SHEET 2 OF 5

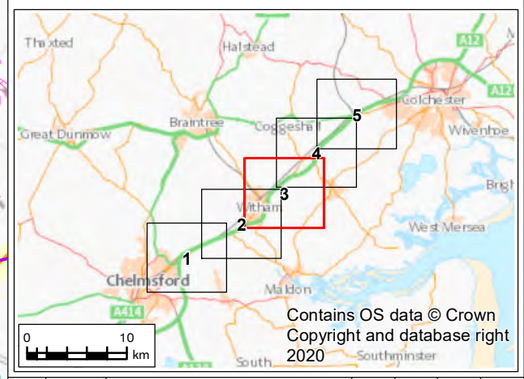
Drawing Status
S4 - SUITABLE FOR STAGE APPROVAL

Scale @ A3	1:26000	DO NOT SCALE
Jacobs No.	B229H130	
Client No.	HE551497	Rev P02

Drawing Number
HE551497-JAC-EAQ-SCHW-SK-GI-0010

FIGURE 6.3





Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- PCF2 Affected Road Network
- Indicative Traffic Reliability Area
- PCM Census Links
- RAMSAR
- Site of Special Scientific Interest (SSSI)
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)
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Human Dust Receptors

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- 100 - 200m

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www.jacobs.com

Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
AIR QUALITY
KEY ENVIRONMENTAL CONSTRAINTS
SHEET 3 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

Scale @ A3	1:26000		DO NOT SCALE
Jacobs No.	B229H130		
Client No.	HE551497	Rev	P02

Drawing Number: HE551497-JAC-EAQ-SCHW-SK-GI-0011

FIGURE 6.3

Marks Tey

Kelvedon

Kilometres

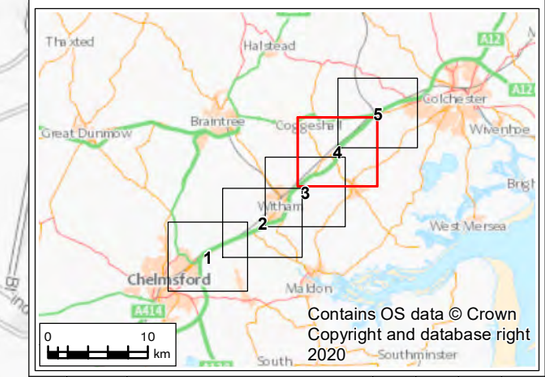
Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- PCF2 Affected Road Network
- Indicative Traffic Reliability Area
- PCM Census Links
- RAMSAR
- Site of Special Scientific Interest (SSSI)
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)
- Ancient Woodland
- Air Quality Management Area (AQMA)
- Local Nature Reserves (LNR)
- Local Wildlife Sites
- PCF2 Human Health Receptors (within 200m of ARN)

Human Dust Receptors

Distance from Provisional Order Limits

- 0 - 50m
- 50 - 100m
- 100 - 200m



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Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
AIR QUALITY
KEY ENVIRONMENTAL CONSTRAINTS
SHEET 4 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

Scale @ A3	1:26000	DO NOT SCALE
Jacobs No.	B229H130	
Client No.	HE551497	Rev P02

Drawing Number: HE551497-JAC-EAQ-SCHW-SK-GI-0012

FIGURE 6.3

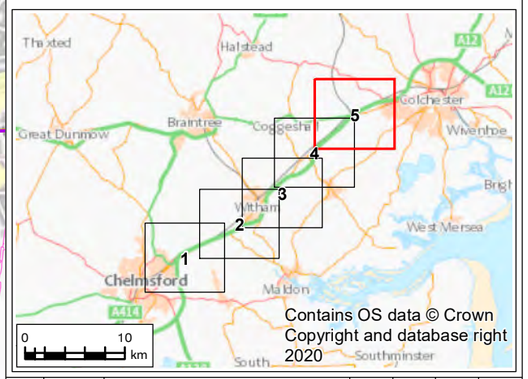
Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- PCF2 Affected Road Network
- Indicative Traffic Reliability Area
- PCM Census Links
- RAMSAR
- Site of Special Scientific Interest (SSSI)
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)
- Ancient Woodland
- Air Quality Management Area (AQMA)
- Local Nature Reserves (LNR)
- Local Wildlife Sites
- PCF2 Human Health Receptors (within 200m of ARN)

Human Dust Receptors

Distance from Provisional Order Limits

- 0 - 50m
- 50 - 100m
- 100 - 200m



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Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
AIR QUALITY
KEY ENVIRONMENTAL CONSTRAINTS
SHEET 5 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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Jacobs No.	B229H130	
Client No.	HE551497	Rev P02

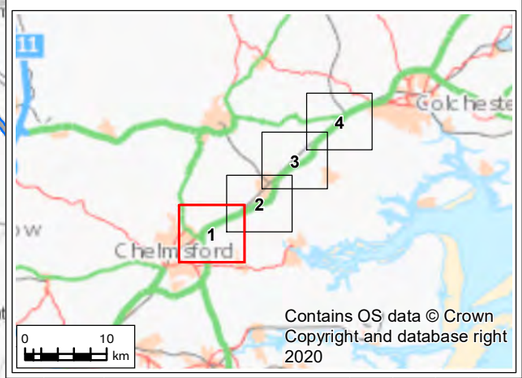
Drawing Number: HE551497-JAC-EAQ-SCHW-SK-GI-0013

0 1 Kilometres

FIGURE 7.1

Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Heritage 300m Study Area
- Heritage 1,000m Study Area
- Railway
- River
- Grade I Listed Building
- Grade II* Listed Building
- Grade II Listed Building
- Conservation Area
- Grade II* Registered park and garden
- Grade II Registered park and garden
- Scheduled Monument
- High Value Heritage Asset
- Medium Value Heritage Asset
- Low Value Heritage Asset
- Negligible Value Heritage Asset



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Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
CULTURAL HERITAGE ASSETS
SHEET 1 OF 4

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

Scale @ A3	1:25000		DO NOT SCALE
Jacobs No.	B229H130	Rev	P02
Client No.	HE551497		

Drawing Number: HE551497-JAC-EHR-SCHW-SK-GI-0001

0 1 Kilometres

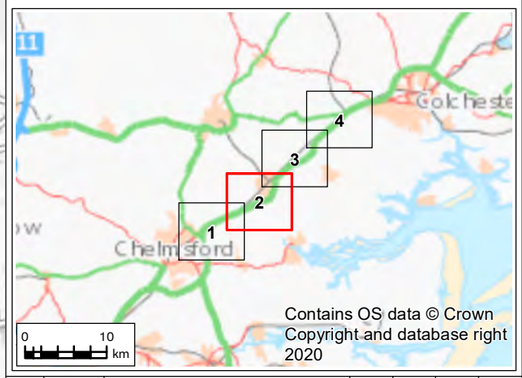
FIGURE 7.1

Witham

Hatfield Peverel

Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Heritage 300m Study Area
- Heritage 1,000m Study Area
- Railway
- River
- Grade I Listed Building
- Grade II* Listed Building
- Grade II Listed Building
- Conservation Area
- Grade II* Registered park and garden
- Grade II Registered park and garden
- Scheduled Monument
- High Value Heritage Asset
- Medium Value Heritage Asset
- Low Value Heritage Asset
- Negligible Value Heritage Asset



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Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
CULTURAL HERITAGE ASSETS
SHEET 2 OF 4

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

Scale @ A3	1:25000	DO NOT SCALE	
Jacobs No.	B229H130	Rev	P02
Client No.	HE551497		

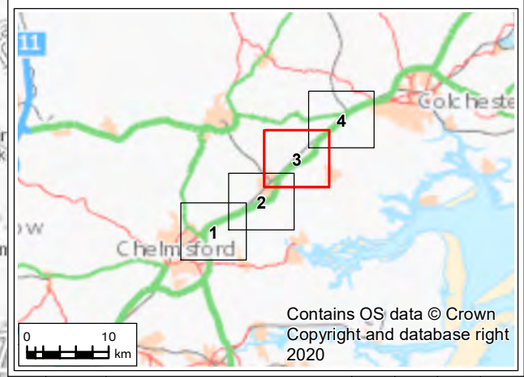
Drawing Number: HE551497-JAC-EHR-SCHW-SK-GI-0002

0 1 Kilometres

FIGURE 7.1

Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Heritage 300m Study Area
- Heritage 1,000m Study Area
- Railway
- River
- Grade I Listed Building
- Grade II* Listed Building
- Grade II Listed Building
- Conservation Area
- Grade II* Registered park and garden
- Grade II Registered park and garden
- Scheduled Monument
- High Value Heritage Asset
- Medium Value Heritage Asset
- Low Value Heritage Asset
- Negligible Value Heritage Asset



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Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
CULTURAL HERITAGE ASSETS
SHEET 3 OF 4

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

Scale @ A3	1:25000		DO NOT SCALE
Jacobs No.	B229H130	Rev	P02
Client No.	HE551497		

Drawing Number: HE551497-JAC-EHR-SCHW-SK-GI-0003

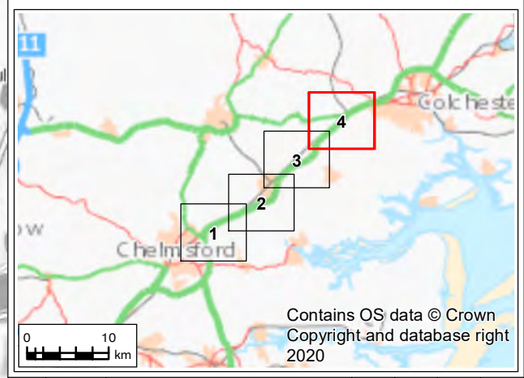
0 1 Kilometres

FIGURE 7.1

Marks Tey

Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Heritage 300m Study Area
- Heritage 1,000m Study Area
- Railway
- River
- Grade I Listed Building
- Grade II* Listed Building
- Grade II Listed Building
- Conservation Area
- Grade II* Registered park and garden
- Grade II Registered park and garden
- Scheduled Monument
- High Value Heritage Asset
- Medium Value Heritage Asset
- Low Value Heritage Asset
- Negligible Value Heritage Asset



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Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
CULTURAL HERITAGE ASSETS
SHEET 4 OF 4

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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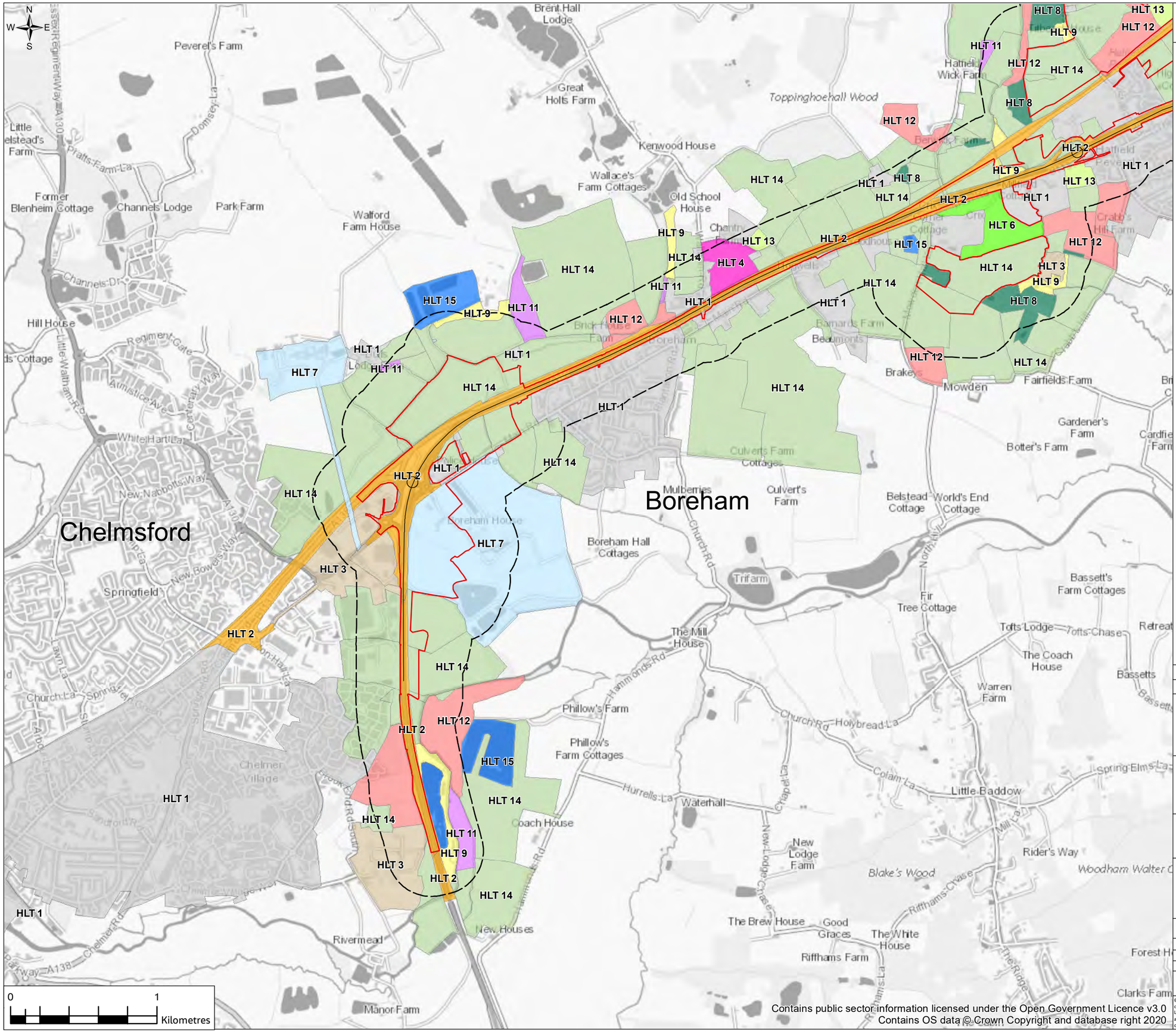
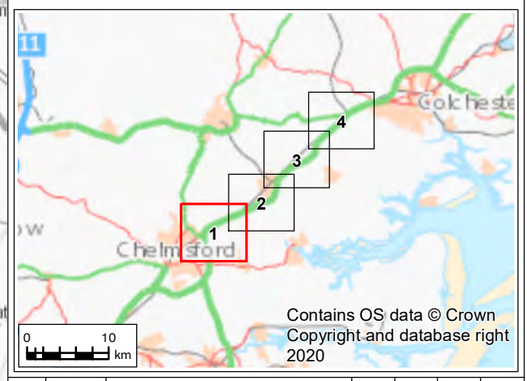
Drawing Number: HE551497-JAC-EHR-SCHW-SK-GI-0004

0 1 Kilometres

FIGURE 7.2





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Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Heritage 300m Study Area

Historic Landscape Type

- HLT 1 - Settlement
- HLT 2 - Communications
- HLT 3 - Industry
- HLT 4 - Mineral Extraction
- HLT 5 - Horticulture
- HLT 6 - Recreation
- HLT 7 - Post-medieval Designed Landscape
- HLT 8 - Ancient Woodland
- HLT 9 - Post-medieval Plantation
- HLT 10 - Unenclosed Heath
- HLT 11 - Enclosed Meadow Pasture
- HLT 12 - Pre-18th Century Enclosure
- HLT 13 - 18th and 19th Century Enclosure
- HLT 14 - Modern Agriculture
- HLT 15 - Artificial Water Bodies

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Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
CULTURAL HERITAGE
HISTORIC LANDSCAPE CLASSIFICATION
SHEET 1 OF 4

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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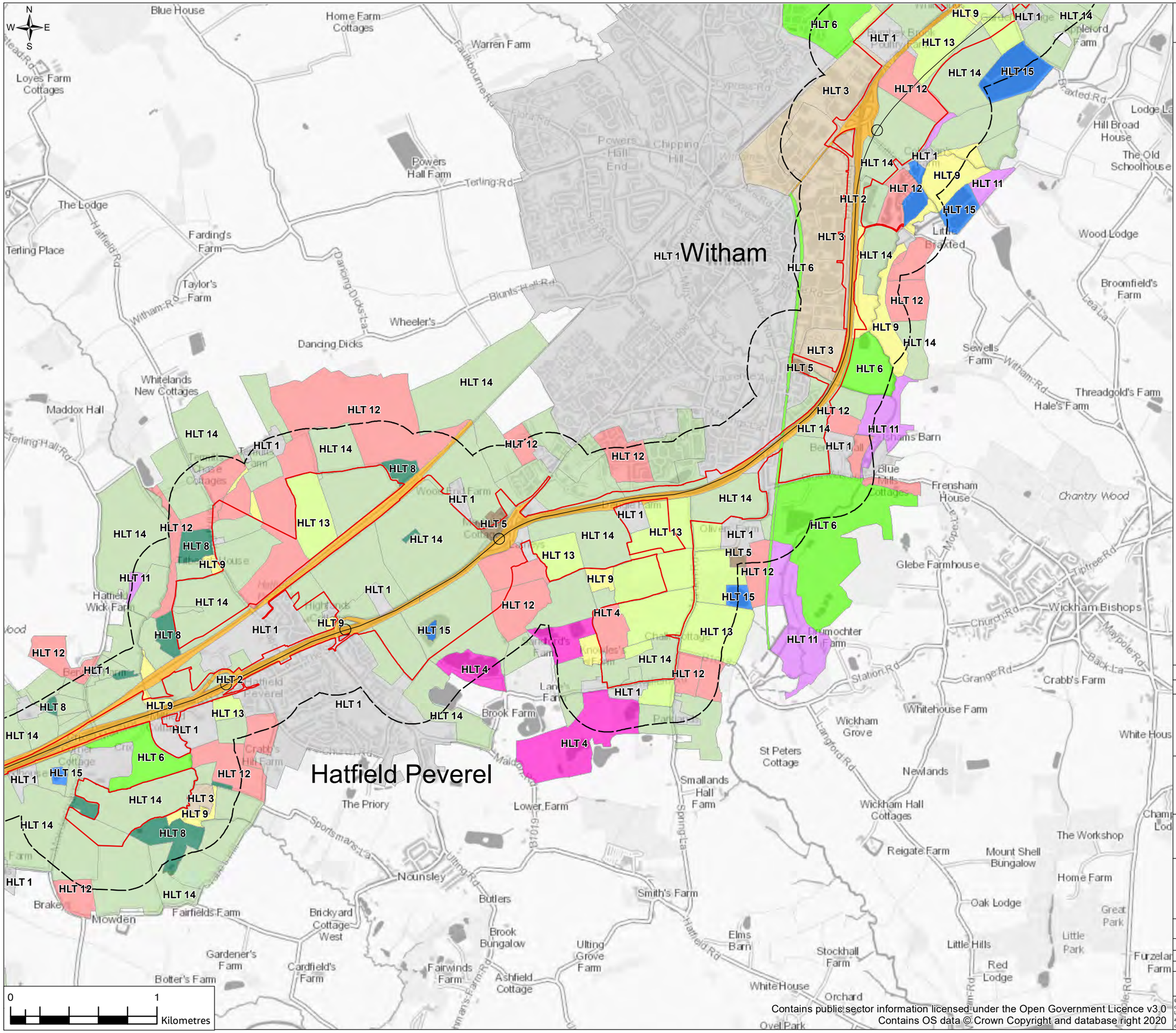
Drawing Number: HE551497-JAC-EHR-SCHW-SK-GI-0005

FIGURE 7.2



Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Heritage 300m Study Area

Historic Landscape Type

- HLT 1 - Settlement
- HLT 2 - Communications
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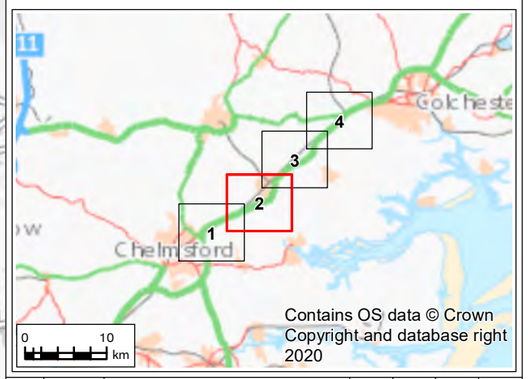

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Drawing Title: ENVIRONMENTAL SCOPING REPORT
CULTURAL HERITAGE
HISTORIC LANDSCAPE CLASSIFICATION
SHEET 2 OF 4

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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Drawing Number: HE551497-JAC-EHR-SCHW-SK-GI-0006

FIGURE 7.2

Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Heritage 300m Study Area

Historic Landscape Type

- HLT 1 - Settlement
- HLT 2 - Communications
- HLT 3 - Industry
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- HLT 13 - 18th and 19th Century Enclosure
- HLT 14 - Modern Agriculture
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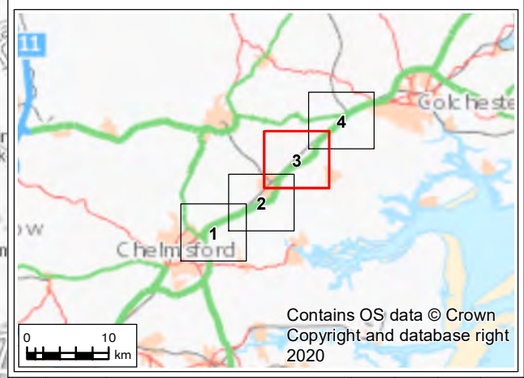

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Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
CULTURAL HERITAGE
HISTORIC LANDSCAPE CLASSIFICATION
SHEET 3 OF 4

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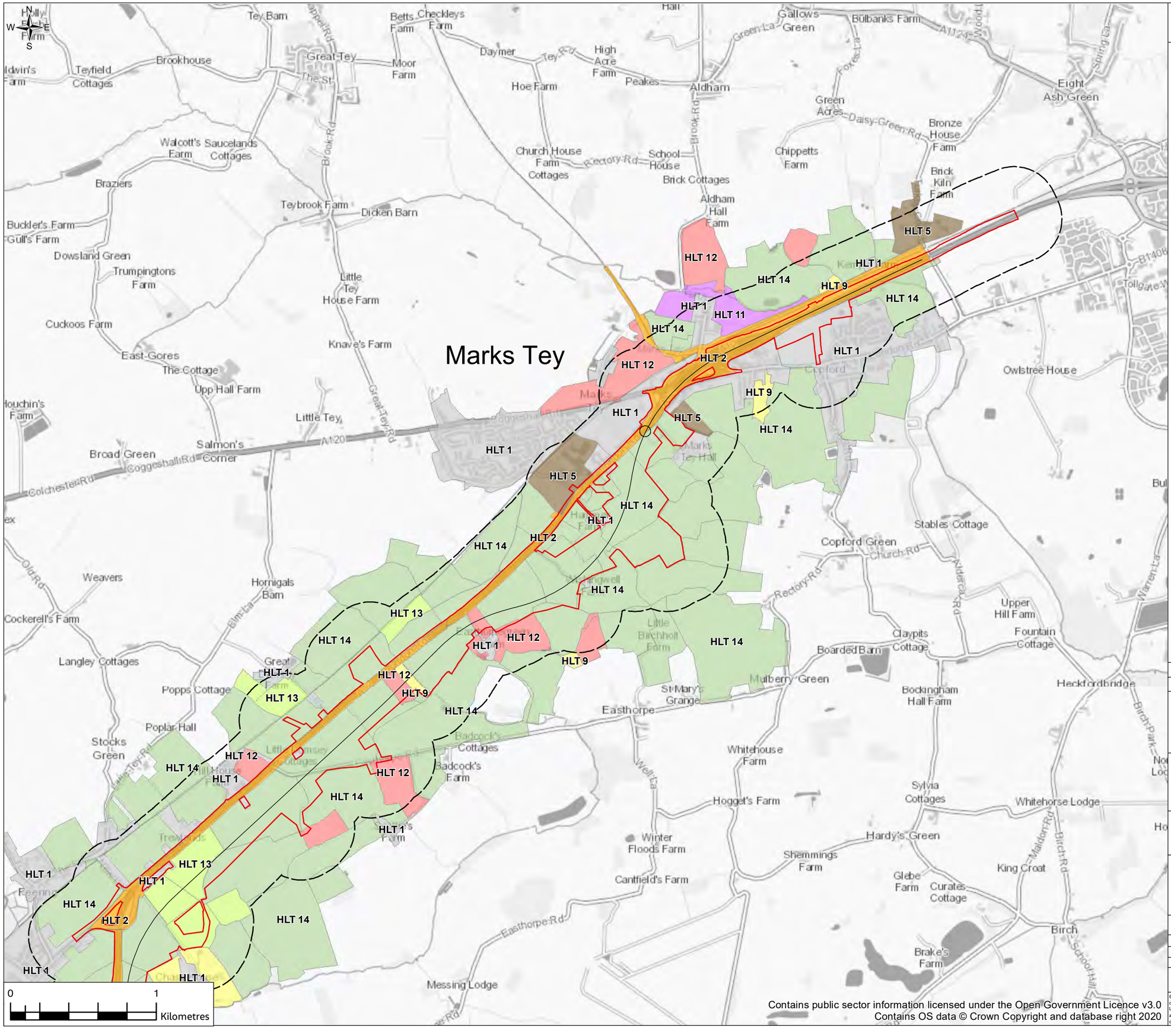
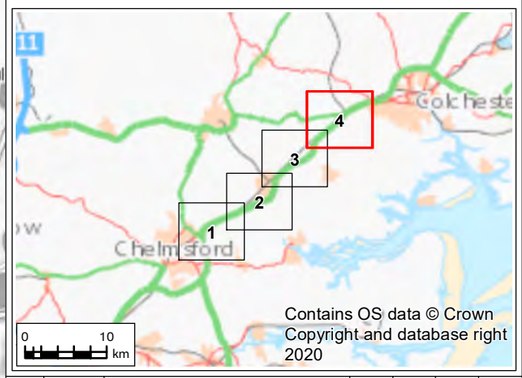
0 1 Kilometres

FIGURE 7.2





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Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Heritage 300m Study Area

Historic Landscape Type

- HLT 1 - Settlement
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Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
CULTURAL HERITAGE
HISTORIC LANDSCAPE CLASSIFICATION
SHEET 4 OF 4

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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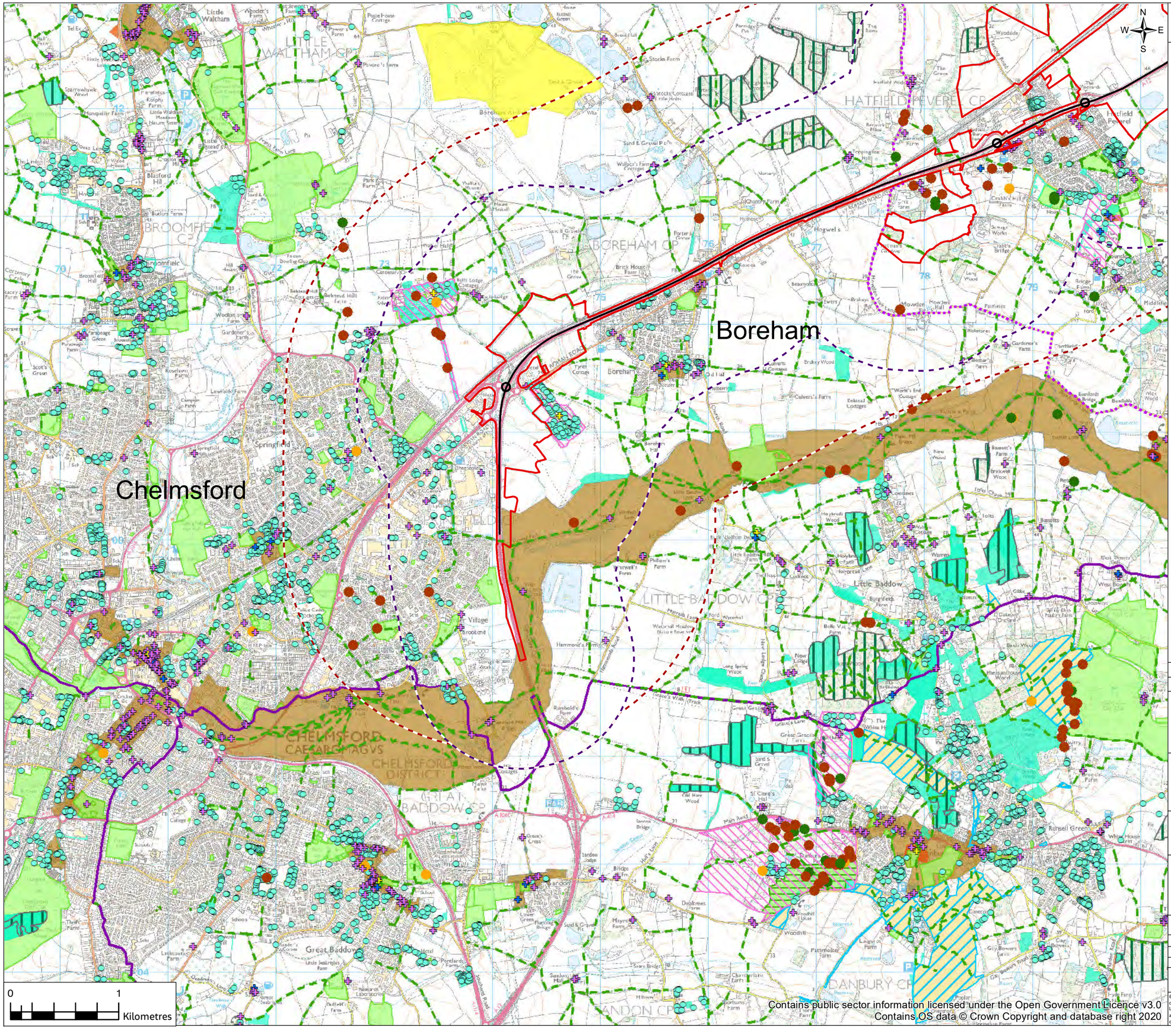
Client No.	HE551497	Rev P02

Drawing Number: HE551497-JAC-EHR-SCHW-SK-GI-0008

FIGURE 8.1



Legend

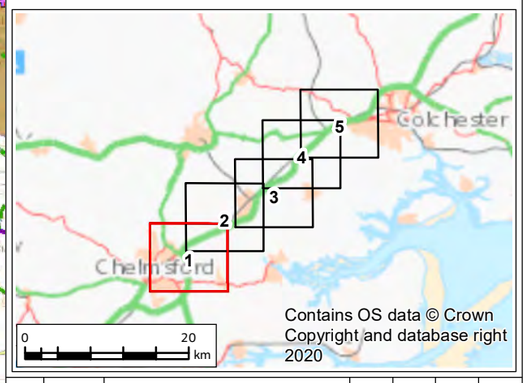
- Proposed Scheme Alignment
- Provisional DCO Boundary
- 1km buffer from Provisional Order Limits
- Approximate 2km study area around proposed scheme alignment
- Public right of way
- National cycle route
- Regional cycle route

Listed buildings

- Grade I listed building
- Grade II listed building
- Grade II* listed building
- Registered parks and gardens
- Scheduled monument
- Conservation area
- Tree preservation order (individual)
- Tree preservation orders (group)
- Ancient woodland
- Registered common land
- Country park
- Proposed country park
- Open green spaces (OS)
- Open access land (CROW Act 2000)

Woodland Trust Ancient Tree Inventory

- Ancient tree
- Notable tree
- Veteran tree



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Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
KEY LANDSCAPE CONSTRAINTS
PAGE 1 OF 5

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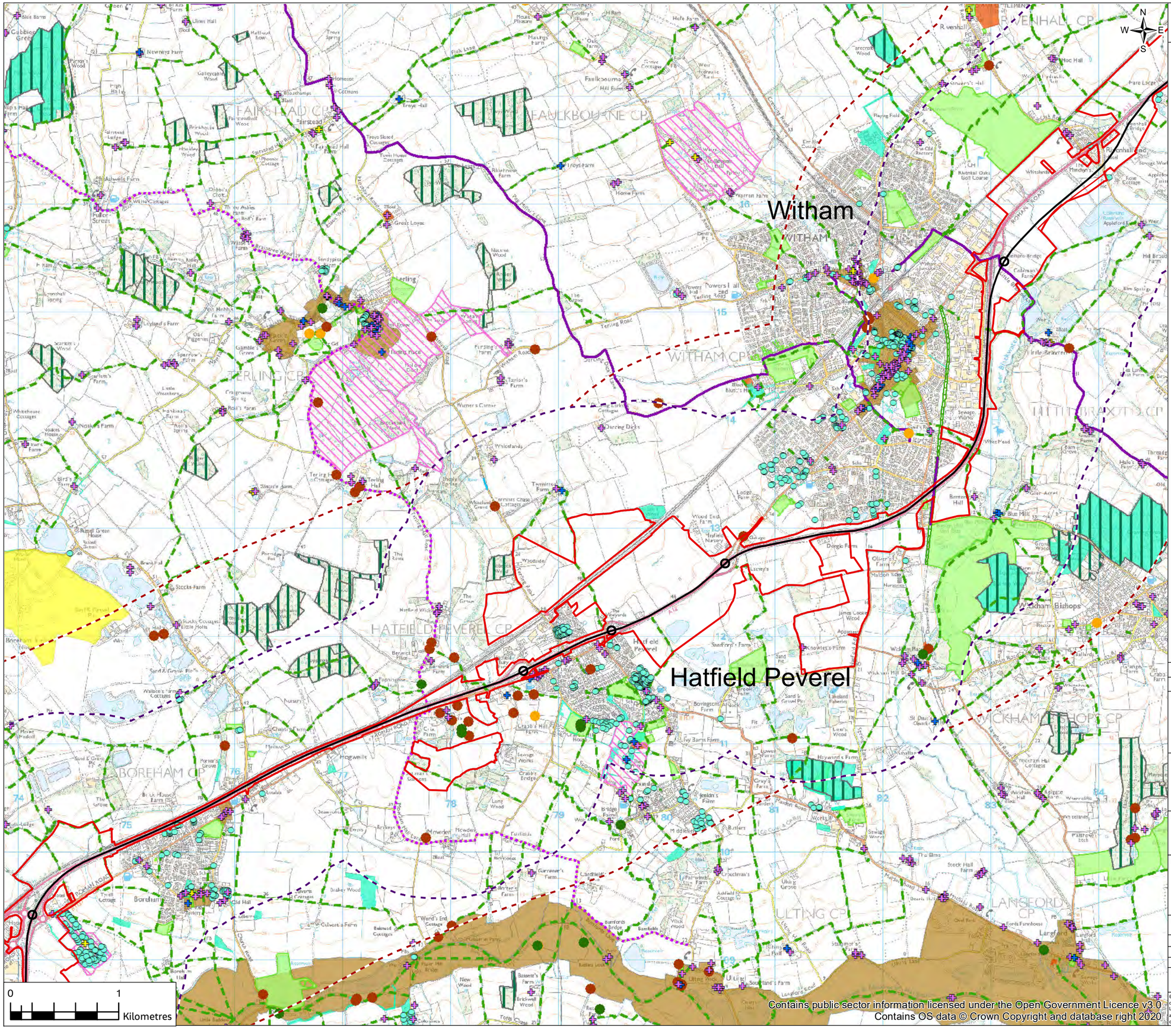
Client No.	HE551497	

Drawing Number: HE551497-JAC-ELS-SCHW-SK-GI-0001

FIGURE 8.1



Legend

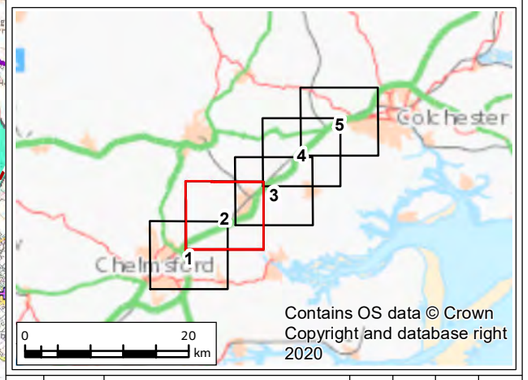
- Proposed Scheme Alignment
- Provisional DCO Boundary
- 1km buffer from Provisional Order Limits
- Approximate 2km study area around proposed scheme alignment
- Public right of way
- National cycle route
- Regional cycle route

Listed buildings

- Grade I listed building
- Grade II listed building
- Grade II* listed building
- Registered parks and gardens
- Scheduled monument
- Conservation area
- Tree preservation order (individual)
- Tree preservation orders (group)
- Ancient woodland
- Registered common land
- Country park
- Proposed country park
- Open green spaces (OS)
- Open access land (CROW Act 2000)

Woodland Trust Ancient Tree Inventory

- Ancient tree
- Notable tree
- Veteran tree



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Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
KEY LANDSCAPE CONSTRAINTS
PAGE 2 OF 5

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Client No.	HE551497	Rev P02

Drawing Number: HE551497-JAC-ELS-SCHW-SK-GI-0002

FIGURE 8.1

Kelvedon

Witham

Legend

- Proposed Scheme Alignment
- Provisional DCO Boundary
- 1km buffer from Provisional Order Limits
- Approximate 2km study area around proposed scheme alignment
- Public right of way
- National cycle route
- Regional cycle route

Listed buildings

- Grade I listed building
- Grade II listed building
- Grade II* listed building
- Registered parks and gardens
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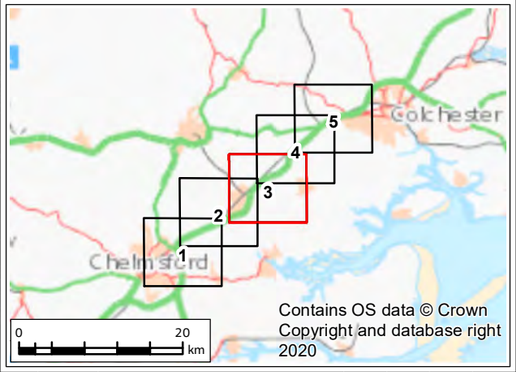
- Conservation area
- Tree preservation order (individual)
- Tree preservation orders (group)
- Ancient woodland
- Registered common land
- Country park
- Proposed country park
- Open green spaces (OS)
- Open access land (CROW Act 2000)

Woodland Trust Ancient Tree Inventory

- Ancient tree
- Notable tree
- Veteran tree



0 1 Kilometres

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Drawing Title: ENVIRONMENTAL SCOPING REPORT
KEY LANDSCAPE CONSTRAINTS
PAGE 3 OF 5

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Drawing Number: HE551497-JAC-ELS-SCHW-SK-GI-0003

FIGURE 8.1

Marks Tey

Kelvedon

0 1 Kilometres

Legend

- Proposed Scheme Alignment
- Provisional DCO Boundary
- 1km buffer from Provisional Order Limits
- Approximate 2km study area around proposed scheme alignment
- Public right of way
- National cycle route
- Regional cycle route

Listed buildings

- Grade I listed building
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- Scheduled monument
- Conservation area
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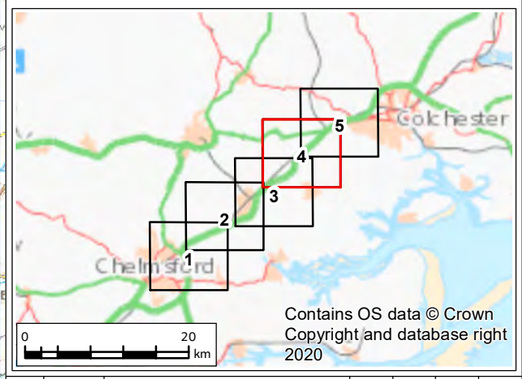
- Ancient woodland
- Registered common land
- Country park
- Proposed country park
- Open green spaces (OS)
- Open access land (CROW Act 2000)

Woodland Trust Ancient Tree Inventory

- Ancient tree
- Notable tree
- Veteran tree



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Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
KEY LANDSCAPE CONSTRAINTS
PAGE 4 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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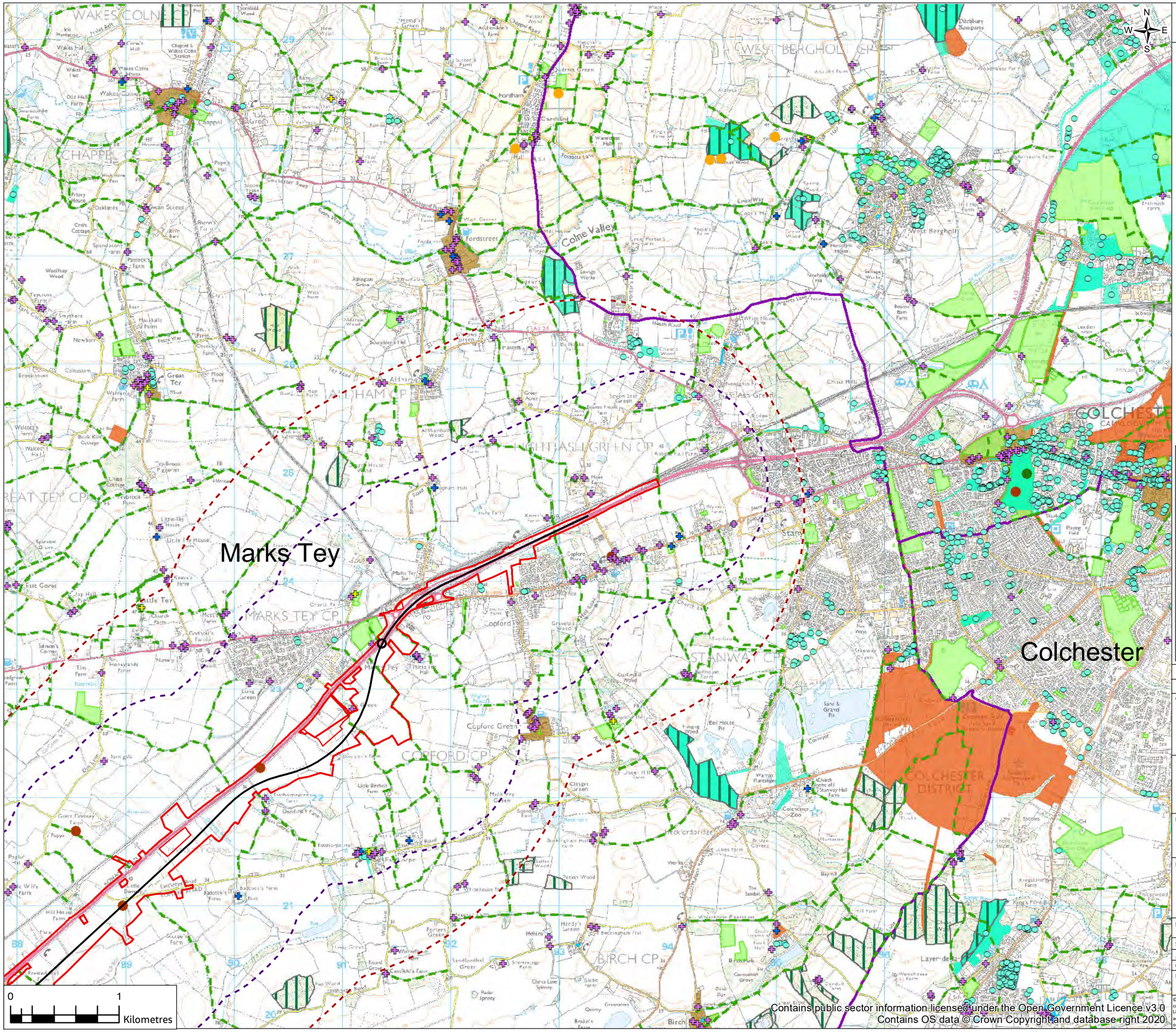
Client No.	HE551497		

Drawing Number: HE551497-JAC-ELS-SCHW-SK-GI-0004

FIGURE 8.1



Legend

- Proposed Scheme Alignment
- Provisional DCO Boundary
- 1km buffer from Provisional Order Limits
- Approximate 2km study area around proposed scheme alignment
- Public right of way
- National cycle route
- Regional cycle route

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- Open access land (CROW Act 2000)

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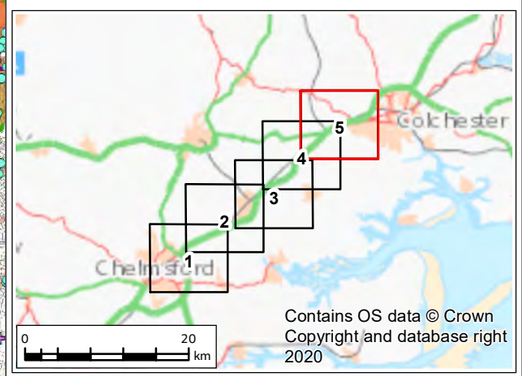

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Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
KEY LANDSCAPE CONSTRAINTS
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Client No.	HE551497	Rev	P02
Drawing Number	HE551497-JAC-ELS-SCHW-SK-GI-0005		

FIGURE 8.2

Marks Tey

Chelmsford

B4 A5 G4 B2 B2A G4 B3 A2 B19 B2 A9 A9A B18 B18 A9 B18 A9 A9 F1 G2 A10 A9 F3 A9 A9A B17 A9 B21 A7

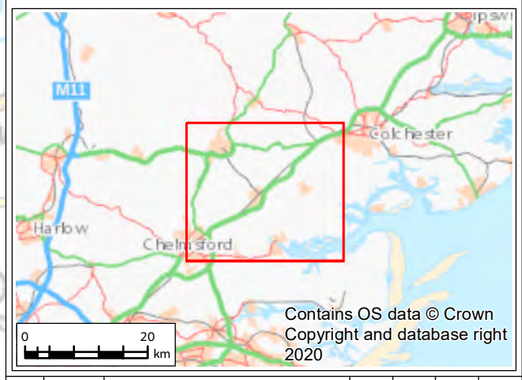
N W E S

Legend

- Proposed scheme alignment
- Provisional Order Limits
- 1km buffer from Provisional Order Limits
- Approximate 2km study area around proposed scheme alignment

Local landscape character area

- A10 - Brain River Valley
- A2 - Wooded Roman River Valley
- A5 - Colne River Valley Slopes
- A7 - Lower Chelmer River Valley
- A9 - Blackwater River Valley
- A9A - Landscape Sub Area
- B17 - Terling Farmland Plateau
- B18 - Silver End Farmland Plateau
- B19 - Langley Green Farmland Plateau
- B2 - Easthorpe Farmland Plateau
- B21 - Boreham Farmland Plateau
- B2A - Landscape Sub Area
- B3 - Southern Colchester Farmland Plateau
- B4 - Great Tey Farmland Plateau
- F1 - Messing Wooded Farmland
- F3 - Totham Wooded Farmland
- G2 - Tiptree Urban Landscape
- G4 - Colchester Urban Landscape
- Urban areas



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Client: highways england

Project
A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title
ENVIRONMENTAL SCOPING REPORT
LOCAL LANDSCAPE CHARACTER AREAS
SHEET 1 OF 1

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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Jacobs No.	B229H130	
Client No.	HE551497	Rev P02

Drawing Number
HE551497-JAC-ELS-SCHW-SK-GI-0006

0 5 Kilometres

1. Zone of theoretical visibility (ZTV) is generated using computer program ArcGIS 10.7 and is based on Environment Agency 2m Composite LiDAR delivered Digital Terrain Model (DTM).
2. The ZTV is based upon bare earth ground model and therefore only takes account of the visual screening provided by existing topography. The ZTV does not take account of surface features, such as buildings and vegetation, which could also provide screening.
3. The ZTV has been modelled with a viewer height of 1.7m.
4. The ZTV results have been calculated within the extent of this figure. The limit of the ZTV shown on this figure is a working draft and provides an indication only of the theoretical maximum extent to which the proposals may be visible from within this area.
5. Elevations used for target points for the ZTV to represent high-sided vehicles (HGVs) and lighting columns along the preferred route are indicative only. Target points 4.5m above the level of the proposed carriageway have been used to represent HGVs. In addition, target points 10m above the level of the proposed carriageway have been used to represent the height of lighting columns where applicable.
6. Potential refinements of the preferred route design may result in changes to the vertical or horizontal alignment, and the location of lighting, signage and gantries. Therefore the ZTV is likely to change.

Boreham

Chelmsford

1
2
3
4

0 1 Kilometres

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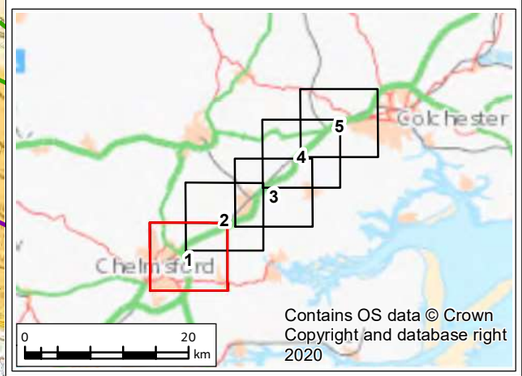
FIGURE 8.3

Legend

- Proposed scheme alignment
- Provisional Order Limits
- 1km buffer from Provisional Order Limits
- Approximate 2km study area around proposed scheme alignment
- Public right of way
- National cycle route
- Regional cycle route
- Contours at 10m intervals
- Representative viewpoints
- Theoretical visibility of HGV and lighting column target points only
- Theoretical visibility of lighting column target points only



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Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
ZONE OF THEORETICAL VISIBILITY
AND REPRESENTATIVE VIEWPOINTS
PAGE 1 OF 5

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Jacobs No.	B229H130	Rev	P03
Client No.	HE551497		

Drawing Number: HE551497-JAC-ELS-SCHW-SK-GI-0007

1. Zone of theoretical visibility (ZTV) is generated using computer program ArcGIS 10.7 and is based on Environment Agency 2m Composite LiDAR delivered Digital Terrain Model (DTM).
2. The ZTV is based upon bare earth ground model and therefore only takes account of the visual screening provided by existing topography. The ZTV does not take account of surface features, such as buildings and vegetation, which could also provide screening.
3. The ZTV has been modelled with a viewer height of 1.7m.
4. The ZTV results have been calculated within the extent of this figure. The limit of the ZTV shown on this figure is a working draft and provides an indication only of the theoretical maximum extent to which the proposals may be visible from within this area.
5. Elevations used for target points for the ZTV to represent high-sided vehicles (HGVs) and lighting columns along the preferred route are indicative only. Target points 4.5m above the level of the proposed carriageway have been used to represent HGVs. In addition, target points 10m above the level of the proposed carriageway have been used to represent the height of lighting columns where applicable.
6. Potential refinements of the preferred route design may result in changes to the vertical or horizontal alignment, and the location of lighting, signage and gantries. Therefore the ZTV is likely to change.

Witham

Hatfield Peverel

0 1 Kilometres

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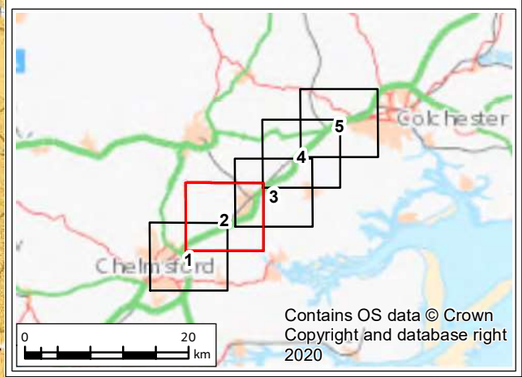
FIGURE 8.3

Legend

- Proposed scheme alignment
- Provisional Order Limits
- 1km buffer from Provisional Order Limits
- Approximate 2km study area around proposed scheme alignment
- Public right of way
- National cycle route
- Regional cycle route
- Contours at 10m intervals
- Representative viewpoints
- Theoretical visibility of HGV and lighting column target points only
- Theoretical visibility of lighting column target points only



Rev.	Rev. Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
P03	12/10/20	Final	ML	LG	HM	SG

Contractor: COSTAIN

Designer: Jacobs
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www.jacobs.com

Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
ZONE OF THEORETICAL VISIBILITY
AND REPRESENTATIVE VIEWPOINTS
PAGE 2 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

Scale @ A3	1:30000		DO NOT SCALE
Jacobs No.	B229H130	Rev	P03
Client No.	HE551497		

Drawing Number: HE551497-JAC-ELS-SCHW-SK-GI-0008

1. Zone of theoretical visibility (ZTV) is generated using computer program ArcGIS 10.7 and is based on Environment Agency 2m Composite LiDAR delivered Digital Terrain Model (DTM).
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Kelvedon

Witham

Tiptree

Great Totham

Colchester

Chelmsford

0 1 Kilometres

0 20 km

FIGURE 8.3

Legend

- Proposed scheme alignment
- Provisional Order Limits
- 1km buffer from Provisional Order Limits
- Approximate 2km study area around proposed scheme alignment
- Public right of way
- National cycle route
- Regional cycle route
- Contours at 10m intervals
- Representative viewpoints
- Theoretical visibility of HGV and lighting column target points only
- Theoretical visibility of lighting column target points only

Rev.	Rev. Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
P03	12/10/20	Final	ML	LG	HM	SG

Contractor: COSTAIN

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www.jacobs.com

Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
ZONE OF THEORETICAL VISIBILITY
AND REPRESENTATIVE VIEWPOINTS
PAGE 3 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

Scale @ A3	1:30000	DO NOT SCALE
Jacobs No.	B229H130	
Client No.	HE551497	Rev P03

Drawing Number: HE551497-JAC-ELS-SCHW-SK-GI-0009

1. Zone of theoretical visibility (ZTV) is generated using computer program ArcGIS 10.7 and is based on Environment Agency 2m Composite LiDAR delivered Digital Terrain Model (DTM).
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6. Potential refinements of the preferred route design may result in changes to the vertical or horizontal alignment, and the location of lighting, signage and gantries. Therefore the ZTV is likely to change.

Marks Tey

Kelvedon

Colchester

Chelmsford

0 1 Kilometres

0 20 km

FIGURE 8.3

Legend

- Proposed scheme alignment
- Provisional Order Limits
- 1km buffer from Provisional Order Limits
- Approximate 2km study area around proposed scheme alignment
- Public right of way
- National cycle route
- Regional cycle route
- Contours at 10m intervals
- Representative viewpoints
- Theoretical visibility of HGV and lighting column target points only
- Theoretical visibility of lighting column target points only

Rev.	Rev. Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
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Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
ZONE OF THEORETICAL VISIBILITY
AND REPRESENTATIVE VIEWPOINTS
PAGE 4 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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Jacobs No.	B229H130	Rev	P03
Client No.	HE551497		

Drawing Number: HE551497-JAC-ELS-SCHW-SK-GI-0010

1. Zone of theoretical visibility (ZTV) is generated using computer program ArcGIS 10.7 and is based on Environment Agency 2m Composite LiDAR delivered Digital Terrain Model (DTM).
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3. The ZTV has been modelled with a viewer height of 1.7m.
4. The ZTV results have been calculated within the extent of this figure. The limit of the ZTV shown on this figure is a working draft and provides an indication only of the theoretical maximum extent to which the proposals may be visible from within this area.
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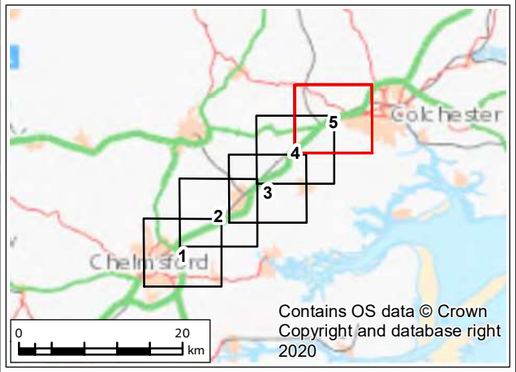
FIGURE 8.3

Legend

- Proposed scheme alignment
- Provisional Order Limits
- 1km buffer from Provisional Order Limits
- Approximate 2km study area around proposed scheme alignment
- Public right of way
- National cycle route
- Regional cycle route
- Contours at 10m intervals
- Representative viewpoints
- Theoretical visibility of HGV and lighting column target points only
- Theoretical visibility of lighting column target points only



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www.jacobs.com

Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
ZONE OF THEORETICAL VISIBILITY
AND REPRESENTATIVE VIEWPOINTS
PAGE 5 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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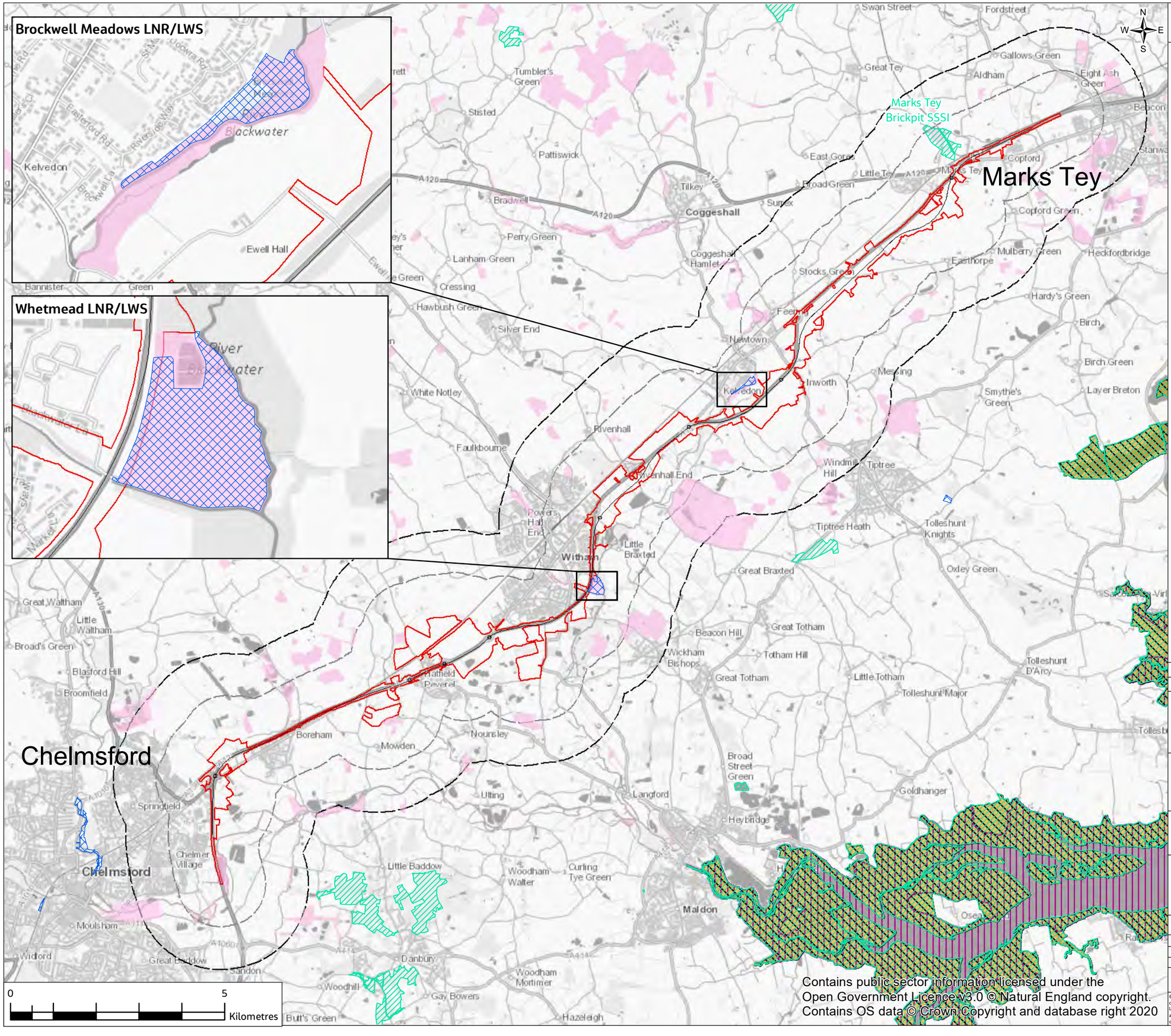
Jacobs No.	B229H130	Rev	P03
Client No.	HE551497		

Drawing Number: HE551497-JAC-ELS-SCHW-SK-GI-0011

FIGURE 9.1



Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Biodiversity 1km Study Area
- Biodiversity 2km Study Area
- Site of Special Scientific Interest (SSSI)
- Local Nature Reserve (LNR)
- Local Wildlife Site (LWS)
- Wetlands of Internationl Importance (RAMSAR)
- Special Areas of Conservation (SAC)
- Special Protection Areas (SPA)

Rev.	Rev. Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
P02	12/10/20	Final	ML	LG	LG	SG

Contractor: COSTAIN

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Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

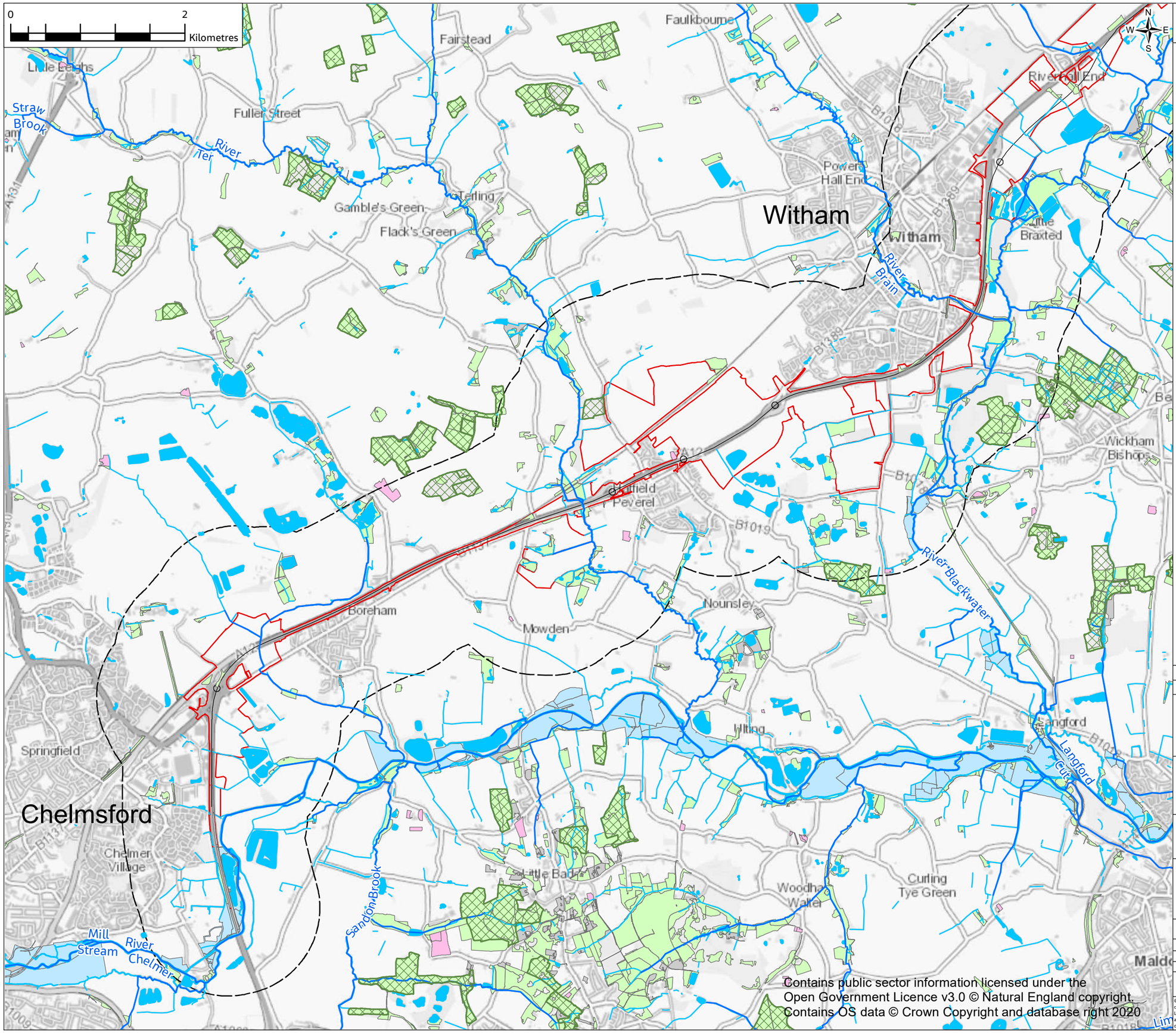
Drawing Title: ENVIRONMENTAL SCOPING REPORT
BIODIVERSITY
DESIGNATED SITES
SHEET 1 OF 1

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

Scale @ A3	1:85000	DO NOT SCALE
Jacobs No.	B229H130	Rev P02
Client No.	HE551497	

Drawing Number: HE551497-JAC-EBD-SCHW-SK-GI-0001

FIGURE 9.2

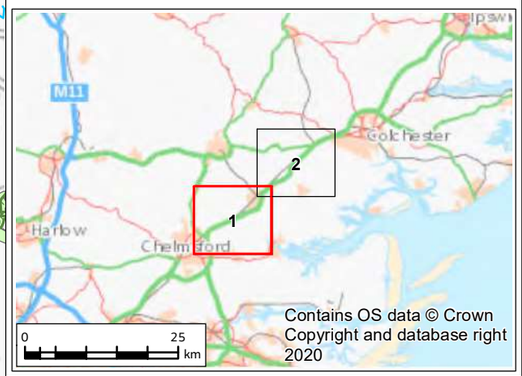


Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Biodiversity 1km Study Area
- Ancient Woodland Inventory site
- Main river
- Other watercourse
- Waterbody

Priority Habitat

- Coastal and floodplain grazing marsh
- Lowland mixed deciduous woodland
- No main habitat but additional habitats present
- Traditional orchard



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www.jacobs.com

Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

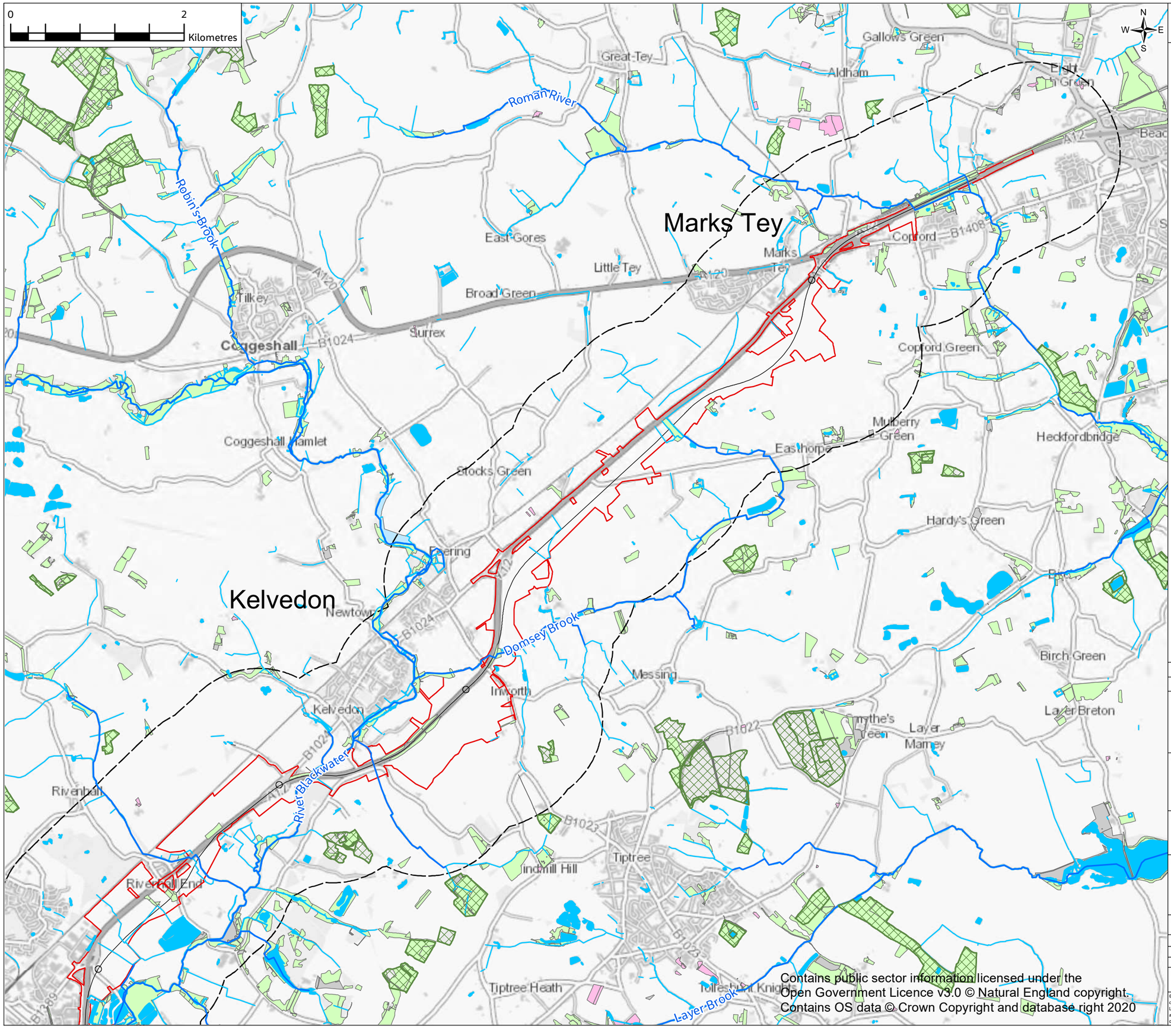
Drawing Title: ENVIRONMENTAL SCOPING REPORT
BIODIVERSITY
IMPORTANT HABITATS
SHEET 1 OF 2

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

Scale @ A3	1:42000	DO NOT SCALE	
Jacobs No.	B229H130	Rev	P02
Client No.	HE551497		

Drawing Number: HE551497-JAC-EBD-SCHW-SK-GI-0002

FIGURE 9.2



Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Biodiversity 1km Study Area
- Ancient Woodland Inventory site
- Main river
- Other watercourse
- Waterbody

Priority Habitat

- Coastal and floodplain grazing marsh
- Lowland mixed deciduous woodland
- No main habitat but additional habitats present
- Traditional orchard

Rev.	Rev. Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
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Contractor: COSTAIN

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Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
BIODIVERSITY
IMPORTANT HABITATS
SHEET 2 OF 2

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

Scale @ A3	1:42000	DO NOT SCALE
Jacobs No.	B229H130	
Client No.	HE551497	Rev P02

Drawing Number: HE551497-JAC-EBD-SCHW-SK-GI-0003

FIGURE 10.1

GBR BGS 1:50k Superficial

- ALLUVIUM - CLAY, SILT, SAND AND GRAVEL
- BRICKEARTH - CLAY, SILT AND SAND
- COVER SAND - CLAY, SILT AND SAND
- GLACIOFLUVIAL DEPOSITS, MID PLEISTOCENE - SAND AND GRAVEL
- GLACIOLACUSTRINE DEPOSITS, MID PLEISTOCENE - CLAY AND SILT
- HEAD - CLAY AND SILT
- HEAD - CLAY, SILT, SAND AND GRAVEL
- INTERGLACIAL LACUSTRINE DEPOSITS - CLAY AND SILT
- KESGRAVE CATCHMENT SUBGROUP - SAND AND GRAVEL
- LOWESTOFT FORMATION - DIAMICTON
- LOWESTOFT FORMATION - SAND AND GRAVEL
- PEAT - PEAT
- RIVER TERRACE DEPOSITS, 1 - SAND AND GRAVEL
- RIVER TERRACE DEPOSITS, 3 - SAND AND GRAVEL

GBR BGS 1:50k Bedrock

- CRAG GROUP - SAND
- LONDON CLAY FORMATION - CLAY, SILT AND SAND
- THANET FORMATION - SAND
- THANET FORMATION AND LAMBETH GROUP (UNDIFFERENTIATED) - CLAY, SILT AND SAND

Boreham

Chelmsford

Brick House Farm

Bulls Lodge Farm

Wilderness

Tyrell Cottages

Police House

Boreham House

Boreham Hall Cottages

Molberries

River Chelmer

Chelmer and Blackwater Navigation

0 1 Kilometres

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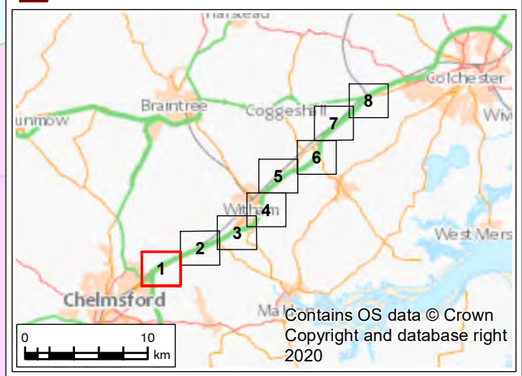
Legend

- River
- Railway
- Proposed Scheme Alignment
- Provisional Order Limits
- Geology and Soils 250m Study Area
- Jacobs 2017/18 surface water monitoring points
- Licensed surface water abstractions
- Fuel station
- Garage
- Obsolete garage
- Electricity substation
- Historical mineral extraction site
- National Grid gas valve compound
- Rifle Range
- Waste Transfer Station
- Industrial area



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P02	12/10/20	Final	ML	IA	RL	SG

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Tel: +44 (0)20 8686 8212 Fax: +44 (0)208 681 2499
www.jacobs.com

Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
GEOLOGY AND SOILS
LAND CONTAMINATION CONSTRAINTS PLAN
SHEET 1 OF 8

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

Scale @ A3	1:10000	DO NOT SCALE	
Jacobs No.	B229H130	Rev	P02
Client No.	HE551497		

Drawing Number: HE551497-JAC-EGT-SCHW-SK-GI-0001

FIGURE 10.1

GBR BGS 1:50k Superficial

- ALLUVIUM - CLAY, SILT, SAND AND GRAVEL
- BRICKEARTH - CLAY, SILT AND SAND
- COVER SAND - CLAY, SILT AND SAND
- GLACIOFLUVIAL DEPOSITS, MID PLEISTOCENE - SAND AND GRAVEL
- GLACIOLACUSTRINE DEPOSITS, MID PLEISTOCENE - CLAY AND SILT
- HEAD - CLAY AND SILT
- HEAD - CLAY, SILT, SAND AND GRAVEL
- INTERGLACIAL LACUSTRINE DEPOSITS - CLAY AND SILT
- KESGRAVE CATCHMENT SUBGROUP - SAND AND GRAVEL
- LOWESTOFT FORMATION - DIAMICTON
- LOWESTOFT FORMATION - SAND AND GRAVEL
- PEAT - PEAT
- RIVER TERRACE DEPOSITS, 1 - SAND AND GRAVEL
- RIVER TERRACE DEPOSITS, 3 - SAND AND GRAVEL

GBR BGS 1:50k Bedrock

- CRAG GROUP - SAND
- LONDON CLAY FORMATION - CLAY, SILT AND SAND
- THANET FORMATION - SAND
- THANET FORMATION AND LAMBETH GROUP (UNDIFFERENTIATED) - CLAY, SILT AND SAND

Hatfield Peverel

Titbeech Wood
Titbeech House
The Grove
Hatfield Wick Farm
Toppinghoehall Wood
Church Hills
Berwick Farm
Hatfield Place
Millfield Cottages
Crix
Crix Corner Cottage
Crabb's Hill Farm
Woodhouse
Hogwells
Spittlemans Cottages
Bamards Farm
Beaumonts
Brakeys
Mowden
Farfields Farm
Brewhouse Wood
Bishop's Wood
Stonehall Wood
Long Wood
Church Rd
Main Rd

0 1 Kilometres

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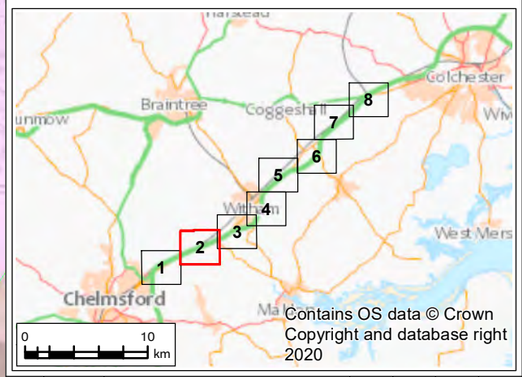
Legend

- River
- Railway
- Proposed Scheme Alignment
- Provisional Order Limits
- Geology and Soils 250m Study Area
- Jacobs 2017/18 surface water monitoring points
- Licensed groundwater abstractions
- Licensed surface water abstractions
- Obsolete fuel station
- Historical fire Station
- Obsolete garage
- Industrial area



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P02	12/10/20	Final	ML	IA	RL	SG

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Designer: Jacobs
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Tel: +44 (0)20 8686 8212 Fax: +44 (0)208 681 2499
www.jacobs.com

Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
GEOLOGY AND SOILS
LAND CONTAMINATION CONSTRAINTS PLAN
SHEET 2 OF 8

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

Scale @ A3	1:10000	DO NOT SCALE
Jacobs No.	B229H130	
Client No.	HE551497	Rev P02

Drawing Number: HE551497-JAC-EGT-SCHW-SK-GI-0002

FIGURE 10.1

GBR BGS 1:50k Superficial

- ALLUVIUM - CLAY, SILT, SAND AND GRAVEL
- BRICKEARTH - CLAY, SILT AND SAND
- COVER SAND - CLAY, SILT AND SAND
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- GLACIOLACUSTRINE DEPOSITS, MID PLEISTOCENE - CLAY AND SILT
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- HEAD - CLAY, SILT, SAND AND GRAVEL
- INTERGLACIAL LACUSTRINE DEPOSITS - CLAY AND SILT
- KESGRAVE CATCHMENT SUBGROUP - SAND AND GRAVEL
- LOWESTOFT FORMATION - DIAMICTON
- LOWESTOFT FORMATION - SAND AND GRAVEL
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- RIVER TERRACE DEPOSITS, 1 - SAND AND GRAVEL
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GBR BGS 1:50k Bedrock

- CRAG GROUP - SAND
- LONDON CLAY FORMATION - CLAY, SILT AND SAND
- THANET FORMATION - SAND
- THANET FORMATION AND LAMBETH GROUP (UNDIFFERENTIATED) - CLAY, SILT AND SAND

Witham

Job's Wood
Wood End Farm
Mayfield Cottage
Dengie Farm
Olivers Farm
Highlands Cottage
Sandlands Farm
Knowles's Farm
Keith Bigden Memorial Ground
Lanes Farm
Strutt Memorial Recreation Ground
Brook Farm
Chalk Cottage
Parklands
Lanes Wood

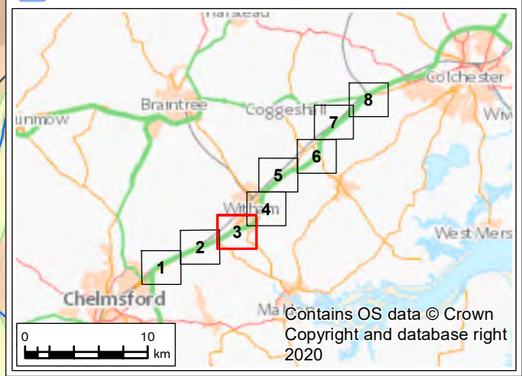
0 1 Kilometres

Legend

- River
- Railway
- Historical Railway (dismantled)
- Proposed Scheme Alignment
- Provisional Order Limits
- Geology and Soils 250m Study Area
- Jacobs 2017/18 surface water monitoring points
- Licensed groundwater abstractions
- Licensed surface water abstractions
- Fuel station
- Obsolete fuel station
- Tank
- Historical mineral extraction site
- Historical fire Station
- Obsolete garage
- Historic landfill site

Groundwater SPZs

- Zone III - Total Catchment



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Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
GEOLOGY AND SOILS
LAND CONTAMINATION CONSTRAINTS PLAN
SHEET 3 OF 8

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

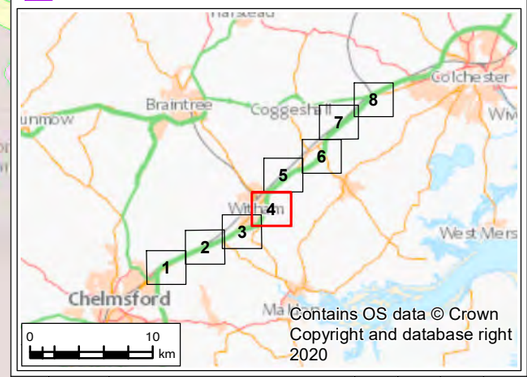
Scale @ A3	1:10000	DO NOT SCALE	
Jacobs No.	B229H130	Rev	P02
Client No.	HE551497		

Drawing Number: HE551497-JAC-EGT-SCHW-SK-GI-0003

FIGURE 10.1

Legend

- River
- Railway
- Historical Railway (dismantled)
- Proposed Scheme Alignment
- Provisional Order Limits
- Geology and Soils 250m Study Area
- Jacobs 2017/18 surface water monitoring points
- Licensed groundwater abstractions
- Licensed surface water abstractions
- Gas governor
- Landfill
- Obsolete fuel station
- Historical sewage works
- Historic landfill site
- Industrial area
- Local Nature Reserve



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GBR BGS 1:50k Superficial

- ALLUVIUM - CLAY, SILT, SAND AND GRAVEL
- BRICKEARTH - CLAY, SILT AND SAND
- COVER SAND - CLAY, SILT AND SAND
- GLACIOFLUVIAL DEPOSITS, MID PLEISTOCENE - SAND AND GRAVEL
- GLACIOLACUSTRINE DEPOSITS, MID PLEISTOCENE - CLAY AND SILT
- HEAD - CLAY AND SILT
- HEAD - CLAY, SILT, SAND AND GRAVEL
- INTERGLACIAL LACUSTRINE DEPOSITS - CLAY AND SILT
- KESGRAVE CATCHMENT SUBGROUP - SAND AND GRAVEL
- LOWESTOFT FORMATION - DIAMICTON
- LOWESTOFT FORMATION - SAND AND GRAVEL
- PEAT - PEAT
- RIVER TERRACE DEPOSITS, 1 - SAND AND GRAVEL
- RIVER TERRACE DEPOSITS, 3 - SAND AND GRAVEL

GBR BGS 1:50k Bedrock

- CRAG GROUP - SAND
- LONDON CLAY FORMATION - CLAY, SILT AND SAND
- THANET FORMATION - SAND
- THANET FORMATION AND LAMBETH GROUP (UNDIFFERENTIATED) - CLAY, SILT AND SAND

0 1 Kilometres

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Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
GEOLOGY AND SOILS
LAND CONTAMINATION CONSTRAINTS PLAN
SHEET 4 OF 8

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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Jacobs No.	B229H130	
Client No.	HE551497	Rev P02

Drawing Number: HE551497-JAC-EGT-SCHW-SK-GI-0004

FIGURE 10.1

GBR BGS 1:50k Superficial

- ALLUVIUM - CLAY, SILT, SAND AND GRAVEL
- BRICKEARTH - CLAY, SILT AND SAND
- COVER SAND - CLAY, SILT AND SAND
- GLACIOFLUVIAL DEPOSITS, MID PLEISTOCENE - SAND AND GRAVEL
- GLACIOLACUSTRINE DEPOSITS, MID PLEISTOCENE - CLAY AND SILT
- HEAD - CLAY AND SILT
- HEAD - CLAY, SILT, SAND AND GRAVEL
- INTERGLACIAL LACUSTRINE DEPOSITS - CLAY AND SILT
- KESGRAVE CATCHMENT SUBGROUP - SAND AND GRAVEL
- LOWESTOFT FORMATION - DIAMICTON
- LOWESTOFT FORMATION - SAND AND GRAVEL
- PEAT - PEAT
- RIVER TERRACE DEPOSITS, 1 - SAND AND GRAVEL
- RIVER TERRACE DEPOSITS, 3 - SAND AND GRAVEL

GBR BGS 1:50k Bedrock

- CRAG GROUP - SAND
- LONDON CLAY FORMATION - CLAY, SILT AND SAND
- THANET FORMATION - SAND
- THANET FORMATION AND LAMBETH GROUP (UNDIFFERENTIATED) - CLAY, SILT AND SAND

Rivenhall End

0 1 Kilometres

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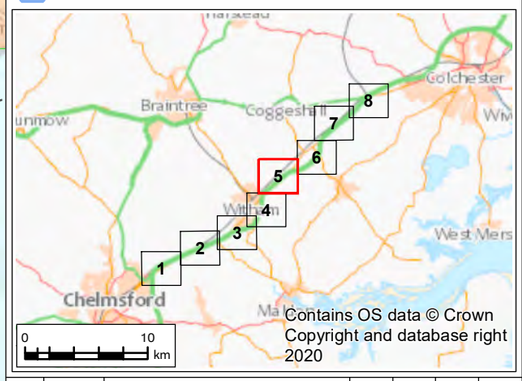
Legend

- River
- Railway
- Proposed Scheme Alignment
- Provisional Order Limits
- Geology and Soils 250m Study Area
- Jacobs 2017/18 surface water monitoring points
- Licensed surface water abstractions
- Fuel station
- Historical mineral extraction site
- Obsolete fuel station
- Electricity substation
- Tank
- Waste Transfer Station
- Unidentified pit
- Historical fire Station
- Historical sewage works
- Infilled pond
- Poultry Farm
- Industrial area

Groundwater SPZs

- Zone III - Total Catchment



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Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
GEOLOGY AND SOILS
LAND CONTAMINATION CONSTRAINTS PLAN
SHEET 5 OF 8

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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Client No.	HE551497	Rev P02

Drawing Number: HE551497-JAC-EGT-SCHW-SK-GI-0005

FIGURE 10.1

GBR BGS 1:50k Superficial

- ALLUVIUM - CLAY, SILT, SAND AND GRAVEL
- BRICKEARTH - CLAY, SILT AND SAND
- COVER SAND - CLAY, SILT AND SAND
- GLACIOFLUVIAL DEPOSITS, MID PLEISTOCENE - SAND AND GRAVEL
- GLACIOLACUSTRINE DEPOSITS, MID PLEISTOCENE - CLAY AND SILT
- HEAD - CLAY AND SILT
- HEAD - CLAY, SILT, SAND AND GRAVEL
- INTERGLACIAL LACUSTRINE DEPOSITS - CLAY AND SILT
- KESGRAVE CATCHMENT SUBGROUP - SAND AND GRAVEL
- LOWESTOFT FORMATION - DIAMICTON
- LOWESTOFT FORMATION - SAND AND GRAVEL
- PEAT - PEAT
- RIVER TERRACE DEPOSITS, 1 - SAND AND GRAVEL
- RIVER TERRACE DEPOSITS, 3 - SAND AND GRAVEL

GBR BGS 1:50k Bedrock

- CRAG GROUP - SAND
- LONDON CLAY FORMATION - CLAY, SILT AND SAND
- THANET FORMATION - SAND
- THANET FORMATION AND LAMBETH GROUP (UNDIFFERENTIATED) - CLAY, SILT AND SAND

N W E S

Kelvedon

0 1 Kilometres

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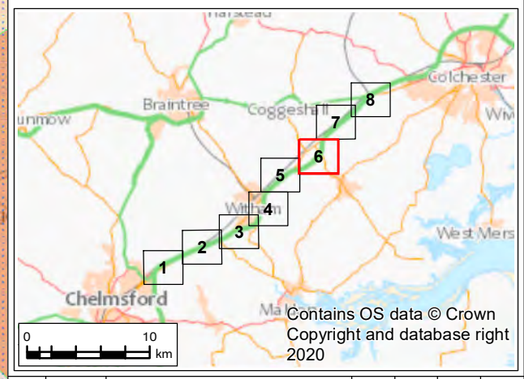
Legend

- River
- Railway
- Historical Railway (dismantled)
- Proposed Scheme
- Provisional Order Limits
- Geology and Soils 250m Study Area
- Jacobs 2017/18 surface water monitoring points
- Licensed groundwater abstraction – public water supply
- Licensed groundwater abstractions
- Licensed surface water abstractions
- Pumping station
- Historical Nursery
- Historical mineral extraction
- Cemetery
- Engine house
- Obsolete garage
- Historical sewage works
- Infilled pit
- Infilled pond
- Pumping station (former sewage works)
- Unspecified ground workings
- Historical unspecified mill
- Unspecified mound
- Unspecified tank
- Industrial area

Groundwater SPZs

- Zone I - Inner Protection
- Zone III - Total



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Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

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GEOLOGY AND SOILS
LAND CONTAMINATION CONSTRAINTS PLAN
SHEET 6 OF 8

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FIGURE 10.1

GBR BGS 1:50k Superficial

- ALLUVIUM - CLAY, SILT, SAND AND GRAVEL
- BRICKEARTH - CLAY, SILT AND SAND
- COVER SAND - CLAY, SILT AND SAND
- GLACIOFLUVIAL DEPOSITS, MID PLEISTOCENE - SAND AND GRAVEL
- GLACIOLACUSTRINE DEPOSITS, MID PLEISTOCENE - CLAY AND SILT
- HEAD - CLAY AND SILT
- HEAD - CLAY, SILT, SAND AND GRAVEL
- INTERGLACIAL LACUSTRINE DEPOSITS - CLAY AND SILT
- KESGRAVE CATCHMENT SUBGROUP - SAND AND GRAVEL
- LOWESTOFT FORMATION - DIAMICTON
- LOWESTOFT FORMATION - SAND AND GRAVEL
- PEAT - PEAT
- RIVER TERRACE DEPOSITS, 1 - SAND AND GRAVEL
- RIVER TERRACE DEPOSITS, 3 - SAND AND GRAVEL

GBR BGS 1:50k Bedrock

- CRAG GROUP - SAND
- LONDON CLAY FORMATION - CLAY, SILT AND SAND
- THANET FORMATION - SAND
- THANET FORMATION AND LAMBETH GROUP (UNDIFFERENTIATED) - CLAY, SILT AND SAND

N W E S

Homagals Farm
Home Farm
Langley Cottages
Great Dansey Farm
Poppe Cottage
Poplar Hall
Stocks Green
Little Dansey Cottages
Badcocks Cottage
Badcock's Farm
Scotties Farm
Feering

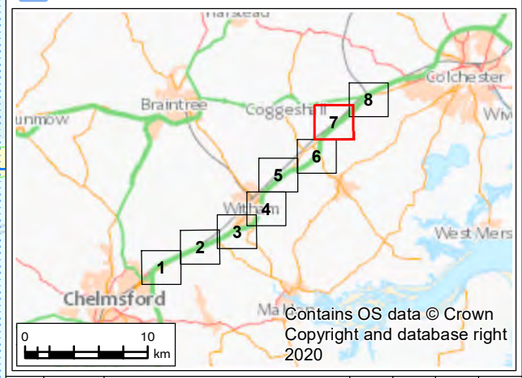
0 1 Kilometres

Legend

- River
- Railway
- Proposed Scheme Alignment
- Provisional Order Limits
- Geology and Soils 250m Study Area
- Jacobs 2017/18 surface water monitoring points
- Licensed groundwater abstractions
- Fuel station
- Garage
- Obsolete fuel station
- Historical Nursery
- Historical mineral extraction site
- Obsolete garage
- Infilled pond
- Poultry Farm

Groundwater SPZs

- Zone III - Total Catchment



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www.jacobs.com

Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
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LAND CONTAMINATION CONSTRAINTS PLAN
SHEET 7 OF 8

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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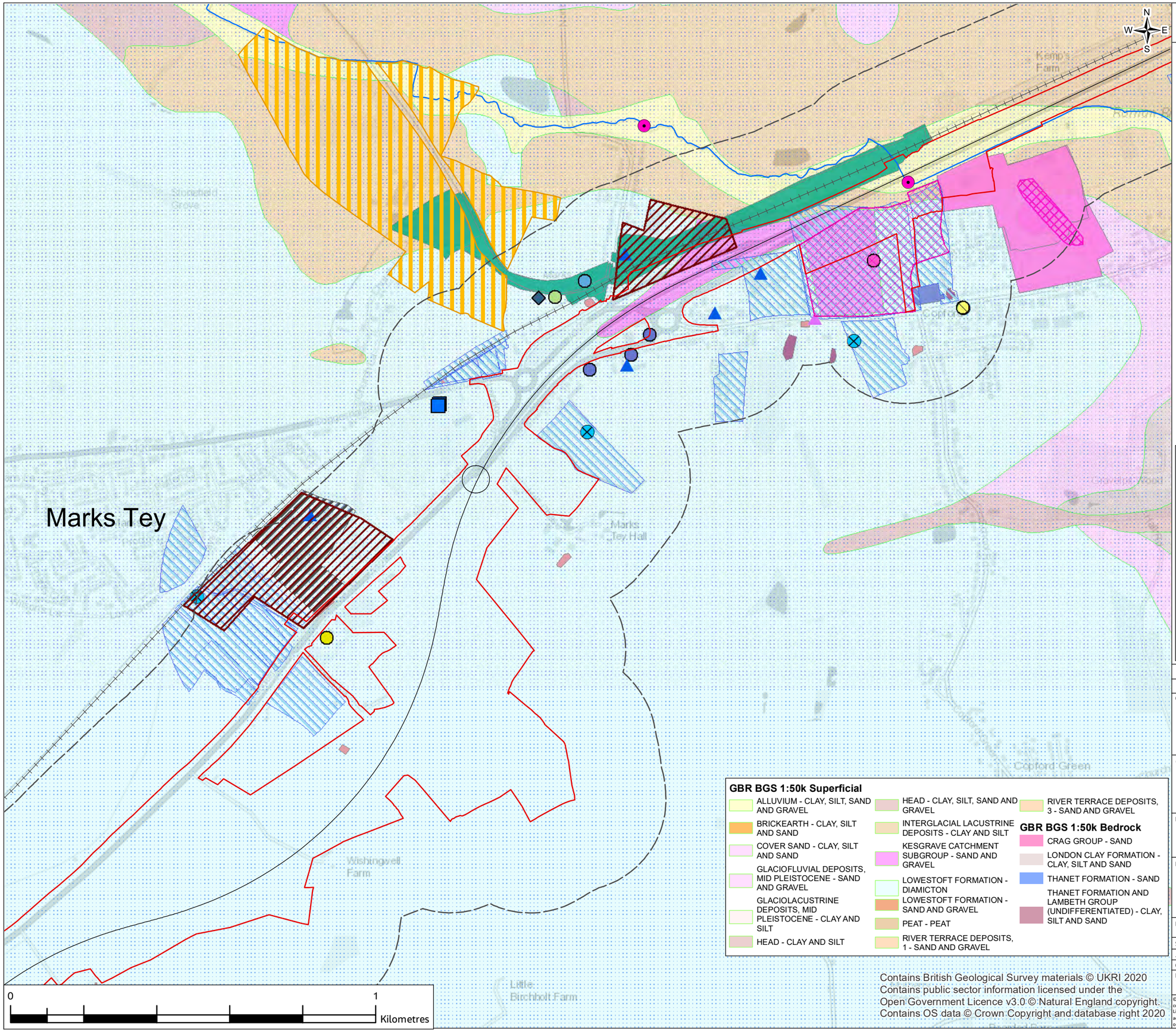
Drawing Number: HE551497-JAC-EGT-SCHW-SK-GI-0007

FIGURE 10.1

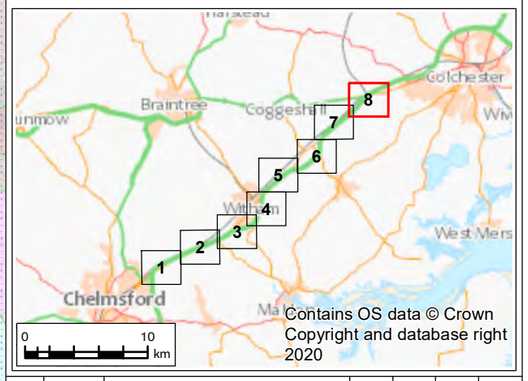


Legend

- River
- Railway
- Proposed Scheme
- Provisional Order Limits
- Geology and Soils 250m Study Area
- Jacobs 2017/18 surface water monitoring points
- Licensed groundwater abstractions
- Gasometer
- Former gasometer
- Former goods yard
- Fuel station
- Garage
- Gas governor
- Historical mineral extraction site
- Obsolete fuel station
- Pumping station
- Electricity substation
- Nurseries
- Historical Nursery
- Historical Timber Depot
- Historical mineral extraction site
- Obsolete garage
- Infilled pit
- Infilled pond
- Railway sidings and yard
- Historic landfill site
- Industrial area
- Site of Special Scientific Interest (SSSI)

Groundwater SPZs

- Zone III - Total Catchment



GBR BGS 1:50k Superficial

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- HEAD - CLAY AND SILT
- HEAD - CLAY, SILT, SAND AND GRAVEL
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- LOWESTOFT FORMATION - SAND AND GRAVEL
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GBR BGS 1:50k Bedrock

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- THANET FORMATION - SAND
- THANET FORMATION AND LAMBETH GROUP (UNDIFFERENTIATED) - CLAY, SILT AND SAND

0 1 Kilometres

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LAND CONTAMINATION CONSTRAINTS PLAN
SHEET 8 OF 8

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FIGURE 11.1

MARKS TEY

COLEMANS FARM

BULLS LODGE

Transhipment site

Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Mineral Safeguarding Area - Brick Clay
- Mineral Safeguarding Area - Sand Gravel
- Minerals Consultation Area
- Minerals Preferred and Reserve Area
- Essex Minerals Local Plan – Site Proposals 2012
- Existing (Operational) Minerals Site
- Transhipment site
- Essex Waste Local Plan – Waste Infrastructure Sites 2017 (indicative)

0 5 Kilometres

0 20 km

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INFRASTRUCTURE AND DESIGNATIONS
SHEET 1 OF 1

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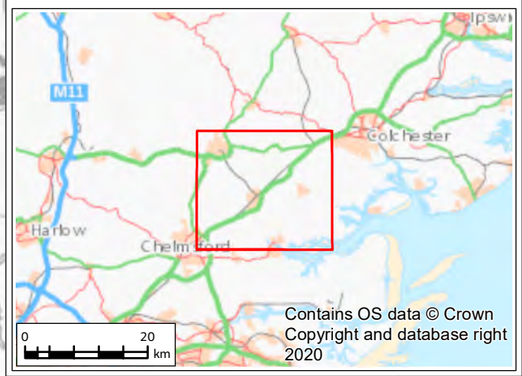
Jacobs No.	B229H130	Rev P02
Client No.	HE551497	

Drawing Number: HE551497-JAC-ESU-SCHW-SK-GI-0001

FIGURE 12.1

Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Expected Operational Noise Study Area
- Proposed Noise Monitoring Location
- Noise Important Area



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Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
EXPECTED OPERATIONAL NOISE STUDY AREA AND PROPOSED NOISE MONITORING LOCATIONS
SHEET 1 OF 1

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Client No.	HE551497		

Drawing Number: HE551497-JAC-ENV-SCHW-SK-GI-0001

FIGURE 13.1

Legend

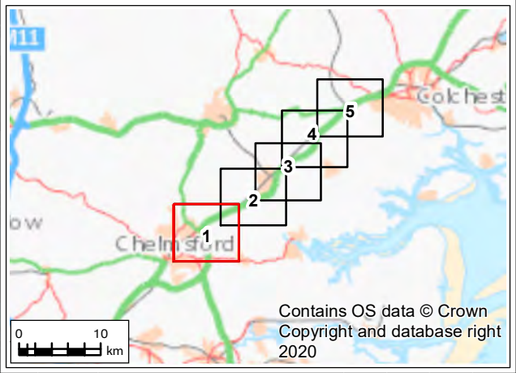
- Proposed Scheme Alignment
- Provisional Order Limits
- Human health study area (indicative)
- Land use and access study area (500m)
- Wider context for access (2km)
- National cycle routes
- Regional cycle routes
- District boundary
- Built up area (source: ONS Census 2011)

Allocations: Chelmsford Local Plan 2013-2036 (Adopted May 2020)

- Employment
- Residential
- Mixed Use

Allocations: Braintree Publication Draft Local Plan (2017)

- Comprehensive Redevelopment Area



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Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

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POPULATION AND HEALTH CONTEXT
STUDY AREA
SHEET 1 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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Jacobs No.	B229H130		
Client No.	HE551497	Rev	P02

Drawing Number: HE551497-JAC-ENM-SCHW-SK-GI-0001

0 1 Kilometres

FIGURE 13.1

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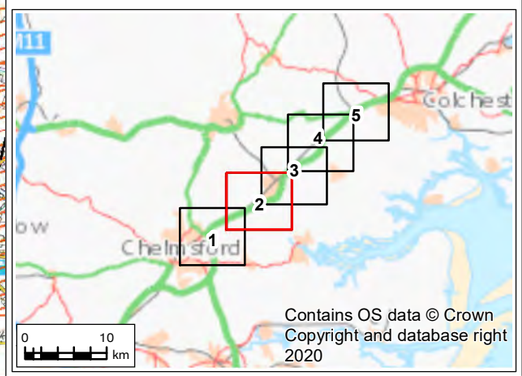
Hatfield Peverel



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Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Human health study area (indicative)
- Land use and access study area (500m)
- Wider context for access (2km)
- National cycle routes
- Regional cycle routes
- District boundary
- Built up area (source: ONS Census 2011)

Allocations: Chelmsford Local Plan 2013-2036 (Adopted May 2020)

- Residential

Allocations: Braintree Publication Draft Local Plan (2017)

- Business Use
- Comprehensive Redevelopment Area
- Employment
- Residential
- Strategic Growth Location

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POPULATION AND HEALTH CONTEXT
STUDY AREA
SHEET 2 OF 5

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Client No.	HE551497	Rev	P02

Drawing Number: HE551497-JAC-ENM-SCHW-SK-GI-0002

0 1 Kilometres

FIGURE 13.1

Legend

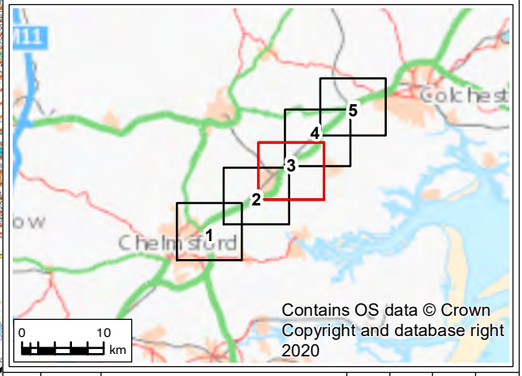
- Proposed Scheme Alignment
- Provisional Order Limits
- Human health study area (indicative)
- Land use and access study area (500m)
- Wider context for access (2km)
- National cycle routes
- District boundary
- Built up area (source: ONS Census 2011)

Allocations: Colchester Local Plan 2017 – 2033 (Publication Draft, June 2017)

- Residential

Allocations: Braintree Publication Draft Local Plan (2017)

- Business Use
- Employment
- Residential
- Specialist Housing
- Strategic Growth Location



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Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
POPULATION AND HEALTH CONTEXT
STUDY AREA
SHEET 3 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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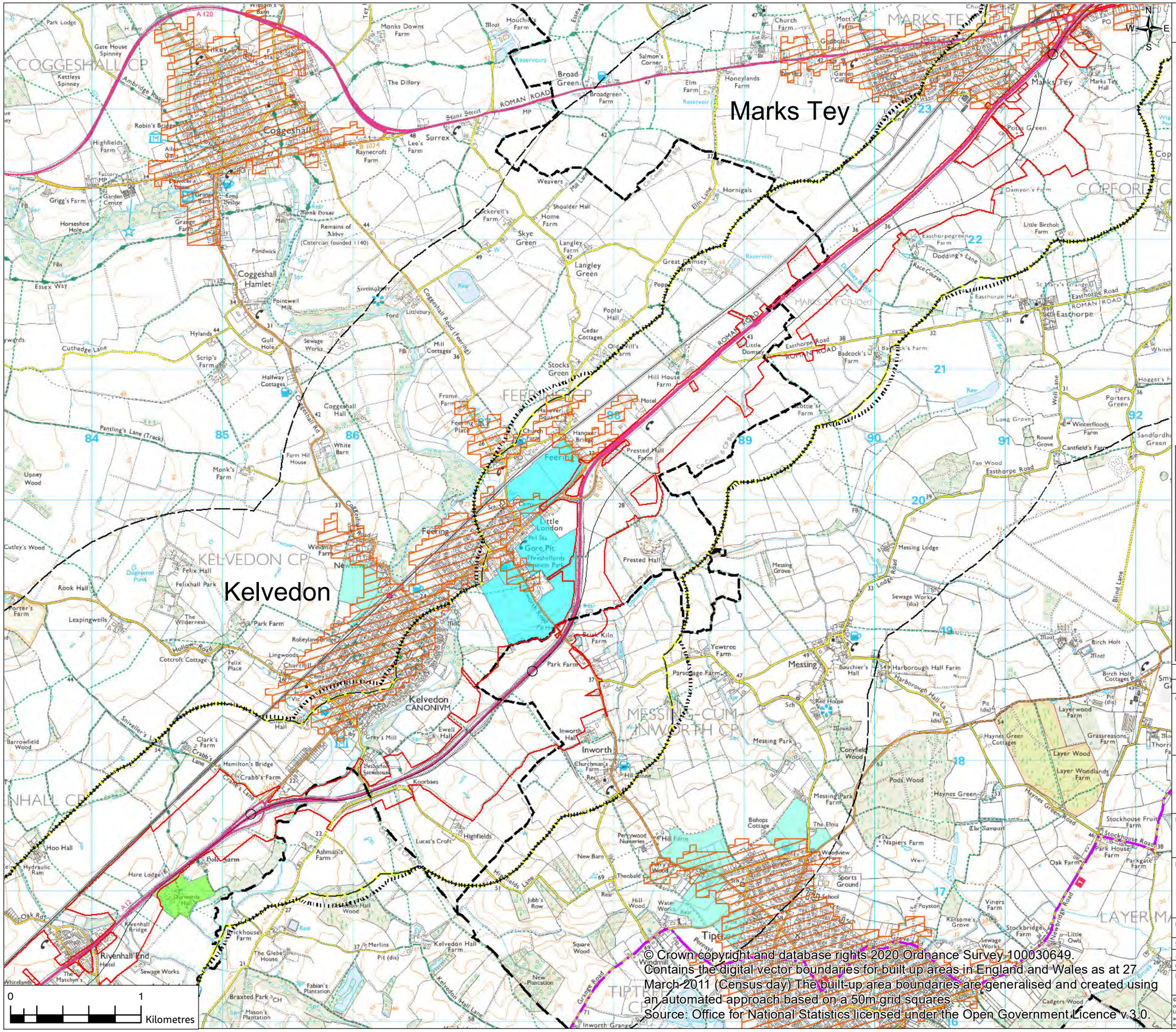
Client No.	HE551497	Rev P02

Drawing Number: HE551497-JAC-ENM-SCHW-SK-GI-0003

0 1 Kilometres

FIGURE 13.1



Legend

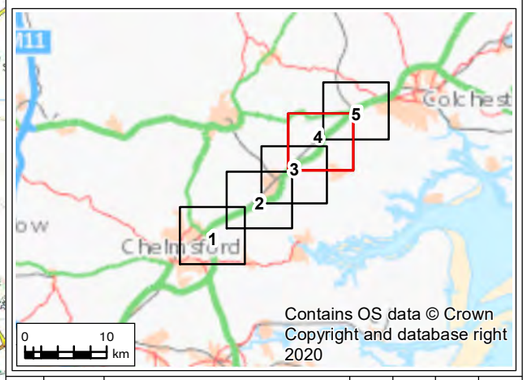
- Proposed Scheme Alignment
- Provisional Order Limits
- Human health study area (indicative)
- Land use and access study area (500m)
- Wider context for access (2km)
- National cycle routes
- District boundary
- Built up area (source: ONS Census 2011)

Allocations: Colchester Local Plan 2017 – 2033 (Publication Draft, June 2017)

- Residential

Allocations: Braintree Publication Draft Local Plan (2017)

- Employment
- Residential
- Specialist Housing
- Strategic Growth Location



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Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
POPULATION AND HEALTH CONTEXT
STUDY AREA
SHEET 4 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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Jacobs No.	B229H130	
Client No.	HE551497	Rev P02

Drawing Number: HE551497-JAC-ENM-SCHW-SK-GI-0004

FIGURE 13.1

Legend

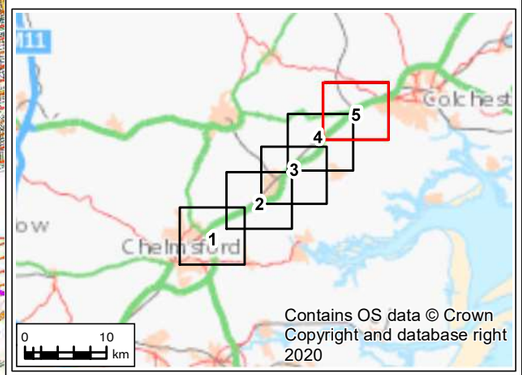
- Proposed Scheme Alignment
- Provisional Order Limits
- Human health study area (indicative)
- Land use and access study area (500m)
- Wider context for access (2km)
- National cycle routes
- District boundary
- Built up area (source: ONS Census 2011)

Allocations: Colchester Local Plan 2017 – 2033 (Publication Draft, June 2017)

- Mixed Use
- Residential
- Strategic Economic Area

Allocations: Braintree Publication Draft Local Plan (2017)

- Strategic Growth Location



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Drawing Title: ENVIRONMENTAL SCOPING REPORT
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STUDY AREA
SHEET 5 OF 5

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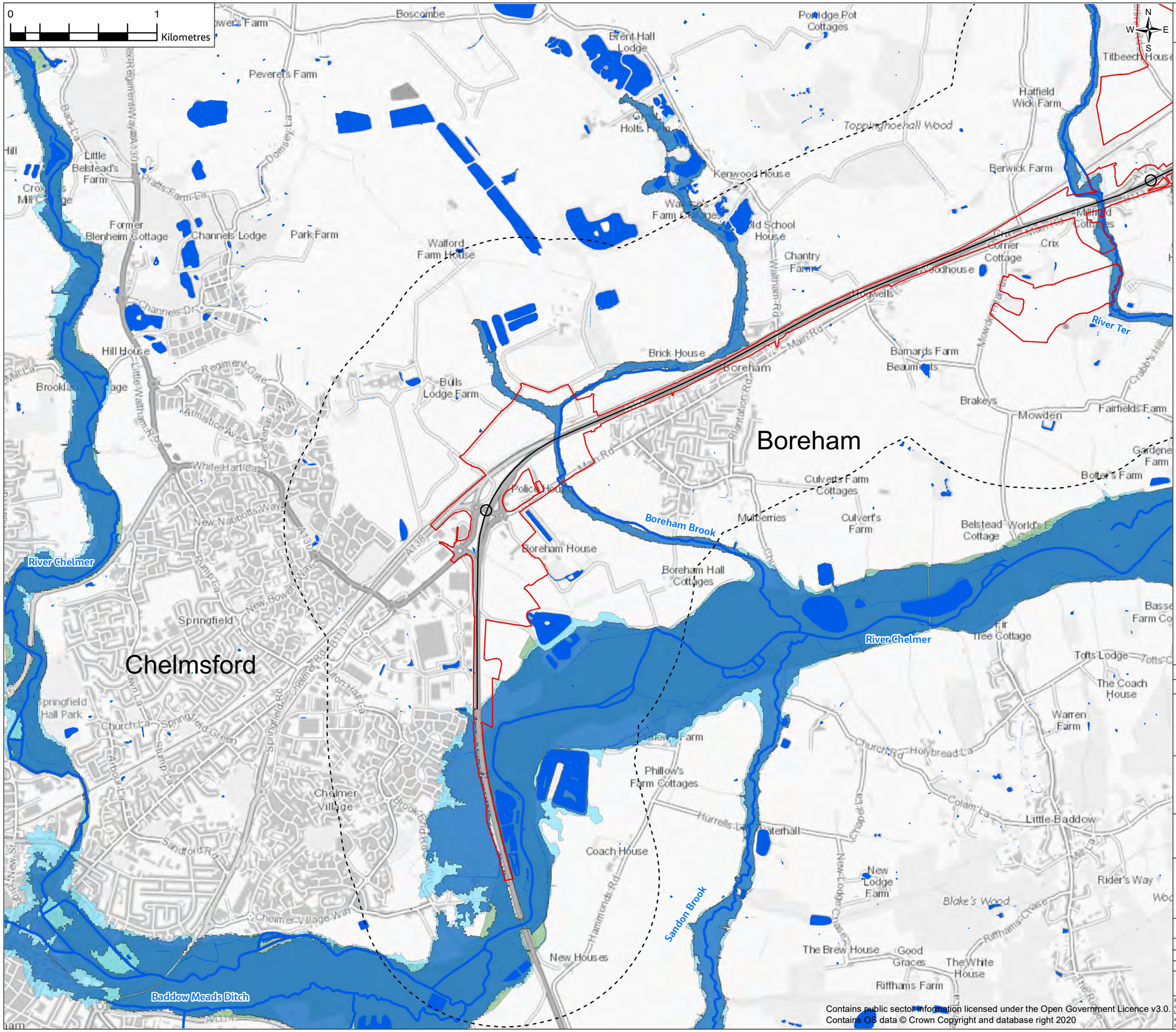
0 1 Kilometres

FIGURE 14.1



Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Water Environment Study Area
- Water Bodies
- Main Rivers
- Environment Agency Flood Zone 3
- Environment Agency Flood Zone 2
- Environment Agency Historic Flood Map

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Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
WATER ENVIRONMENT FEATURES
SHEET 1 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

Scale @ A3	1:25000	DO NOT SCALE
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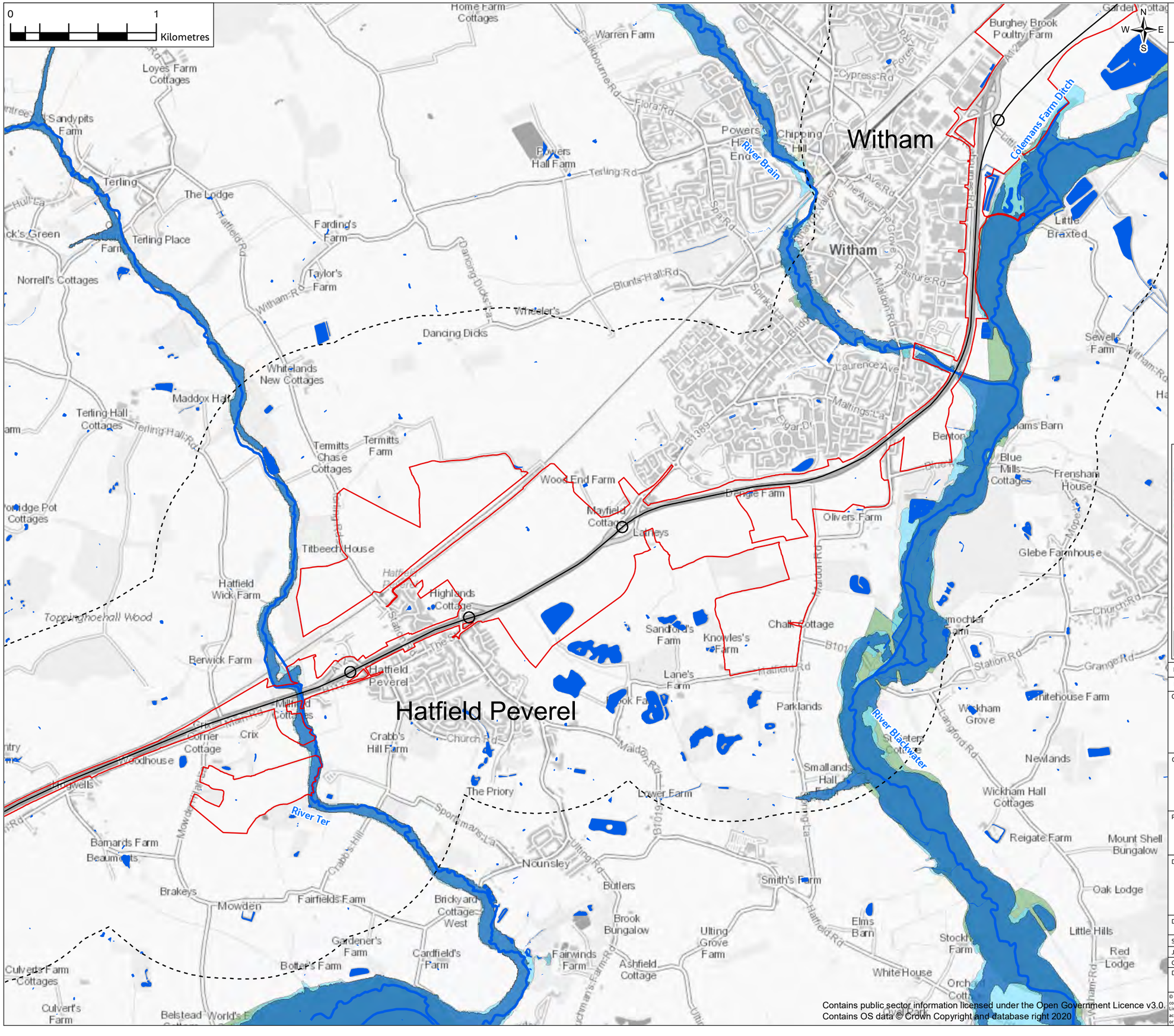
Client No.	HE551497	Rev P02

Drawing Number: HE551497-JAC-EWE-SCHW-SK-GI-0001

FIGURE 14.1



Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Water Environment Study Area
- Water Bodies
- Main Rivers
- Environment Agency Flood Zone 3
- Environment Agency Flood Zone 2
- Environment Agency Historic Flood Map

Rev.	Rev. Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
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Drawing Title: ENVIRONMENTAL SCOPING REPORT
WATER ENVIRONMENT FEATURES
SHEET 2 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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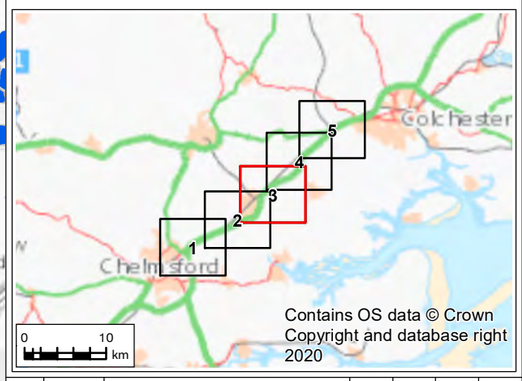
Jacobs No.	B229H130	
Client No.	HE551497	Rev P02

Drawing Number: HE551497-JAC-EWE-SCHW-SK-GI-0002

FIGURE 14.1

Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Water Environment Study Area
- Water Bodies
- Main Rivers
- Environment Agency Flood Zone 3
- Environment Agency Flood Zone 2
- Environment Agency Historic Flood Map



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Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
WATER ENVIRONMENT FEATURES
SHEET 3 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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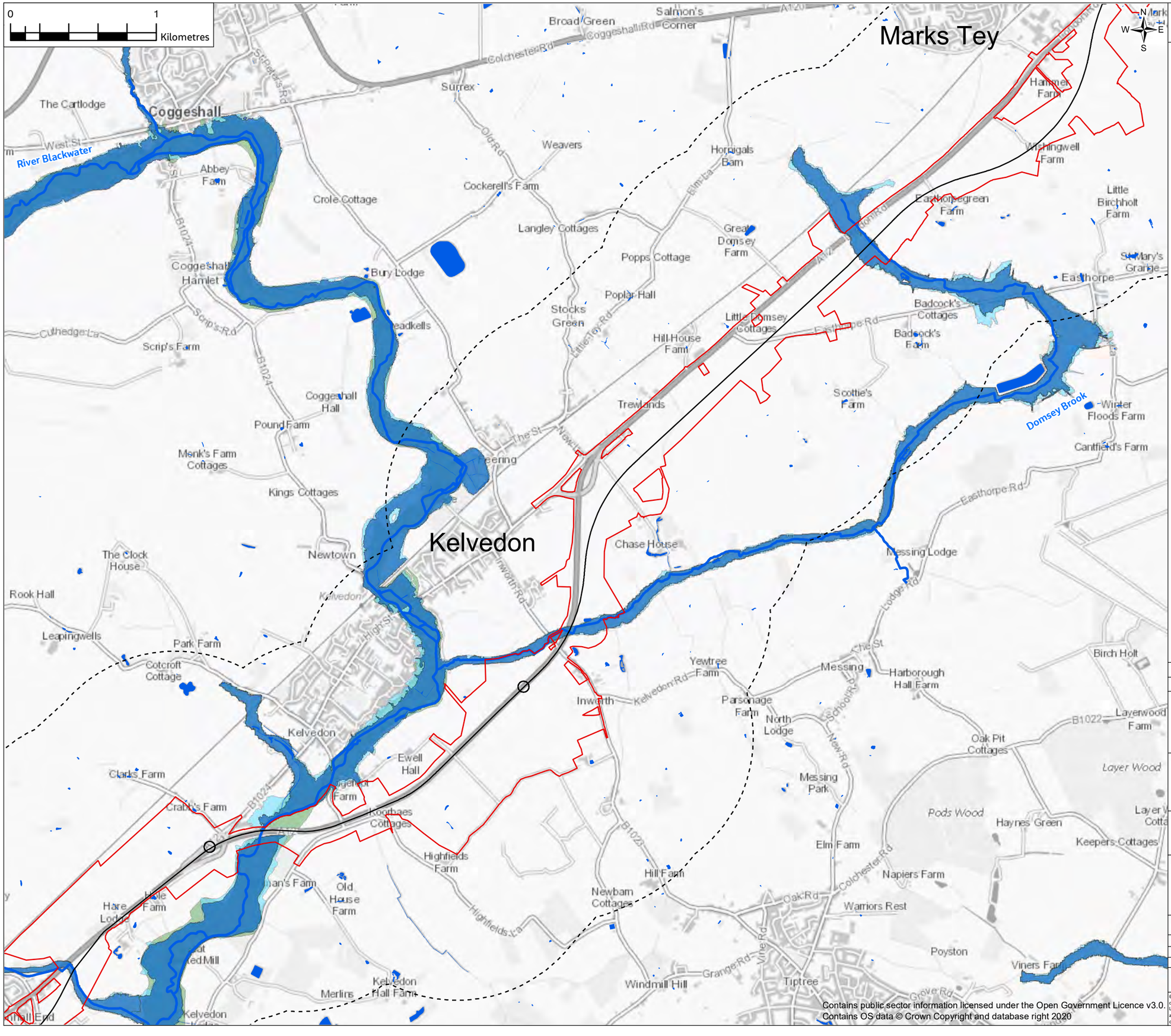
Jacobs No.	B229H130	Rev	P02
Client No.	HE551497		

Drawing Number: HE551497-JAC-EWE-SCHW-SK-GI-0003

FIGURE 14.1



Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Water Environment Study Area
- Water Bodies
- Main Rivers
- Environment Agency Flood Zone 3
- Environment Agency Flood Zone 2
- Environment Agency Historic Flood Map

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Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
WATER ENVIRONMENT FEATURES
SHEET 4 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

Scale @ A3	1:25000	DO NOT SCALE
Jacobs No.	B229H130	
Client No.	HE551497	Rev P02

Drawing Number: HE551497-JAC-EWE-SCHW-SK-GI-0004

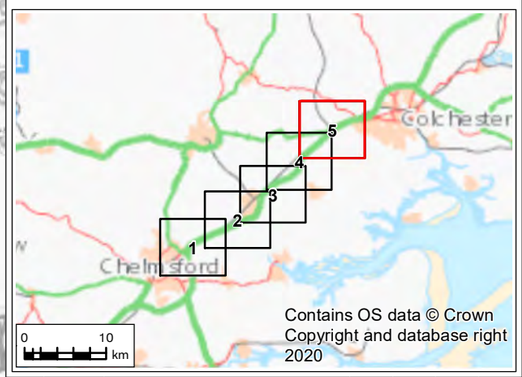
FIGURE 14.1

0 1 Kilometres

N W E S

Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Water Environment Study Area
- Water Bodies
- Main Rivers
- Environment Agency Flood Zone 3
- Environment Agency Flood Zone 2
- Environment Agency Historic Flood Map



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www.jacobs.com

Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
WATER ENVIRONMENT FEATURES
SHEET 5 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

Scale @ A3	1:25000	DO NOT SCALE
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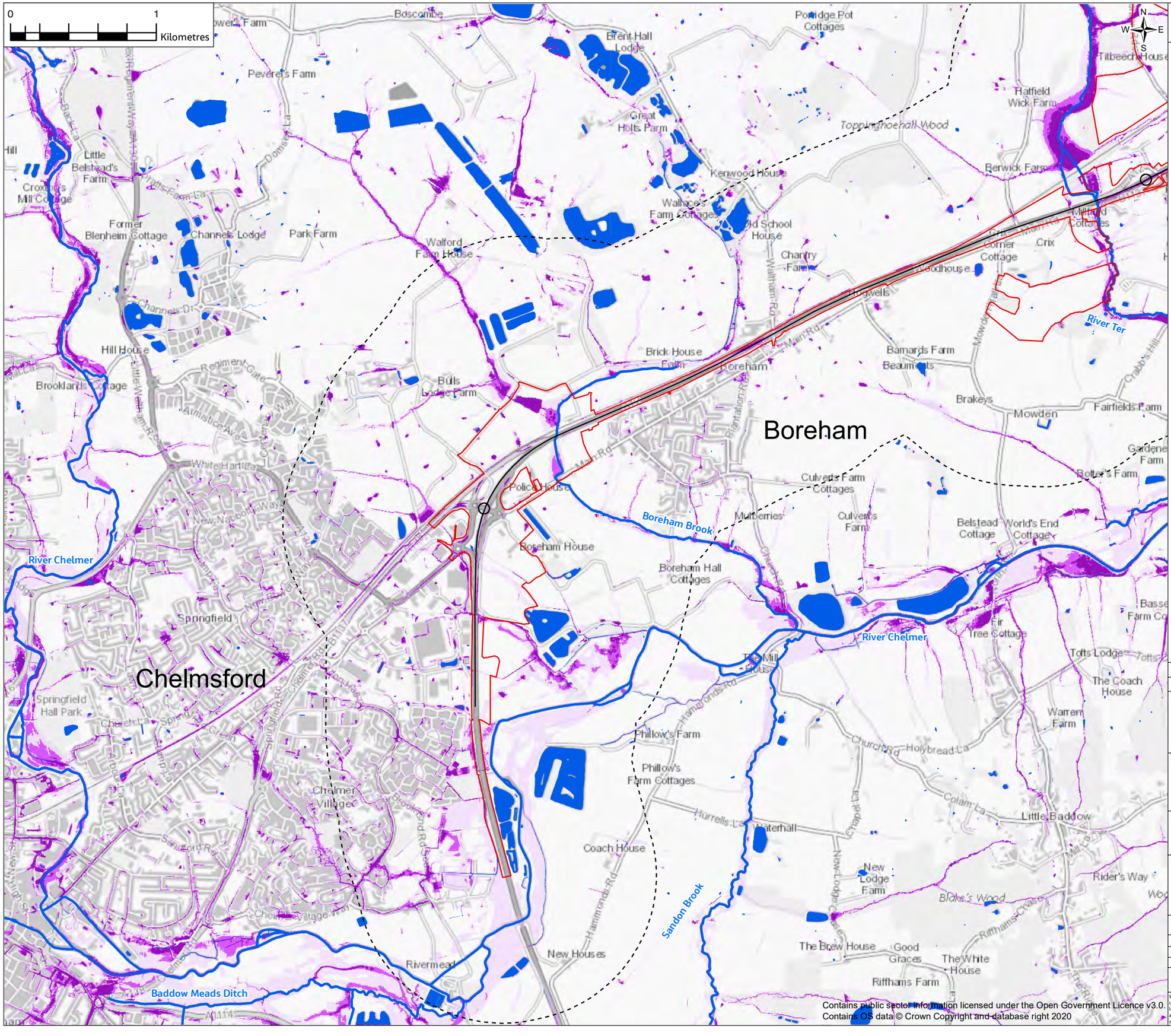
Client No.	HE551497	Rev P02

Drawing Number: HE551497-JAC-EWE-SCHW-SK-GI-0005

FIGURE 14.2



Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Water Environment Study Area
- Water Bodies
- Main Rivers
- Environment Agency Risk of Flooding from Surface Water: > 3.33% (1 in 30) AEP Event
- Environment Agency Risk of Flooding from Surface Water: 1 - 3.3% (between 1 in 100 and 1 in 30) AEP Event
- Environment Agency Risk of Flooding from Surface Water: 0.1 - 1% (between 1 in 1000 and 1 in 100) AEP Event

Rev.	Rev. Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
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Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
SURFACE WATER FLOOD RISK
SHEET 1 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

Scale @ A3	1:25000	DO NOT SCALE
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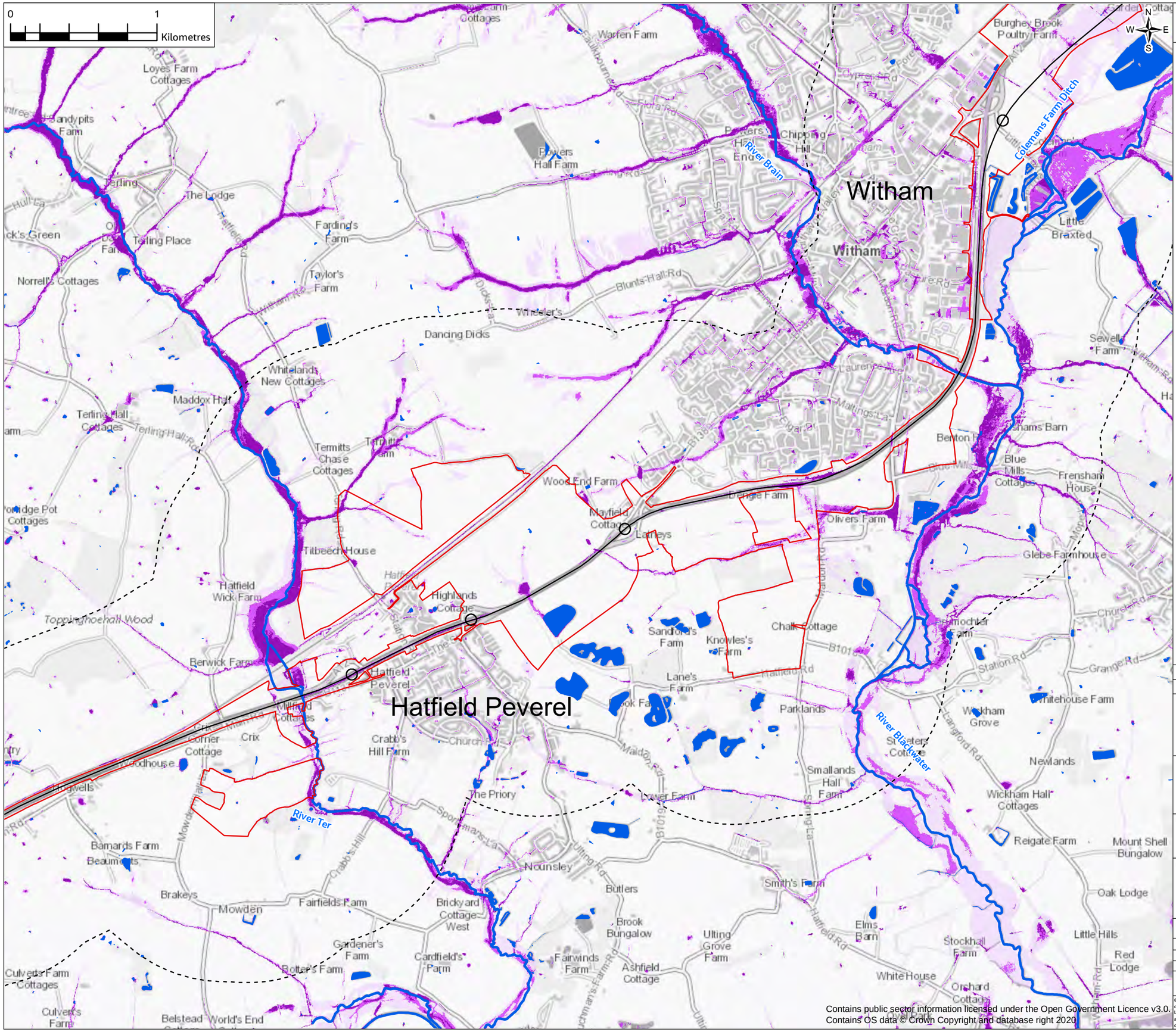
Client No.	HE551497	Rev P02

Drawing Number: HE551497-JAC-EWE-SCHW-SK-GI-0006

FIGURE 14.2



Legend

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Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
SURFACE WATER FLOOD RISK
SHEET 2 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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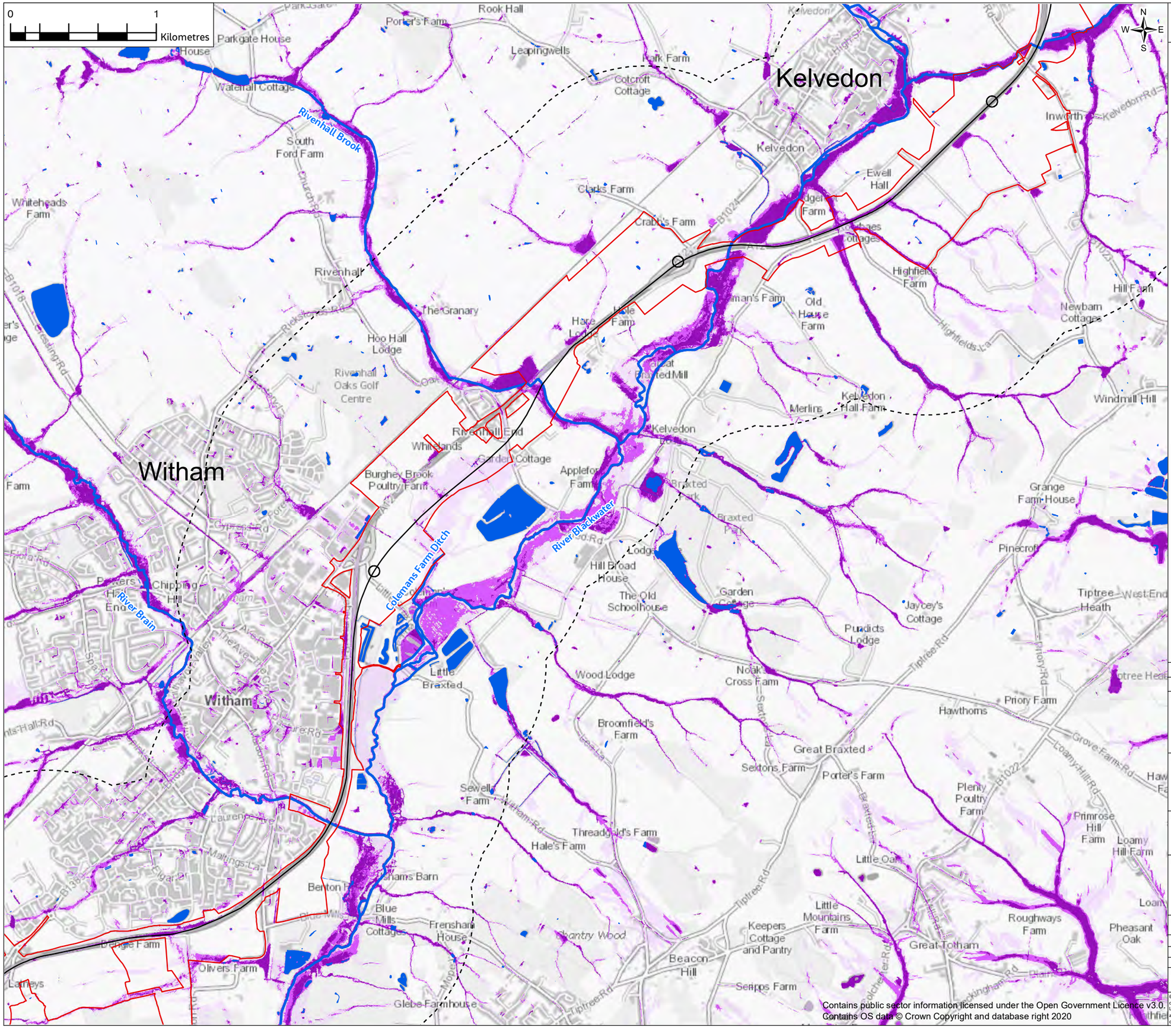
FIGURE 14.2



Legend

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- Provisional Order Limits
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Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
SURFACE WATER FLOOD RISK
SHEET 3 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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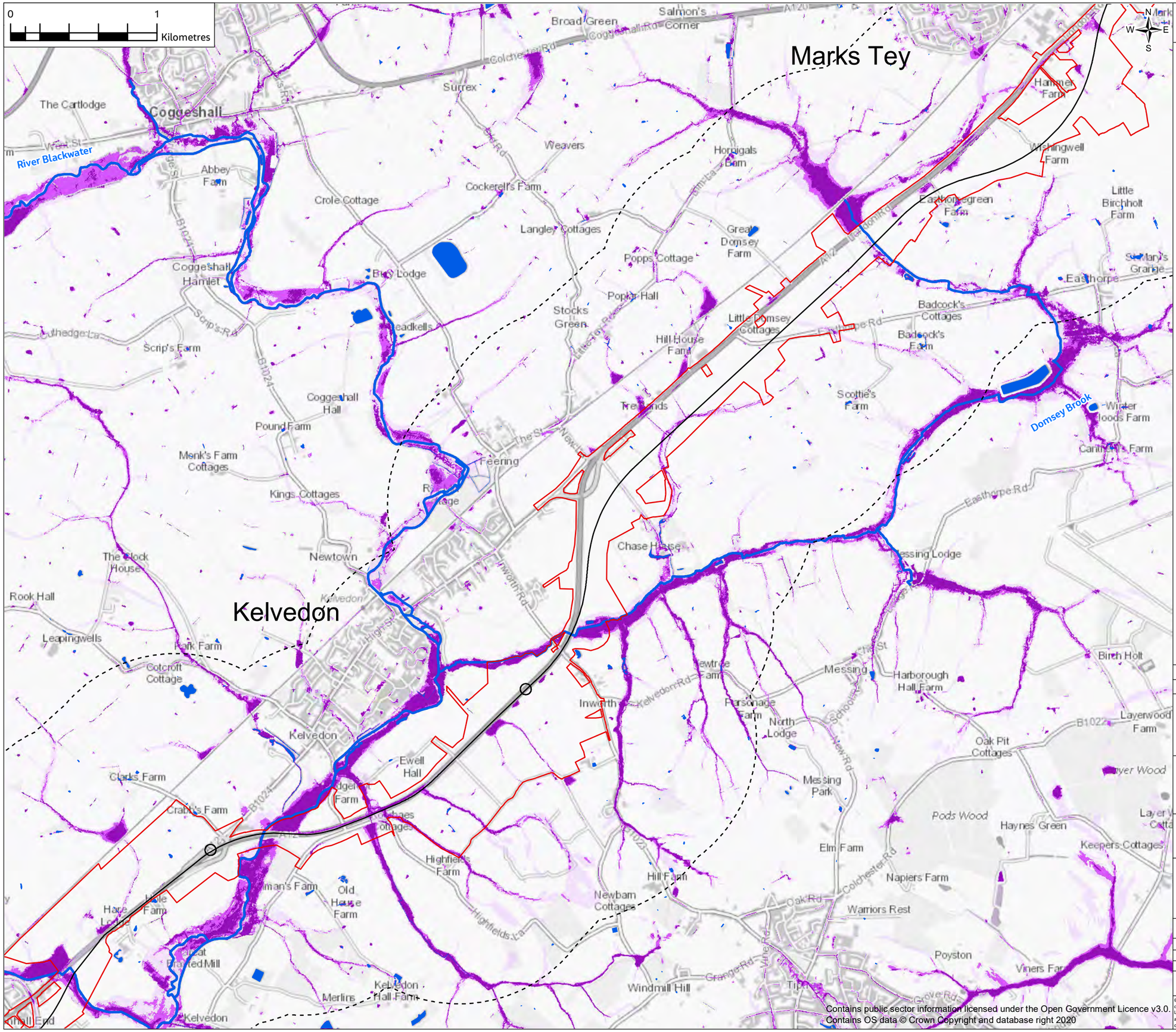
Client No.	HE551497	Rev P02

Drawing Number: HE551497-JAC-EWE-SCHW-SK-GI-0008

FIGURE 14.2



Legend

- Proposed Scheme Alignment
- Provisional Order Limits
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- Water Bodies
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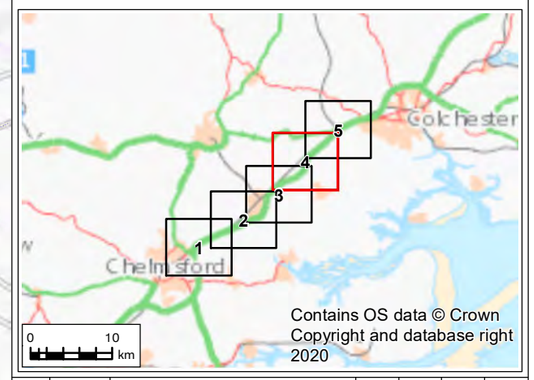

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Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

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SURFACE WATER FLOOD RISK
SHEET 4 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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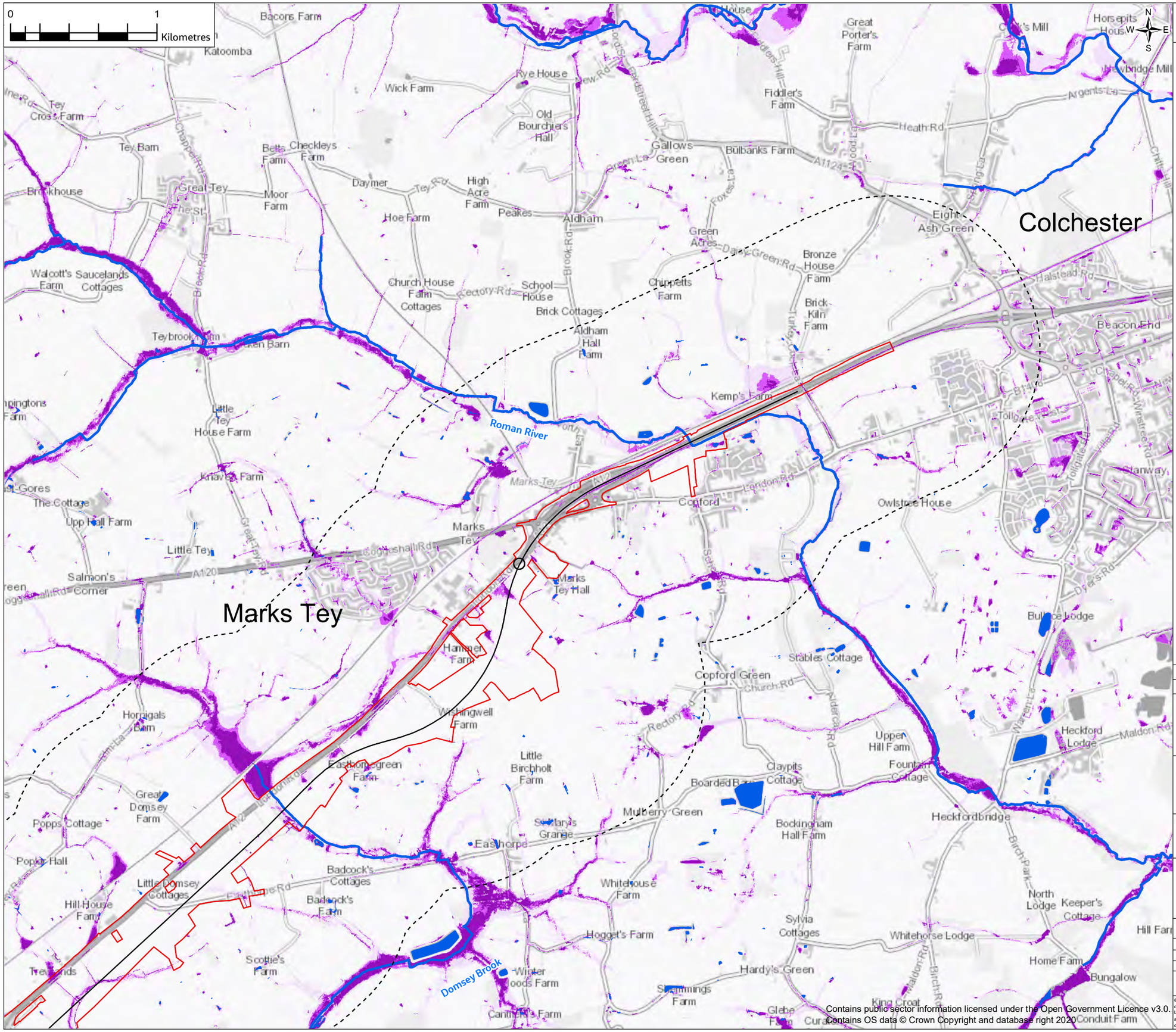
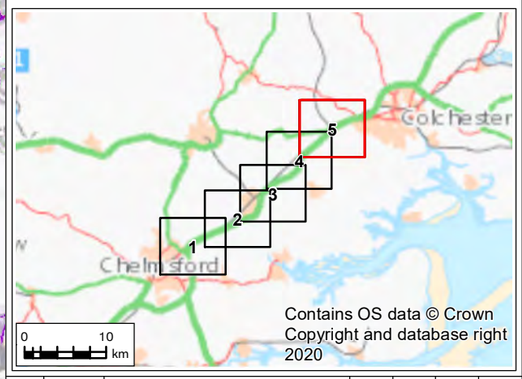
Drawing Number: HE551497-JAC-EWE-SCHW-SK-GI-0009

FIGURE 14.2





Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Water Environment Study Area
- Water Bodies
- Main Rivers
- Environment Agency Risk of Flooding from Surface Water: > 3.33% (1 in 30) AEP Event
- Environment Agency Risk of Flooding from Surface Water: 1 - 3.3% (between 1 in 100 and 1 in 30) AEP Event
- Environment Agency Risk of Flooding from Surface Water: 0.1 - 1% (between 1 in 1000 and 1 in 100) AEP Event

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Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
SURFACE WATER FLOOD RISK
SHEET 5 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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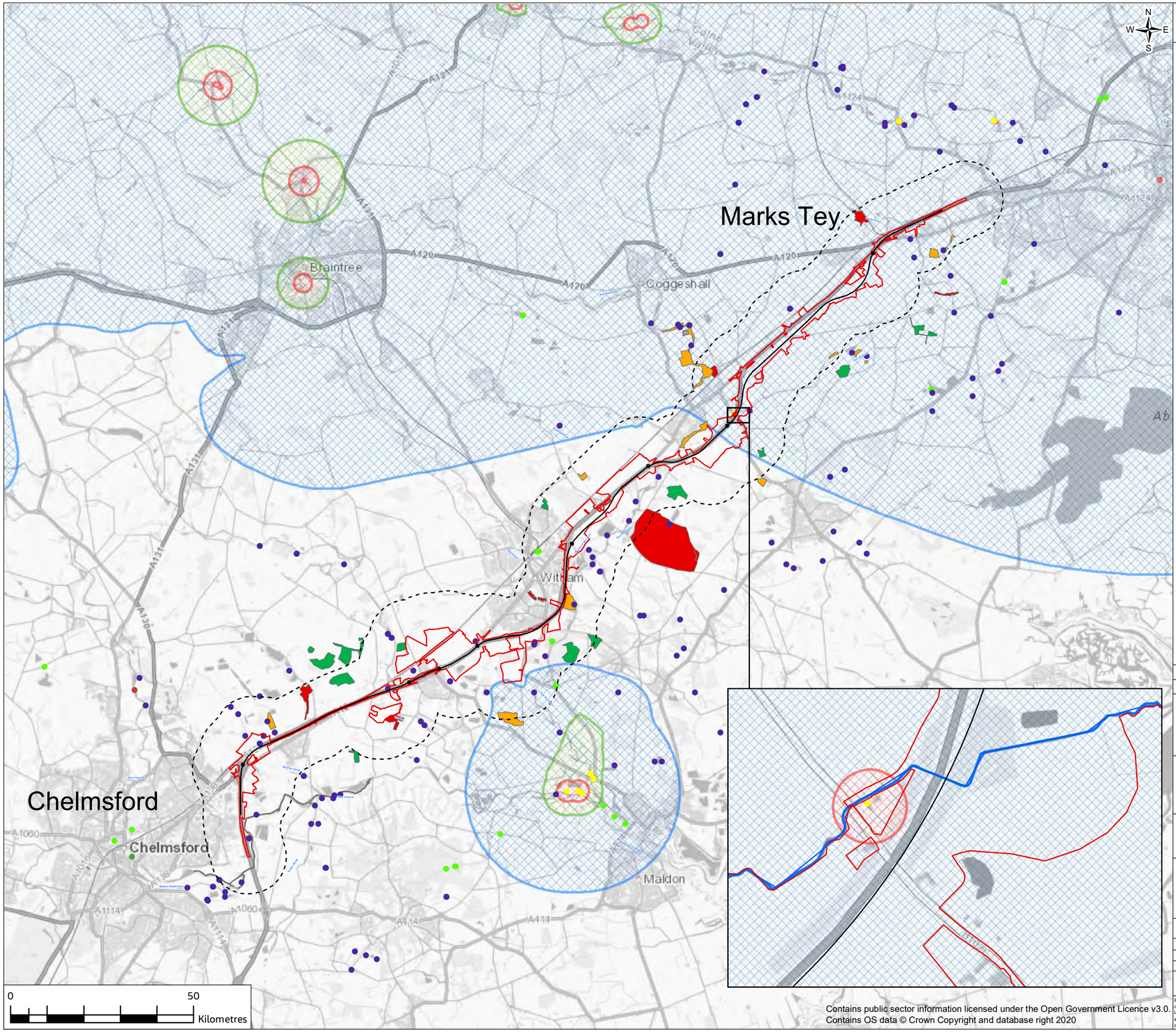
FIGURE 14.3



Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Water Environment Study Area

Licensed Groundwater Abstractions:

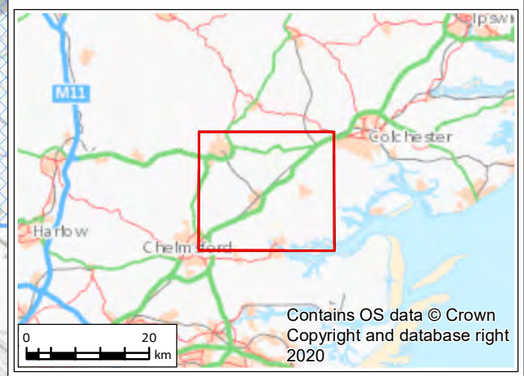
- Agriculture
- Industrial, Commercial And Public Services
- Water Supply

Potential Groundwater Dependency of LWSs and LNRs:

- High or High/Medium
- Medium or Medium/Low
- Low

Groundwater SPZs:

- Zone I - Inner Protection Zone
- Zone II - Outer Protection Zone
- Zone III - Total Catchment



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Project
A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title
ENVIRONMENTAL SCOPING REPORT
POTENTIAL GROUNDWATER RECEPTORS
SHEET 1 OF 1

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Jacobs No.	B229H130	
Client No.	HE551497	Rev P02

Drawing Number
HE551497-JAC-EWE-SCHW-SK-GI-0011

FIGURE 14.4

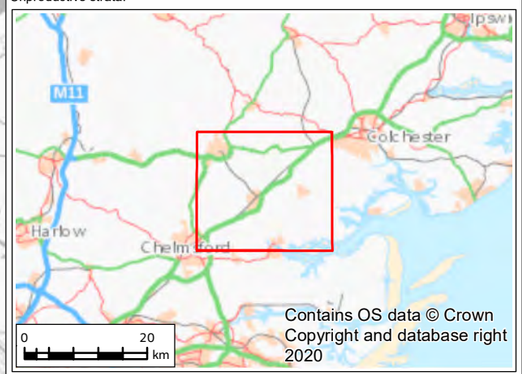
Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Water Environment Study Area

BGS Aquifer Designation*

- Secondary A Superficial Aquifer
- Secondary B Superficial Aquifer
- Secondary Superficial Aquifer Undifferentiated
- Unproductive Superficial Aquifer
- Secondary A Bedrock Aquifer
- Unproductive Bedrock Aquifer

*With the exception of the two areas of bedrock Secondary A aquifer in the vicinity of Witham and Kelveden, all bedrock within the study area is designated as Unproductive strata.



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Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL SCOPING REPORT
AQUIFER DESIGNATIONS
SHEET 1 OF 1

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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Client No.	HE551497	Rev P02

Drawing Number: HE551497-JAC-EWE-SCHW-SK-GI-0012

Braintree
Coggeshall
Marks Tey
Colne Valley
Witham
Chelmsford
Maldon
A120
A131
A1124
A133
A414
A1114
A1060
A130
A1016
A138

0 5 Kilometres

Appendix B. Local planning framework

B.1.1 Local planning policy is important and relevant to the consideration of an application for development consent as it may inform the Local Impact Report.

B.1.2 Table B.1 sets out the local planning policy documents prepared by each local planning authority along the Proposed Scheme corridor.

B.1.3 Emerging local plans have been identified. Planning policies set out in emerging plans are important, though until the plans are adopted, they hold limited weight in planning decisions. Given the programme for adoption for the relevant local plans it is reasonable to assume that some or all the emerging local plans will have been adopted prior to submission of the DCO application. Emerging plans will therefore be attributed increasing material weight as they progress through the adoption process.

B.1.4 Emerging plans and planning policy will be monitored, and policies added as they are adopted, so that the Environmental Statement (ES) and other planning documents are up to date at the point that the application for development consent is submitted.

Table B.1: Local planning policy framework

Local planning authority	Planning policy documents
Chelmsford City Council	• Core Strategy and Development Control Policies Focused Review (2013) • North Chelmsford Area Action Plan and Adopted Proposals Map (2011) • Chelmsford Local Plan - Our Planning Strategy 2013 to 2036 (2020)
Braintree District Council	• Core Strategy (2011) • Pre-Submission Site Allocations and Development Management Plan (amended 2014) • Strategic Housing Land Availability Assessment - 5 Years Housing Supply 2018-2023 • Supplementary Planning Documents (SPD) • Emerging: Braintree Publication Draft Local Plan (2017) Section 1 and Section 2
Maldon District Council	• Maldon District Approved Local Development Plan 2014 – 2029 (2017) • Maldon District Green Infrastructure Strategy SPD (2019)
Colchester Borough Council	• Core Strategy (adopted 2008, amended in 2014 by the Local Plan Focused Review) • Development Policies Development Plan Document (DPD)- as amended (2014) • Proposals Maps (2010) • Tiptree Jam Factory DPD (2013) • Emerging: Colchester Publication Draft Local Plan (2017) Section 1 and Section 2 • The Adopted Local Plan 2001- 2021
Essex County Council	• Essex Minerals Local Plan (2014) • Essex and Southend-on-Sea Waste Local Plan (2017)

Appendix C. Assessment criteria

C.1 Sensitivity criteria

C.1.1 This tabulates how the baseline has been assessed in terms of its value and sensitivity. The assessment is based on Table 3.2N from DMRB LA 104 (recreated in table C.1). It has then been interpreted by technical specialists for each aspect in table C.2. Additional notes are provided under the aspect heading where applicable. The table is used as guidance for the assessment and is not designed to be prescriptive. Technical judgement will be used to provide the final value.

Table C.1: Guidance for assessing value (sensitivity) taken from DMRB LA 104

Value (sensitivity)	Typical descriptors
Very high	Very high importance and rarity, international scale and very limited potential for substitution.
High	High importance and rarity, national scale, and limited potential for substitution.
Medium	Medium or high importance and rarity, regional scale, limited potential for substitution.
Low	Low or medium importance and rarity, local scale.
Negligible	Very low importance and rarity, local scale.

Table C.2: Topic specific interpretation of the DMRB guidance for the Proposed Scheme

Value (sensitivity)	Typical descriptors
Air quality (operational and construction traffic/dust effects; DMRB LA 105)	
Notes	All sensitive receptors are considered to be of equal value (high).

Value (sensitivity)	Typical descriptors
Cultural heritage (using criteria set out in DMRB LA 104 Environmental Assessment and Monitoring, DMRB LA106 Cultural Heritage Assessment and using professional judgement)	
Very high	**Archaeological remains**: World Heritage Sites (including nominated sites). Assets of acknowledged international importance. Assets that can contribute significantly to acknowledged international research objectives. **Historic buildings**: Structures recognised as of universal importance as World Heritage Sites. Other buildings of recognised international importance. **Historic landscapes**: World Heritage Sites recognised for their historic landscape qualities. Historic landscapes of international value, whether designated or not. Extremely well-preserved historic landscapes with exceptional coherence, time-depth, or other critical factor(s).
High	**Archaeological remains**: Scheduled monuments (including proposed sites). Undesignated assets of schedulable quality and importance. Assets that can contribute significantly to acknowledged national research objectives. **Historic buildings**: Scheduled monuments with standing remains. Grade I, Grade II* and Grade II listed buildings. Other listed buildings that can be shown to have exceptional qualities in their fabric or historical associations not adequately reflected in the listing grade. Conservation areas containing very important buildings. Undesignated structures of clear national importance. **Historic landscapes**: Designated historic landscapes of outstanding interest. Undesignated landscapes of outstanding interest. Undesignated landscapes of high quality and importance, and of demonstrable national value. Well preserved historic landscapes, exhibiting considerable coherence, time-depth or other critical factor(s).
Medium	**Archaeological remains**: Designated or undesignated assets that contribute to regional research objectives. **Historic buildings**: Historic (unlisted) buildings that can be shown to have exceptional qualities in their fabric or historical associations. Conservation areas containing buildings which contribute significantly to their historic character. Historic townscape or built-up areas with important historic integrity in their buildings or built settings (e.g. including street furniture and other structures). **Historic landscapes**: Designated special historic landscapes. Undesignated historic landscapes that would justify special historic landscape designation, landscapes of regional value. Averagely well-preserved historic landscapes with reasonable coherence, time-depth or other critical factor(s).
Low	**Archaeological remains**: Designated and undesignated assets of local importance. Assets compromised by poor preservation and/or poor survival of contextual associations. Assets of limited value, but with potential to contribute to local research objectives. **Historic buildings**: 'Locally listed' buildings. Historic (unlisted) buildings of modest quality in their fabric or historical association. Historic townscape or built-up areas of limited historic integrity in their buildings or built settings (e.g. including street furniture and other structures). **Historic landscapes**: Robust undesignated historic landscapes. Historic landscapes with importance to local interest groups. Historic landscapes whose value is limited by poor preservation and/or poor survival of contextual associations.

Value (sensitivity)	Typical descriptors
Negligible	**Archaeological remains:** Assets with very little or no surviving archaeological importance. **Historic buildings:** Buildings of no architectural or historical note; buildings of an intrusive character. **Historic landscapes:** Landscapes with little or no significant historical interest.
Landscape (using the criteria set out in DMRB LA 107)	
Notes	DMRB LA 107 considers landscape 'sensitivity' which incorporates judgements on 'value'.
Very high	**Landscape:** Landscapes of very high international/national importance and rarity or value with no or very limited ability to accommodate change without substantial loss/gain (i.e. national parks, internationally acclaimed landscapes - UNESCO World Heritage Sites). **Visual:** • Static views from and of major tourist attractions • Views from and of very important national/international landscapes, cultural/historical sites (e.g. National Parks, UNESCO World Heritage sites) • Receptors engaged in specific activities for enjoyment of dark skies
High	**Landscape:** Landscapes of high national importance containing distinctive features/elements with limited ability to accommodate change without incurring substantial loss/gain (i.e. designated areas, areas of strong sense of place - registered parks and gardens, country parks). **Visual:** • Views by users of nationally important PRoW / recreational trails (e.g. national trails, long distance footpaths) • Views by users of public open spaces for enjoyment of the countryside (e.g. country parks) • Static views from dense residential areas, longer transient views from designated public open space, recreational areas • Views from and of rare designated landscapes of national importance

Value (sensitivity)	Typical descriptors
Medium	**Landscape:** Landscapes of local or regional recognition of importance able to accommodate some change (i.e. features worthy of conservation, some sense of place or value through use/perception). **Visual:** • Static views from less populated residential areas, schools and other institutional buildings and their outdoor areas; • Views by outdoor workers • Transient views from local/regional areas such as public open space, scenic roads, railways or waterways, users of local/regional designated tourist routes of moderate importance • Views from and of landscapes of regional importance
Low	**Landscape:** Local landscape areas or receptors of low to medium importance with ability to accommodate change (i.e. non-designated or designated areas of local recognition or areas of little sense of place). **Visual:** • Views by users of main roads or passengers in public transport on main arterial routes • Views by indoor workers • Views by users of recreational/formal sports facilities where the landscape is secondary to enjoyment of the sport • Views by users of local public open spaces of limited importance with limited variety or distinctiveness
Negligible	**Landscape:** Landscapes of very low importance and rarity able to accommodate change. **Visual:** • Quick transient views such as from fast moving vehicles • Views from industrial area, land awaiting re-development • Views from landscapes of no importance with no variety or distinctiveness

Value (sensitivity)	Typical descriptors
Biodiversity (based on DMRB LA 108)	
International or European importance	Sites including: • European sites: - Sites of Community Importance (SCI) - Special Protection Areas (SPA) - potential SPAs (pSPA) - Special Areas of Conservation (SAC) - Candidate or possible SACs (cSAC or pSAC) - Wetlands of International Importance (Ramsar sites) • Biogenetic Reserves, World Heritage Sites (where recognised specifically for their biodiversity value) and Biosphere Reserves • Areas which meet the published selection criteria for those sites listed above but which are not themselves designated as such
	Habitats: N/A
	Species: Resident, or regularly occurring, populations of species which can be considered at an international or European level where: • The loss of these populations would adversely affect the conservation status or distribution of the species at an international or European scale; or • The population forms a critical part of a wider population at this scale; or • The species is at a critical phase of its life cycle at an international or European scale
UK or national importance	Sites including: • Sites of Special Scientific Interest (SSSI) or Areas of Special Scientific Interest (ASSI) • National Nature Reserves (NNR) • National Parks • Marine Protected Areas (MPA) including Marine Conservation Zones (MCZ) • Areas which meet the published selection criteria for those sites listed above but which are not themselves designated as such

Value (sensitivity)	Typical descriptors
	Habitats including: • Areas of UK BAP priority habitats • Habitats included in the relevant statutory list of priority species and habitats • Areas of irreplaceable habitats including: - ancient woodland - ancient or veteran trees - blanket bog - limestone pavement - sand dunes - salt marsh - lowland fen • Areas of habitat which meet the definition for habitats listed above but which are not themselves designated or listed as such
	Species: Resident, or regularly occurring, populations of species which can be considered at an international, European, UK or national level where: • The loss of these populations would adversely affect the conservation status or distribution of the species at a UK or national scale; or • The population forms a critical part of a wider population at this scale; or • The species is at a critical phase of its life cycle at a UK or national scale
Regional importance	Designated sites (non-statutory) including heritage coasts.
	Areas of habitats identified (including for restoration) in regional plans or strategies (where applicable).
	Species including: • Resident, or regularly occurring, populations of species which can be considered at an international, European, UK or national level where: - the loss of these populations would adversely affect the conservation status or distribution of the species at a regional scale; or - the population forms a critical part of a wider regional population; or - the species is at a critical phase of its life cycle • Species identified in regional plans or strategies

Value (sensitivity)	Typical descriptors
County or equivalent importance	Wildlife / nature conservation sites designated at a county (or equivalent) level including: • Local Wildlife Sites (LWS) • Local Nature Conservation Sites (LNCS) • Local Nature Reserves (LNR) • Sites of Importance for Nature Conservation (SINC) • Sites of Nature Conservation Importance (SNCI) • County Wildlife Sites (CWS)
	Areas of habitats identified in county or equivalent authority plans or strategies (where applicable).
	Species including: • Resident, or regularly occurring, populations of species which can be considered at an international, European, UK or national level where: - the loss of these populations would adversely affect the conservation status or distribution of the species at a county or unitary authority scale; or - the population forms a critical part of a wider county or equivalent authority area population, e.g. metapopulations; or - the species is at a critical phase of its life cycle • Species identified in a county or equivalent authority area plans or strategies
Local importance	Wildlife / nature conservation sites designated at a local level including: • Local Wildlife Sites (LWS) • Local Nature Conservation Sites (LNCS) • Local Nature Reserves (LNR) • Sites of Importance for Nature Conservation (SINC) • Sites of Nature Conservation Importance (SNCI) • Sites of Local Nature Conservation Importance (SLNCI)
	Areas of habitat considered to appreciably enrich the habitat resource within the local context including features of importance for migration, dispersal, or genetic exchange.
	Populations / communities of species considered to appreciably enrich the habitat resource within the local context including features of importance for migration, dispersal or genetic exchange.

Value (sensitivity)	Typical descriptors
Geology and soils (based on DMRB LA 109)	
Very high	**Geology:** International designated sites of geological value e.g. (e.g. UNESCO World Heritage Sites). **Human health:** Very sensitive land use such as residential or allotments. **Soil:** • ALC grades 1 and 2 • Soils directly supporting an EU designated site (e.g. SACs or SPAs) **Groundwater quality:** • Groundwater that locally supports a GWDTE • SPZ1 • Principal aquifer **Surface water quality:** Watercourse having a WFD classification shown in RBMP and a Q95≥1.0m^3/s.
High	**Geology:** Rare and of national importance with little potential for replacement (e.g. geological SSSI). **Human health:** High sensitivity land use such as public open space. **Soil:** • ALC subgrade 3a • Soils directly supporting a UK designated site (e.g. SSSI) **Groundwater quality:** Principal or secondary A aquifer providing locally important resource or supporting a river ecosystem. **Surface water quality:** Watercourse having a WFD classification shown in RBMP and a Q95<1.0m^3/s.
Medium	**Geology:** Regionally Important Geological Sites with limited potential for replacement (e.g. RIGS). **Human health:** Medium sensitivity land use such as commercial or industrial. **Soil:** • ALC grade 3b • Soils supporting non-statutory designated sites (e.g. LNR) **Groundwater quality:** Aquifer providing water for agricultural or industrial use with limited connection to surface water. Unlicensed private water supply. **Surface water quality:** Watercourse not having a WFD classification shown in RBMP and a Q95>0.001m^3/s.

Value (sensitivity)	Typical descriptors
Low	**Geology:** Geology of local importance / interest with potential for replacement (e.g. non designated geological exposures, former quarries / mining sites). **Human health:** Low sensitivity land use such as highways and rail. **Soil:** • ALC grades 4 and 5 • Soils supporting non-designated notable or priority habitats **Groundwater quality:** Unproductive strata. **Surface water quality:** A highly modified watercourse that has been changed by channel modification or other anthropogenic pressures. The watercourse exhibits no morphological diversity and has a uniform channel, showing no evidence of active fluvial processes and not likely to be affected by modification.
Negligible	**Geology:** No geological exposures, little / no local interest. **Human health:** Undeveloped surplus land / no sensitive land use proposed. **Soil:** Previously developed land formerly in 'hard uses' with little potential return to agriculture. **Groundwater quality:** Not applicable. **Surface water quality:** Not applicable.
Material assets and waste (no sensitivity criteria assigned to this aspect in DMRB LA 110 as assessment is based on significance criteria alone)	
Noise and vibration (based on DMRB LA 111)	
Notes	The DMRB LA 111 does not explicitly refer to the concept of receptor value (sensitivity), nor does it define a value for receptors. Rather, the assumption is made that a receptor is either sensitive or not sensitive. Within DMRB LA 111 are examples of receptors that are potentially sensitive to noise and vibration.
Population and health (criteria for land use and accessibility adapted from DMRB LA 112)	
Very high	**Residential property and housing** • Residential settlements within the study area which exceed 5ha or 150 houses • Land allocated for housing located in a local authority area where the number of households are expected to increase by >25% by 2041 (ONS data)

Value (sensitivity)	Typical descriptors
	Community land and assets • Community land and assets providing essential services for the daily health and functioning of the community where: - there are no alternatives within a reasonably accessible distance - they are frequently used by the majority of the community or by vulnerable groups who could be disproportionately affected by changes in the baseline due to potentially different needs • Locations where access between residents and community land and assets is physically severed, or highway conditions prevent access for people with characteristics protected under the Equality Act 2010
	Development land and businesses: Large employment sites and allocations within study area which exceed 5ha.
	Agricultural land holdings: Large agricultural holdings which are dependent on very regular access between fields and agricultural infrastructure, for example dairy farms.
	Walkers, cyclists and horse riders • National trails and routes likely to be used regularly by high numbers for commuting and/or recreation (with limited potential for substitution) • Routes regularly used by vulnerable travellers such as the elderly, school children and people with disabilities, who could be disproportionately affected by small changes in the baseline due to potentially different needs • Rights of way for walkers, cyclists and horse riders crossing existing roads at grade with >16,000 vehicles per day
High	**Residential property and housing** • Small settlements (>1-5ha / circa 30 – 150 houses) • Land allocated for housing located in a local planning authority area where the number of households are expected to increase by 16-25% by 2041 (ONS data)
	Community land and assets • Community land and assets supporting the health and functioning of the community where: - alternatives are available only by travel to other settlements / areas - they are regularly used by a large portion of the community or by vulnerable groups who could be disproportionately affected by changes in the baseline due to potentially different needs • Locations where access between residents and community land and assets is substantially severed or difficult to negotiate, or highway conditions offer limited provision which is compliant with Equality Act 2010 standards

Value (sensitivity)	Typical descriptors
	Development land and businesses: Employment sites and allocations (circa >1 – 5ha).
	Agricultural land holdings: Farm holdings dependent on access to extensive land to maintain high productivity, for example extensive arable farms.
	Walkers, cyclists and horse riders • Regional trails and routes (e.g. promoted circular walks) located close to communities likely to be used for recreation and to a lesser extent commuting, that record frequent (daily) use and have limited potential for substitution • At grade crossings with >8,000 - 16,000 vehicles per day and/or routes with limited accessibility provision
Medium	**Residential property and housing:** Isolated houses and very small hamlets (<1ha and/or <30 houses) within study area.

	Community land and assets
	• Community land and assets supporting the health and functioning of the community where:
	  - limited alternatives are available within an easily accessible distance (i.e. in adjacent neighbourhoods)
	  - they are regularly used by the community
	• Locations where access between residents and community land and assets is indirect due to areas of severance but has access provision compliant with the Equality Act 2010

	Development land and businesses: Small employment sites and land allocated for employment (circa <1ha).
	Agricultural land holdings: Small agricultural land holdings requiring access to limited areas of land with potential for relocation, for example free range poultry sites.
	Walkers, cyclists and horse riders • Public rights of way and other routes close to communities which are used for recreational purposes (e.g. dog walking), but for which alternative routes can be taken. These routes are likely to link to a wider network of routes to provide options for longer, recreational journeys • Rights of way for WCH crossing roads at grade with >4000 – 8000 vehicles per day
Low	**Residential property and housing:** Proposed housing development on unallocated sites providing housing with planning permission or are in the planning process.

Value (sensitivity)	Typical descriptors
	Community land and assets • Community land and assets where: - alternatives are available at a local level in the wider community; or - level of use is infrequent; or - land and assets are used by a minority in the community
	Development land and businesses: Proposed employment development on unallocated sites providing employment with planning permission or are in the planning process.
	Agricultural land holdings: Agricultural business not dependent on direct land access and with potential for relocation, for example farm shops.
	Walkers, cyclists and horse riders: Routes which have fallen into disuse through past severance and/or which are scarcely used because they do not offer a meaningful route for either utility or recreational purposes.
Negligible	**Residential property and housing:** N/A.
	Community land and assets: N/A.
	Development land and businesses: N/A.
	Agricultural land holdings: Areas of land which are infrequently used on a non-commercial basis.
	Walkers, cyclists and horse riders: N/A.
Road drainage and the water environment (based on DMRB LA 113)	
Very high	**Flood risk and drainage**: Essential infrastructure or highly vulnerable development. **Surface water**: Watercourse having a WFD classification shown in a RBMP and Q95 ≥ 1.0 m^3/s. Site protected/designated under EC or UK legislation (SAC, Special Protection Area (SPA), SSSI, Ramsar site, salmonid water) and species protected by EC legislation. **Fluvial geomorphology**: A watercourse that appears to be in complete natural equilibrium and exhibits a natural range of morphological features. There is a diverse range of fluvial processes present, free from any modification or anthropogenic influence. Morphological features and processes would be highly sensitive to change as a result of temporary or permanent works. **Groundwater**: Principal aquifer providing a regionally important resource and/or supporting a site protected under EC and UK legislation. Groundwater that locally supports a GWDTE. SPZ1. World Heritage Site. Nationally important infrastructure and buildings.

Value (sensitivity)	Typical descriptors
High	**Flood risk and drainage**: More vulnerable development. **Surface water**: Watercourses having a WFD classification shown in a RBMP and Q95 <1.0m^3/s. **Fluvial geomorphology:** A watercourse that appears to be in natural equilibrium and exhibits a natural range of morphological features. There is a diverse range of fluvial processes present, with very limited signs of modification or other anthropogenic influences. Morphological features and processes would be sensitive to change as a result temporary or permanent works. **Groundwater**: Principal or secondary A aquifer providing locally important resource or supporting a river ecosystem. Groundwater that supports a GWDTE. SPZ2. Grade I and II* listed buildings. Regionally important infrastructure and buildings.
Medium	**Flood risk and drainage**: Less vulnerable development. **Surface water**: Watercourses not having a WFD classification shown in a RBMP and Q95 >0.001m^3/s. **Fluvial geomorphology**: A watercourse showing signs of modification, recovering to a natural equilibrium, and exhibiting a limited range of morphological features (such as pools and riffles). The watercourse is one with a limited range of fluvial processes and is affected by modification or other anthropogenic influences. Morphological features and processes could be sensitive to change as a result temporary or permanent works. **Groundwater:** Aquifer providing water for agricultural or industrial use with limited connection to surface water. Unlicensed groundwater abstractions. SPZ3. Grade II listed buildings. Locally important infrastructure and buildings.
Low	**Flood risk and drainage**: Water compatible development. **Surface water**: Watercourses not having a WFD classification shown in a RBMP and Q95 ≤0.001m^3/s. **Fluvial geomorphology**: A highly modified watercourse that exhibits no morphological diversity and has a uniform channel, showing no evidence of active fluvial processes. Has likely been significantly affected by anthropogenic factors which may include modification of flow regime, resulting in a dry channel during prolonged dry periods. Morphological features and processes would be unlikely to be sensitive to temporary or permanent works. Includes heavily modified main rivers and drainage channels. **Groundwater:** Unproductive strata. Undesignated historic buildings.
Climate change (based on DMRB LA 114)	
Notes	The assessment criteria below relate to the Proposed Scheme's vulnerability to climate change. The assessment of significance is a function of the likelihood of a climate event occurring, and the consequence if an event occurred. The below criteria therefore relate to likelihood, rather than sensitivity / value of receptor.
High	The event occurs several times during the lifetime of the project (60 years) e.g. approximately once every five years, typically 12 events.
Medium	The event occurs limited times during the lifetime of the project (60 years) e.g. approximately once every 15 years, typically 4 events.

Value (sensitivity)	Typical descriptors
Low	The event occurs during the lifetime of the project (60 years) e.g. once in 60 years.
Very low	The event can occur once during the lifetime of the project (60 years).

C.2 Magnitude criteria

C.2.1 This section tabulates how the effects will be assessed in terms of magnitude. The criteria are based on Table 3.4N from DMRB LA 104 (recreated in table C.3). It has then been interpreted by technical specialists for each aspect in table C.4.

Table C.3: Guidance for assessing magnitude taken from DMRB LA 104

Magnitude of impact	Typical criteria descriptors
Major adverse	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements.
Moderate adverse	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements.
Minor adverse	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements.
Negligible adverse	Very minor loss or detrimental alteration to one or more characteristics, features or elements.
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.
Negligible beneficial	Very minor benefit to or positive addition of one or more characteristics, features or elements.
Minor beneficial	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring.
Moderate beneficial	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality.
Major beneficial	Large scale or major improvement of resource quality; extensive restoration; major improvement of attribute quality.

Table C.4: Topic specific interpretation of the DMRB guidance for the Proposed Scheme

Magnitude	Typical descriptors
Air quality (using the criteria of change set out in DMRB LA 105 to support the determination of significant effects)	
Notes	The below criteria relate to operational effects. Construction dust impacts will be assessed in accordance with DMRB LA 105.
Large	Large change (>4 µg/m³). Greater than full measure of uncertainty (MoU) value of 10 % of annual mean NO_2 and PM_{10} air quality objectives (4µg/m³).
Medium	Medium change (>2 to 4 µg/m³). Greater than half of the MoU (2µg/m³), but less than the full MoU (4µg/m³) of 10% of annual mean NO_2 and PM_{10} air quality objectives.
Small	Small change (>0.4 to 2µg/m³). More than 1% of objective (0.4µg/m³) and less than half of the MoU i.e. 5% (2µg/m³). The full MoU is 10% of annual mean NO_2 and PM_{10} air quality objectives (4µg/m³).
Imperceptible	Imperceptible change (≤ 0.4 µg/m³). Less than or equal to 1% of annual mean NO_2 and PM_{10} air quality objectives (0.4µg/m³).
Cultural heritage (using criteria set out in DMRB LA 104 Environmental Assessment and Monitoring, DMRB LA106 Cultural Heritage Assessment and using professional judgement)	
Major	**Archaeological remains**: Change to most or all key archaeological materials, such that the resource is totally altered. Comprehensive changes to setting. **Historic buildings**: Change to key historic building elements, such that the resource is totally altered. Comprehensive changes to the setting. **Historic landscapes**: Change to most or all key historic landscape elements, parcels or components; extreme visual effects; gross change of noise or change to sound quality; fundamental changes to use or access; resulting in total change to historic landscape character unit.
Moderate	**Archaeological remains**: Changes to many key archaeological materials, such that the resource is clearly modified. Considerable changes to setting that affect the character of the asset. **Historic buildings**: Change to many key historic building elements, such that the resource is significantly modified. Changes to the setting of an historic building, such that it is significantly modified. **Historic landscapes**: Changes to many key historic landscape elements, parcels or components, visual change to many key aspects of the historic landscape, noticeable differences in noise or sound quality, considerable changes to use or access; resulting in moderate changes to historic landscape character.

Magnitude	Typical descriptors
Minor	**Archaeological remains**: Changes to key archaeological materials, such that the asset is slightly altered. Slight changes to setting. **Historic buildings**: Change to key historic building elements, such that the asset is slightly different. Change to setting of an historic building, such that it is noticeably changed. **Historic landscapes**: Changes to few key historic landscape elements, parcels or components, slight visual changes to few key aspects of historic landscape, limited changes to noise levels or sound quality; slight changes to use or access; resulting in limited changes to historic landscape character.
Negligible	**Archaeological remains**: Very minor changes to archaeological materials or setting. **Historic buildings**: Slight changes to historic buildings elements or setting that hardly affect it. **Historic landscapes**: Very minor changes to key historic landscape elements, parcels or components, virtually unchanged visual effects, very slight changes in noise levels or sound quality; very slight changes to use or access; resulting in a very small change to historic landscape character.
Landscape (using the criteria set out in DMRB LA 107)	
Notes	No beneficial effect criteria are provided for visual effects in DMRB LA 107, just landscape effects.
Major adverse	**Landscape**: Total loss or large-scale damage to existing landscape character or distinctive features or elements; and/or addition of new uncharacteristic, conspicuous features or elements (i.e. road infrastructure). **Visual**: The project, or a part of it, would become the dominant feature or focal point of the view.
Moderate adverse	**Landscape**: Partial loss or noticeable damage to existing landscape character or distinctive features or elements; and/or addition of new uncharacteristic, noticeable features or elements (i.e. road infrastructure). **Visual**: The project, or a part of it, would form a noticeable feature or element of the view which is readily apparent to the receptor.
Minor adverse	**Landscape**: Slight loss or damage to existing landscape character of one (maybe more) key features and elements; and/or addition of new uncharacteristic features and elements. **Visual**: The project, or a part of it, would be perceptible but not alter the overall balance of features and elements that comprise the existing view.
Negligible adverse	**Landscape**: Very minor loss, damage or alteration to existing landscape character of one or more features and elements. **Visual**: Only a very small part of the project work or activity would be discernible, or being at such a distance it would form a barely noticeable feature or element of the view.

Magnitude	Typical descriptors
No change	**Landscape:** No noticeable alteration or improvement, temporary or permanent, of landscape character of existing features and elements. **Visual:** No part of the project work or activity would be discernible.
Negligible beneficial	**Landscape**: Very minor noticeable improvement of character by the restoration of one or more existing features and elements.
Minor beneficial	**Landscape**: Slight improvement of landscape character by the restoration of one (maybe more) key existing features and elements; and/or the addition of new characteristic features.
Moderate beneficial	**Landscape**: Partial or noticeable improvement of landscape character by restoration of existing features or elements; or addition of new characteristic features or elements or removal of noticeable features or elements.
Major beneficial	**Landscape**: Large scale improvement of landscape character to features and elements; and/or addition of new distinctive features or elements, or removal of conspicuous road infrastructure elements.
Biodiversity (based on DMRB LA 108)	
Major adverse	• Permanent/irreversible damage to a biodiversity resource • The extent, magnitude, frequency, and/or timing of an impact negatively affects the integrity or key characteristics of the resource
Moderate adverse	• Temporary/reversible damage to a biodiversity resource • The extent, magnitude, frequency, and/or timing of an impact negatively affects the integrity or key characteristics of the resource
Minor adverse	• Permanent/irreversible damage to a biodiversity resource • The extent, magnitude, frequency, and/or timing of an impact does not affect the integrity or key characteristics of the resource
Negligible adverse	• Temporary/reversible damage to a biodiversity resource • The extent, magnitude, frequency, and/or timing of an impact does not affect the integrity or key characteristics of the resource
No change	No observable impact, either positive or negative.
Negligible beneficial	• Temporary addition of, improvement to, or restoration of a biodiversity resource • The extent, magnitude, frequency, and/or timing of an impact does not affect the integrity or key characteristics of the resource

Magnitude	Typical descriptors
Minor beneficial	• Permanent addition of, improvement to, or restoration of a biodiversity resource • The extent, magnitude, frequency, and/or timing of an impact does not affect the integrity or key characteristics of the resource
Moderate beneficial	• Temporary addition of, improvement to, or restoration of a biodiversity resource • The extent, magnitude, frequency, and/or timing of an impact positively affects the integrity or key characteristics of the resource
Major beneficial	• Permanent addition of, improvement to, or restoration of a biodiversity resource • The extent, magnitude, frequency, and/or timing of an impact positively affects the integrity or key characteristics of the resource
Geology and soils (based on DMRB LA 109)	
Major	**Geology:** Loss of geological feature / designation and/or quality and integrity, severe damage to key characteristics, features or elements. **Human health:** Significant contamination identified. Contamination levels significantly exceed background levels and relevant screening criteria (e.g. category 4 screening levels) with potential for significant harm to human health. Contamination heavily restricts future use of land. **Soil:** Physical removal or permanent sealing of >20ha of agricultural land. **Groundwater quality:** • Loss of, or extensive change to, an aquifer • Loss of regionally important water supply • Potential high risk of pollution to groundwater from routine runoff - risk score >250 (groundwater quality and runoff assessment) • Calculated risk of pollution from spillages ≥2% annually (spillage assessment) **Surface water quality:** • Loss of regionally important public water supply (licensed surface water abstraction for public water supply) • Reduction in water body WFD classification

Magnitude	Typical descriptors
Moderate	**Geology:** Partial loss of geological feature / designation, potentially adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements. **Human health:** • Contaminant concentrations exceed background levels and are in line with limits of relevant screening criteria (e.g. category 4 screening levels) • Significant contamination can be present. Control / remediation measures are required to reduce risks to human health / make land suitable for intended use **Soil:** • Physical removal or permanent sealing of 1ha – 20ha of agricultural land • Permanent loss / reduction of one or more soil function(s) and restriction to current or approved future use (e.g. through degradation, compaction, erosion of soil resource). **Groundwater quality:** • Partial loss or change to an aquifer • Degradation of regionally important public water supply or loss of significant commercial/ industrial/ agricultural supplies • Potential medium risk of pollution to groundwater from routine runoff - risk score 150-250 • Contribution to reduction in water body WFD classification **Surface water quality:** • Failure of both acute-soluble and chronic-sediment related pollutants in HEWRAT but compliance with EQS values • Degradation of regionally important public water supply or loss of major commercial/industrial/agricultural supplies • Contribution to reduction in water body WFD classification

Magnitude	Typical descriptors
Minor	**Geology:** • Minor measurable change in geological feature / designation attributes, quality or vulnerability • Minor loss of, or alteration to, one (maybe more) key characteristics, features or elements **Human health:** Contaminant concentrations are below relevant screening criteria (e.g. category 4 screening levels). Significant contamination is unlikely with a low risk to human health. Best practice measures can be used to avoid or reduce risks to human health. **Soil:** Temporary loss / reduction of one or more soil function(s) and restriction to current or approved future use (e.g. through degradation, compaction, erosion of soil resource). **Groundwater quality:** • Potential low risk of pollution to groundwater from routine runoff - risk score <150. Calculated risk of pollution from spillages ≥0.5% annually and <1% annually • Minor effects on an aquifer and abstractions **Surface water quality:** Minor effects on water supplies.
Negligible	**Geology:** Very minor loss or detrimental alteration to one or more characteristics, features or elements of geological feature / designation. Overall integrity of resource not affected. **Human health:** Contaminant concentrations substantially below levels outlined in relevant screening criteria (e.g. category 4 screening levels). No requirement for control measures to reduce risks to human health / make land suitable for intended use. **Soil:** No discernible loss / reduction of soil function(s) that restrict current or approved future use. **Groundwater quality:** No measurable impact upon an aquifer and/or groundwater receptors and risk of pollution from spillages <0.5%. **Surface water quality:** No risk identified by HEWRAT (pass both acute-soluble and chronic-sediment related pollutants). Risk of pollution from spillages <0.5%.
Material assets and waste (no magnitude criteria assigned to this aspect in DMRB LA 110 as assessment is based on significance criteria alone)	
Nosie and vibration effect levels (based upon the criteria in DMRB LA 111)	

	Time period	LOAEL	SOAEL
Construction time period LOAEL and SOAEL	Day (0700-1900 weekday and 0700-1300 Saturdays)	Baseline noise levels $L_{Aeq,T}$	Threshold level determined as per BS 5228-1 Section E3.2 and Table E.1 of BS 5228-1

Magnitude	Typical descriptors		
	Night (2300-0700)	Baseline noise levels $L_{Aeq,T}$	Threshold level determined as per BS 5228-1 Section E3.2 and Table E.1 of BS 5228-1
	Evening and weekends (time periods not covered above)	Baseline noise levels $L_{Aeq,T}$	Threshold level determined as per BS 5228-1 Section E3.2 and Table E.1 of BS 5228-1
Construction vibration LOAELs and SOAELs for all receptors	All time periods	0.3mm/s PPV	1.0mm/s PPV
Operational noise LOAELs and SOAELs for all receptors	Day (06:00-24:00)	55dB $L_{A10,18hr}$ facade	68dB $L_{A10,18hr}$ facade
	Night (23:00-07:00)	40dB $L_{night,\ outside}$ (free-field)	55dB $L_{night,\ outside}$ (free-field)
Noise and vibration magnitude (based upon the criteria in DMRB LA 111)			
Major	**Construction traffic noise:** Increase in BNL of closest public road used for construction traffic (dB) above or equal to SOAEL +5dB. **Construction vibration:** Vibration level above or equal to 10 mm/s PPV. **Operational noise (short-term):** Short term noise change (dB $L_{A10,18hr}$ or L_{night}) greater than or equal to 5.0. **Operational noise (long-term):** Long term noise change (dB $L_{A10,18hr}$ or L_{night}) greater than or equal to 10.0.		
Moderate	**Construction traffic noise:** Increase in BNL of closest public road used for construction traffic (dB) above or equal to SOAEL and below SOAEL +5dB. **Construction vibration:** Vibration level above or equal to SOAEL and below 10 mm/s PPV. **Operational noise (short-term):** Short term noise change (dB $L_{A10,18hr}$ or L_{night}) 3.0 to 4.9. **Operational noise (long-term):** Long term noise change (dB $L_{A10,18hr}$ or L_{night}) 5.0 to 9.9.		
Minor	**Construction traffic noise:** Increase in BNL of closest public road used for construction traffic (dB) above or equal to LOAEL and below SOAEL. **Construction vibration:** Vibration level above or equal to LOAEL and below SOAEL. **Operational noise (short-term):** Short term noise change (dB $L_{A10,18hr}$ or L_{night}) 1.0 to 2.9. **Operational noise (long-term):** Long term noise change (dB $L_{A10,18hr}$ or L_{night}) 3.0 to 4.9.		

Magnitude	Typical descriptors
Negligible	**Construction traffic noise:** Increase in BNL of closest public road used for construction traffic (dB) below LOAEL. **Construction vibration:** Vibration level below LOAEL. **Operational noise (short-term):** Short term noise change (dB $L_{A10,18hr}$ or L_{night}) less than 1.0. **Operational noise (long-term):** Long term noise change (dB $L_{A10,18hr}$ or L_{night}) less than 2.9.
Population and health (based on DMRB LA 112)	
Major	**Private property and housing, community land and assets, development land and businesses, and agricultural land holdings:** • Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements. e.g. direct acquisition and demolition of buildings and direct development of land to accommodate highway assets • Introduction (adverse) or removal (beneficial) of complete severance with no/full accessibility provision **Walkers, cyclists, horse riders:** >500m increase (adverse) / decrease (beneficial) in walking/cycling/horse rider journey length.
Moderate	**Private property and housing, community land and assets, development land and businesses, and agricultural land holdings:** • Partial loss of/damage to key characteristics, features or elements, e.g. partial removal or substantial amendment to access or acquisition of land compromising viability of property, businesses, community assets or agricultural holdings • Introduction (adverse) or removal (beneficial) of severe severance with limited / moderate accessibility provision **Walkers, cyclists, horse riders:** >250m - 500m increase (adverse) or decrease (beneficial) in walking/cycling/horse rider journey length.
Minor	**Private property and housing, community land and assets, development land and businesses, and agricultural land holdings:** • A discernible change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements, e.g. amendment to access or acquisition of land resulting in changes to operating conditions that do not compromise overall viability of property, businesses, community assets or agricultural holdings • Introduction (adverse) or removal (beneficial) of severance with adequate accessibility provision **Walkers, cyclists, horse riders:** >50m - 250m increase (adverse) or decrease (beneficial) in walking/cycling/horse rider journey length.

Magnitude	Typical descriptors
Negligible	**Private property and housing, community land and assets, development land and businesses, and agricultural land holdings:** • Very minor loss or detrimental alteration to one or more characteristics, features or elements. e.g. acquisition of non-operational land or buildings not directly affecting the viability of property, businesses, community assets or agricultural holdings • Very minor introduction (adverse) or removal (beneficial) of severance with ample accessibility provision **Walkers, cyclists, horse riders:** <50m increase (adverse) or decrease (beneficial) in walking/cycling/horse rider journey length.
No change	No loss or alteration of characteristics, features, elements or accessibility; no observable impact in either direction.
Road drainage and the water environment (based on DMRB LA 113)	
Major adverse	**Flood risk:** Increase in peak flood level (1% annual probability event) >100mm. **Fluvial geomorphology**: Loss or extensive damage to habitat due to extensive modification of natural channel planform, and/or sediment and flow processes. Replacement of a large extent of the natural bed and/or banks with artificial material. **Surface water and groundwater quality**: Loss of special characteristics of a water resource. Change in pollution/treatment of potable source. Any pollution inside SPZ1 or a groundwater protection zone of special interest. Failure of both soluble and sediment bound pollutants in HEWRAT (Method A, Annex 1) and compliance failure with environmental quality standard (EQS) values (Method B). Calculated risk of pollution from a spillage >2% annually (Method D). Potential high risk of pollution to groundwater from routine runoff with a risk score >250 (Method C, Annex 1). **Groundwater:** Loss of, or extensive change to, an aquifer. Loss of regionally important water supply. Loss of, or extensive change to GWDTE or baseflow contribution to protected surface water bodies. Reduction in water body WFD classification. Loss or significant damage to major structures through subsidence or similar effects.

Magnitude	Typical descriptors
Moderate adverse	**Flood risk:** Increase in peak flood level (1% annual probability event) >50mm. **Fluvial geomorphology**: Moderate deterioration from baseline conditions, with partial loss or damage to habitat due to modifications and/or changes to natural fluvial forms and processes. Replacement of the natural bed and/or banks with artificial material. **Surface water and groundwater quality**: Partial loss or change to an aquifer/groundwater supported designated wetlands. Pollution of a receiving water body, but insufficient to change the environmental status/classification, including water quality classification. Failure of both soluble and sediment bound pollutants in HEWRAT (Method A, Annex 1) but compliance with EQS values (Method B). Calculated risk of pollution from a spillage 1-2% annually (Method D). Potential medium risk of pollution to groundwater from routine runoff with a risk score 150-250 (Method C, Annex 1). **Groundwater:** Partial loss or change to an aquifer. Degradation of regionally important public water supply or loss of significant commercial/ industrial/ agricultural supplies. Partial loss of the integrity of GWDTE. Contribution to reduction in water body WFD classification. Damage to major structures through subsidence or similar effects or loss of minor structures.
Minor adverse	**Flood risk**: Increase in peak flood level (1% annual probability event) >10mm. **Fluvial geomorphology**: Slight deterioration from baseline conditions, with partial loss/damage to habitat due to modifications and/or changes to natural fluvial forms and processes. **Surface water and groundwater quality**: Potential low risk of some pollution to a water body, insufficient to cause loss in quality, fishery productivity or biodiversity. Failure of either soluble or sediment bound pollutants in HEWRAT (Method A, Annex 1). Calculated risk of pollution from a spillage 0.5-1% annually (Method D). Potential low risk of pollution to groundwater from routine runoff with a risk score <150 (Method C, Annex 1). **Groundwater:** Minor effects on an aquifer, GWDTEs, abstractions and structures.
Negligible	The project may adversely affect the integrity of the water environment, although this is not considered measurable. **Flood risk:** Negligible change to peak flood level (1% annual probability event) ≤ ± 10mm. **Fluvial geomorphology:** Very slight change from surface water baseline conditions, approximating to a ‘no change’ situation. **Surface water and groundwater quality:** No risk identified in HEWRAT. Calculated risk of pollution from a spillage >0.5% annually (Method D). No measurable impact on an aquifer. **Groundwater:** No measurable impact upon an aquifer and/or groundwater receptors.

Magnitude	Typical descriptors
Minor beneficial	**Flood risk:** Creation of flood storage and decrease in peak flood level (1% annual probability event) >10mm. **Fluvial geomorphology**: Slight improvement of baseline conditions through partial improvement/gain in riparian or in-channel habitat. Slight diversification of flow processes and/or sediment processes. **Surface water and groundwater quality**: Potential for slight reduction in pollution to a water body, but insufficient to cause noticeable benefit in quality, fishery productivity or biodiversity. HEWRAT assessment of either soluble or sediment-bound pollutants becomes a 'pass' from an existing baseline of a 'fail' condition. Calculated reduction in existing spillage risk by 50% or more (when existing spillage is <1% annually). **Groundwater:** Reduction of groundwater hazards to existing structures. Reductions in waterlogging and groundwater flooding.
Moderate beneficial	**Flood risk:** Creation of flood storage and decrease in peak flood level (1% annual probability event) >50mm. **Fluvial geomorphology**: Moderate improvement from baseline conditions, with partial creation of both in-channel and riparian habitat. Removal of existing superfluous structure or artificial channel bed/bank. Moderate diversification of flow processes and/or sediment processes. **Surface water and groundwater quality**: Partial improvement or change to an aquifer/groundwater supported designated wetlands. Reduced pollution of a receiving water body, but insufficient to change the environmental status/classification, including water quality classification. HEWRAT assessment of both soluble and sediment-bound pollutants becomes a 'pass' from an existing baseline of a 'fail' condition. Calculated reduction in existing spillage risk by 50% or more (when existing spillage is >1% annually). **Groundwater:** Contribution to improvement in water body WFD classification. Improvement in water body catchment abstraction management Strategy (or equivalent) classification. Support to significant improvements in damaged GWDTE.
Major beneficial	**Flood risk:** Creation of flood storage and decrease in peak flood level (1% annual probability event) >100mm. **Fluvial geomorphology**: Extensive enhancement in-channel habitat and/or riparian habitat, as well as diversification of flow and sediment processes. Removal of an existing superfluous structure or artificial channel bed/bank. Extensive diversification of flow processes and/or sediment processes. **Surface water and groundwater quality**: Improvements or extensive change to, an aquifer/groundwater supported designated wetlands. Removal of existing polluting discharge or removing the likelihood of polluting discharges occurring to a water body. **Groundwater:** Recharge of an aquifer. Improvement in water body WFD classification.
Climate change (based on DMRB LA 114)	
Notes	The assessment criteria below relate to the project's vulnerability to climate change. The assessment of significance is a function of the likelihood of a climate event occurring, and the consequence if an event occurred. The below criteria therefore relate to consequence, rather than magnitude of impact.

Magnitude	Typical descriptors
Very large adverse	National level (or greater) disruption to strategic route(s) lasting more than 1 week.
Large adverse	National level disruption to strategic route(s) lasting more than 1 day but less than 1 week or regional level disruption to strategic route(s) lasting more than 1 week.
Moderate adverse	Regional level disruption to strategic route(s) lasting more than 1 day but less than 1 week.
Minor adverse	Regional level disruption to strategic route(s) lasting less than 1 day.
Negligible adverse	Disruption to an isolated section of a strategic route lasting less than 1 day.

Appendix D. Major accidents and disasters

D.1 Introduction

D.1.1 A disaster is defined as a sudden, catastrophic event that can result in serious damage to human welfare or the environment. A disaster can result in major disruption to society or communities and can result in economic and environmental losses. Disasters can be caused by both natural processes, and by human actions.

D.1.2 The EIA Regulations require that risks due to accidents and disasters are considered within the EIA. This appendix provides a risk assessment of the major accidents and disasters that could affect the Proposed Scheme, and where these are being reported and mitigated within the environmental assessment.

D.2 Methodology

D.2.1 A screening matrix (table D.1) has been completed detailing a long list of major accidents and disasters that could reasonably occur. This long list has been compiled using information from the International Federation of Red Cross and Red Crescent Societies website[7] and National Risk Register (NRR) of Civil Emergencies[8].

D.2.2 The screening matrix takes into consideration the Proposed Scheme's location and intended land-use to determine if it is at risk from a major accident or disaster. For example, as the scheme is located near waterbodies, the location presents a potential risk from major flooding. Likewise, as the scheme would be used as a transport route, the risk of a major transport accident exists. Where potential risks were identified, these were taken forward for further consideration.

D.2.3 Accidents and disasters requiring further consideration were subject to a more detailed risk assessment (table D.2). This looked at the probability of an event occurring, and the consequence / effect if an event did occur. Probabilities of event occurrence were obtained from the NRR, with consideration to the local context of the Proposed Scheme and future climate change (see chapter 15 of the Environmental Scoping Report). These factors were used to determine if an event presented a significant risk and how this is considered in the environmental assessment. In this instance a significant risk is one with the potential to cause loss of life or long lasting / permanent environmental damage and would require a response beyond existing response measures in place.

D.3 Screening and scoping

D.3.1 The risk assessment (table D.2) has been used to screen and scope potential environmental impacts from major accidents and disasters.

[7] International Federation of Red Cross and Red Crescent Societies. http://www.ifrc.org/en/what-we-do/disaster-management/about-disasters/definition-of-hazard/. Accessed July 2020

[8] Cabinet Office. (2017). National Risk Register of Civil Emergencies 2017 Edition

D.3.2 This shows how risks are being managed through the scheme design or reported and mitigated within other areas of the environmental assessment (e.g. climate change adaptation). Major accidents and disasters will therefore not be scoped into the environmental assessment as an EIA aspect chapter but will be reported on within relevant aspects. The scheme design will consider the potential effects associated with accidents and disasters, with mitigation embedded into the design where required.

Table D.1: Major accidents and disasters screening matrix

Accident / disaster	Location risk	Land-use risk	Further consideration required
Biological hazards: epidemics	×	×	×
Biological hazards: animal and insect infestation	×	×	×
Earthquakes	×	×	×
Mass movements / ground hazards	✓	×	✓
Tsunamis	×	×	×
Volcanic eruptions	×	×	×
Drought	×	×	×
Heatwaves	✓	×	✓
Wildfires	×	×	×
Inland floods	✓	×	✓
Coastal floods	×	×	×
Tropical storms	×	×	×
Storms and gales	✓	×	✓
Industrial accidents	×	×	×
Transport accidents	✓	✓	✓
Famine	×	×	×
Displaced populations	×	×	×
Terrorist attacks	×	×	×
Cyber attacks	×	×	×
Public disorder	×	×	×
Critical infrastructure failure	×	✓	✓
Heavy snowfall / low temperatures	✓	×	✓
Armed conflict / complex emergency	×	×	×

Table D.2: Major accidents and disasters risk assessment (orange - risks considered within the scheme design; green - risks that are not considered further)

Event	Likelihood	Consequence	Further considerations
Mass movements / ground hazards	A Preliminary Sources Study Report (PSSR) has been produced for the Proposed Scheme. This contains a risk assessment which has identified several ground hazards which are 'probable' or 'likely' to occur, including collapsible and compressible ground.	Subsidence and other ground hazards can occur rapidly with little warning. They can cause damage to infrastructure, disruption to the traffic network, and casualties/fatalities. Depending on the nature of the incident, environmental damage can occur through release of contaminants and opening source-pathway-receptor linkages.	Geophysical hazards are being considered in the scheme design. The PSSR summarises the potential hazards and risks associated with the ground conditions that need to be factored into the design process and assessed going forward. Ground investigations are ongoing. The findings of the investigations, along with the associated design requirements and risk mitigation, will be documented in a Ground Investigation Report.
Heatwaves	The NRR probability of a heatwave occurring in the next five years is between 1 in 20 and 1 in 2. Summer temperatures are predicted to increase in the UK due to climate change, potentially increasing the likelihood of this event occurring.	Hot weather increases the risk of tarmac melting and technology overheating. This could result in unsafe driving conditions, potentially leading to accidents. Hot temperatures could also result in increased driver stress, increasing the likelihood of an accident occurring. Environmental damage could occur if a crash resulted in discharge of contaminants (e.g. if an oil tanker crashed).	The UK Met Office has a system in place for providing warnings of extreme weather, which reduces the risk of drivers driving in extreme weather. There is a minor risk of high temperatures damaging the road surface and technology, however, the likelihood of this resulting in a catastrophic event is considered unlikely. Heatwaves will therefore not be considered further.
Storms and gales	The NRR probability of a storm/gale occurring in the next five years is between 1 in 20 and 1 in 2. It is uncertain if wind speeds are likely to increase or decrease in the east of England due to climate change.	High wind speeds can fell trees and man-made structures. This can result in property damage, disruption to the transport network, disruption to critical infrastructure, and casualties/fatalities. Large scale events have the potential to impact at a regional or even national scale.	High wind speeds have caused historic disruption to transport networks in the east of England, and there is potential for future events to impact the A12. The Proposed Scheme will be designed in accordance with best practice (BS EN 1991-1-4:2005 – Actions on Structures (covering wind) and the associated UK National Annex), and no further measures taken. Therefore, no additional consideration is needed.

Event	Likelihood	Consequence	Further considerations
Inland floods	The NRR probability of inland flooding occurring in the next five years is between 1 in 200 and 1 in 20. Locally, the Proposed Scheme is located in areas of flood zone 3 (1 in 100-year event). Winters are predicted to get wetter in the UK due to climate change, potentially increasing the likelihood of this event occurring.	Large scale flooding events can result in damage to property, disruption of the transport network, casualties and fatalities. There can also be impacts on local communities if they are not equipped to deal with a large-scale event in their area. Depending on the nature of the event, environmental damage can occur through release of contaminants and opening source-pathway-receptor linkages. The magnitude and severity of an event could increase due to future climate change and land use change (e.g. development within floodplain).	The Proposed Scheme would involve development in floodplain. There are also areas at high risk from surface water flooding. The scheme is therefore at risk from a flood event and potentially increases the risk of flooding elsewhere. This problem is likely to be exacerbated by future climate change. As such this event is being considered in the scheme design, along with other climate change adaptation measures. The flood risk assessment will also consider future risk due to climate change and propose mitigation measures as required.
Transport accidents	The NRR probability of a major transport accident occurring in the next five years is between 1 in 2000 and 1 in 200. This probability could increase (e.g. due to future stress on the network) or decrease (e.g. through advances in technology) beyond five years.	Major accidents can result in fatalities, casualties, and damage to infrastructure, causing disruption to the network. There can also be impacts on local communities if they are not equipped to deal with a large-scale event in their area. Environmental damage could occur if a crash resulted in discharge of contaminants (e.g. if an oil tanker crashed).	Although accidents are likely to take place on the A12, these are not likely to occur at a scale that would be considered a national or regional disaster. The Proposed Scheme is also being designed to increase capacity and improve safety, which should reduce the probability of an incident occurring. Traffic accidents would be managed through existing emergency service procedures and would unlikely need a coordinated government response. Traffic accidents will therefore not be considered further.
Critical infrastructure failure	The NRR probability of a widespread electricity failure occurring in the next five years is between 1 in 200 and 1 in 20. Excluding a recent event in August 2019, this has never occurred in the UK before; however, the risk could increase due to the increased risk of severe weather.	The A12 is a strategic route that relies on powered technology, such as variable message signs and traffic signals, to allow safe operation of the road. A critical electricity failure could disrupt this technology, resulting in potential casualties / fatalities due to road accidents.	The Department for Business, Energy & Industrial Strategy works closely with industry and government to provide contingency planning in the event of a widespread electricity shutdown occurring. Existing measures are in place to manage this event, and it is therefore not considered further.

Event	Likelihood	Consequence	Further considerations
Heavy snowfall / low temperatures	The NRR probability of heavy snow fall occurring in the next five years is between 1 in 20 and 1 in 2. Winters are predicted to get milder in the UK due to climate change, potentially reducing the likelihood of this event occurring.	Heavy snowfall can result in serious disruption to the transport network, resulting in road closures and increasing the hazard of vehicle accidents. This has the potential to result in casualties and fatalities. Environmental damage could occur if a crash resulted in discharge of contaminants (e.g. if an oil tanker crashed).	The UK Met Office has a system in place for providing warnings of extreme weather. Highways England and local authorities operate gritting lorries and manage operations for removing snow. These existing mitigation measures reduce the risk of accidents occurring. Although a residual risk remains for an accident to occur, the chance of one resulting in catastrophic damage to human health or the environment is considered unlikely. As such snow storms will not be considered further.

Appendix E. Transboundary effects screening matrix

Criteria and relevant considerations	Result of screening considerations
Characteristics of the development: Size of the development Use of natural resources Production of waste Pollution and nuisances Risk of accidents Use of technologies	The development is linear in nature and runs south-west north-east between Chelmsford and Marks Tey for a distance of approximately 24km. It is fully contained within the UK, in the county of Essex. Some of the resources required for the construction of the scheme are likely to be obtained from the global market, e.g. steel, but it is envisaged that materials would be obtained locally wherever possible. No waste, nuisances or accidents are likely that would extend beyond the border of the UK. No novel technologies are proposed that have potential for transboundary effects.
Location of development and geographical area: What is the existing use? What is the distance to another European Economic Area (EEA) state? (Name EEA state) What is the extent of the area of a likely impact under the jurisdiction of another EEA state?	The existing land use is highway for part of the scheme and open land (mainly arable/agricultural) for other parts of the Scheme. It is approximately 122km from France. No physical works or impacts are likely to extend beyond the jurisdiction of the UK.
Environmental importance: Are particular environmental values (e.g. protected areas – name them) likely to be affected? Capacity of the natural environment. Wetlands, coastal zones, mountain and forest areas, nature reserves and parks, Natura 2000 sites, areas where environmental quality standards already exceeded, densely populated areas, landscapes of historical, cultural or archaeological significance.	There are no European sites designated under the Habitats Directive within 2km of the Proposed Scheme, or sites designated for bats within 30km. There are nine European sites within 20km of the scheme designated for their breeding bird populations, or with a hydrological connection to the scheme. An HRA screening exercise has determined that the Proposed Scheme is not likely to significantly affect any European site. The Proposed Scheme is likely to result in localised impacts to landscape, heritage, soils, biodiversity, communities, and the water environment. These impacts would be mitigated to reduce the significance of any effect. These impacts would not result in impacts to any other EEA state.
Potential impacts and carrier: By what means could impacts be spread (i.e. what pathways)?	The pathways by which impacts could be spread are via air and water. However, these pathways are over extended distances.
Extent: What is the likely extent of the impact (geographical area and size of the affected population)?	No significant effects are anticipated that could impact on another EEA member state.
Magnitude: What will the likely magnitude of the change in relevant variables relative to the status quo, taking into account the sensitivity of the variable?	None of the anticipated effects from the Proposed Scheme are likely to occur at a magnitude that would impact another EEA state.

Criteria and relevant considerations	Result of screening considerations
Probability: What is the degree of probability of the impact? Is the impact likely to occur as a consequence of normal conditions or exceptional situations, such as accidents?	The probability of the Proposed Scheme impacting another EEA state is considered very unlikely during both normal and abnormal operating conditions.
Duration: Is the impact likely to be temporary, short-term or long-term? Is the impact likely to relate to the construction, operation or decommissioning phase of the activity?	The impact is likely to be long-term, relating to both construction and operation.
Frequency: What is likely to be the temporal pattern of the impact?	The temporal pattern is likely to be relatively constant.
Reversibility: Is the impact likely to be reversible or irreversible?	Reversibility varies depending on the impact. In general, the impacts are considered irreversible over the Proposed Scheme's lifetime.
Cumulative impacts: Are other major developments close by?	There are a number of other developments along the Proposed Scheme route, including proposed housing and mixed-use developments such as the large development north of Chelmsford. The traffic model developed to assess impacts for the Proposed Scheme includes assumptions on traffic generation from proposed development in the area. The potential cumulative effect upon transport emissions from the Proposed Scheme and proposed development will therefore be accounted for in the Scheme EIA. However, it is not anticipated that there is potential for cumulative transboundary effects from these developments.

Appendix F. Cultural heritage gazetteer

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
1	Extending north east from Chelmsford	Road Transport Site	N/A	MEX42332	Roman	Non-Designated	Low
2	Springfied-White Hart Lane	MON	N/A	MEX19743	Uncertain	Non-Designated	Negligible
3	Dairy Farm Cottages	Dwelling	1237310	N/A	Post-medieval	Grade II Listed Building	High
4	Cottages at Dairy Farm	Dwelling	1264166	N/A	Medieval	Grade II Listed Building	High
5	New or Little Park, New Hall, Boreham	Land Use Site	N/A	MEX1040105	Medieval	Non-Designated	Low
6	Greater Beaulieu Park	MON	N/A	MEX1040591	Prehistoric	Non-Designated	Negligible
7	New Hall, Boreham	Designed Landscape	1000207	N/A	Post-medieval	Grade II Registered Park and Garden	Medium
8	Springfield Lyons	Dwelling	1237394	N/A	Post-medieval	Grade II Listed Building	High
9	White Hart Cottage, Springfield	Dwelling	1236565	N/A	Post-medieval	Grade II Listed Building	High
10	New Hall	Dwelling	1338404	N/A	Medieval	Grade I Listed Building	High
11	Land East of White Hart Lane, Springfield: Balancing Pond Area	Findspot	N/A	MEX1033500	Uncertain	Non-Designated	Negligible
12	Cuton Hall	Dwelling	1264542	N/A	Post-medieval	Grade II Listed Building	High
13	Pease Hall	Dwelling	1236536	N/A	Medieval	Grade II Listed Building	High

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
14	Winsford Hill	MON	N/A	MEX19542	Prehistoric	Non-Designated	Low
15	Laburnham Cottage	Dwelling	1264529	N/A	Post-medieval	Grade II Listed Building	High
16	Brook House	Dwelling	1236534	N/A	Post-medieval	Grade II Listed Building	High
17	North eastern chelmsford	MON	N/A	MEX19678	Uncertain	Non-Designated	Low
18	East of Pease Hall Farm	MON	N/A	MEX19466	Prehistoric	Non-Designated	Low
19	IND 1 (Springfield), Chelmsford	MON; Findspot	N/A	MEX1033306; MEX1033307; MEX1033308	Uncertain	Non-Designated	Negligible
20	Sandford Bridge, Chelmer and Blackwater Navigation	Water Transport Site	1264022	N/A	Post-medieval	Grade II Listed Building	High
21	Barn at Bulls Lodge	Dwelling	1169571	N/A	Post-medieval	Grade II Listed Building	High
22	Pillbox (destroyed), Brook End Road	Defensive Site	N/A	MEX31636	Modern	Non-Designated	Negligible
23	IND 1 (Springfield), Chelmsford - Phase 2	MON	N/A	MEX1033497	Modern	Non-Designated	Negligible
24	Bulls Lodge	Dwelling	1122224	N/A	Post-medieval	Grade II Listed Building	High
25	Sheepcotes Cottages	Dwelling	1263955	N/A	Medieval	Grade II Listed Building	High
26	East of Brookend	MON	N/A	MEX28686	Uncertain	Non-Designated	Negligible
27	Chelmer Village East (off Chelmer Village Way)	MON	N/A	MEX42263; MEX42267	Prehistoric	Non-Designated	Low
28	North east Chelmsford	MON	N/A	MEX28693	Uncertain	Non-Designated	Low

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
29	Boreham A12 Interchange, Archaeological Remains	Cropmark	N/A	MEX31269; MEX31276; MEX31285; MEX31286; MEX39725	Prehistoric	Non-Designated	Negligible
30	A portable Antiquities Scheme findspot of Roman to Early Medieval date 1	Findspot	N/A	MEX1041998	Roman	Non-Designated	Negligible
31	A portable Antiquities Scheme findspot of Roman to Early Medieval date 2	Findspot	N/A	MEX1047516	Roman	Non-Designated	Negligible
32	Cropmarks SW of Genfield	MON	N/A	MEX28484	Prehistoric	Non-Designated	Low
33	Mount Maskells	Dwelling	1338402	N/A	Post-medieval	Grade II Listed Building	High
34	Brookend Sewage Works	Industrial Site	N/A	MEX1031852	Post-medieval	Non-Designated	Low
35	Sandford Lock, Including Lock Gates, Chelmer and Blackwater Navigation	Water Transport Site	1237589	N/A	Post-medieval	Grade II Listed Building	High
36	Brook End Bridge, Chelmer and Blackwater Navigation	Water Transport Site	1264059	N/A	Post-medieval	Grade II Listed Building	High
37	Chelmsford North east industrial estate	Findspot	N/A	MEX18938	Uncertain	Non-Designated	Negligible
38	Pillbox (destroyed), under A12, E of Chelmer Village	Defensive Site	N/A	MEX31634	Modern	Non-Designated	Negligible
39	Pillbox (destroyed), under A12 E of Chelmer Village	Defensive Site	N/A	MEX31637	Modern	Non-Designated	Negligible
40	Water feeder ditch, Chelmer and Blackwater Navigation	Water Transport Site	N/A	MEX1033440	Post-medieval	Non-Designated	Negligible

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
41	Pillbox (destroyed) under A12, E of Chelmer Village	Defensive Site	N/A	MEX31639	Modern	Non-Designated	Negligible
42	Water feeder, Chelmer and Blackwater Navigation 1	Water Transport Site	N/A	MEX1033439	Post-medieval	Non-Designated	Negligible
43	Water feeder, Chelmer and Blackwater Navigation 2	Water Transport Site	N/A	MEX1033617	Post-medieval	Non-Designated	Negligible
44	Pillbox E of Sewage Works	Defensive Site	N/A	MEX31650	Modern	Non-Designated	Low
45	Red Deer Park, New Hall, Boreham	Land Use Site	N/A	MEX1040104	Medieval	Non-Designated	Negligible
46	Prepared Rifle Emplacement	Defensive Site	N/A	MEX31641	Modern	Non-Designated	Negligible
47	Post, Chelmer and Blackwater Navigation 1	MON	N/A	MEX1033630	Post-medieval	Non-Designated	Low
48	Post, Chelmer and Blackwater Navigation 2	MON	N/A	MEX1033442	Post-medieval	Non-Designated	Low
49	Pillbox (destroyed), under A12, E of Sewage Farm	Defensive Site	N/A	MEX31643	Modern	Non-Designated	Negligible
50	Barn about 850 metres east north-east of New Hall	Agricultural Building	1263960	N/A	Medieval	Grade II Listed Building	High
51	Cuton Lock, Including Lock Gates and three Bollards to each tow path, Chelmer and Blackwater Navigation	Water Transport Site	1237556	N/A	Post-medieval	Grade II Listed Building	High
52	Cuton Weir	Water Management Site	N/A	MEX1033437	Uncertain	Non-Designated	Low
53	Pillbox on Chelmer Island	Defensive Site	N/A	MEX31638	Modern	Non-Designated	Low
54	South of Bulls Lodge	MON	N/A	MEX20596	Uncertain	Non-Designated	Negligible
55	Bulls Lodge Farm Dam	Earthworks	N/A	MEX37215	Medieval	Non-Designated	Low

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
56	Water feeder down stream from Cuton Weir	Water Transport Site	N/A	MEX1033438	Post-medieval	Non-Designated	Negligible
57	Generals	Dwelling	1306446	N/A	Post-medieval	Grade II Listed Building	High
58	Hammonds Farm, Cropmark 1	MON	N/A	MEX19671	Prehistoric	Non-Designated	Low
59	Field barns (site of), Chelmer and Blackwater Navigation	Agricultural Building	N/A	MEX1033636	Post-medieval	Non-Designated	Negligible
60	River meander, Chelmer and Blackwater Navigation	Area of Potential	N/A	MEX1033435	Uncertain	Non-Designated	Low
61	Water channel, Chelmer and Blackwater Navigation	Water Transport Site	N/A	MEX1033432	Post-medieval	Non-Designated	Low
62	Boreham-Old A12	Road Transport Site	N/A	MEX19764	Uncertain	Non-Designated	Low
63	Footbridge, Chelmer and Blackwater Navigation	Water Transport Site	N/A	MEX1033433	Uncertain	Non-Designated	Low
64	Post, Chelmer and Blackwater Navigation 3	MON	N/A	MEX1033639	Post-medieval	Non-Designated	Low
65	Boreham Hall Cropmarks	Cropmark	N/A	MEX19562	Prehistoric	Non-Designated	Low
66	Bulls Lodge Farm Cropmarks	MON	N/A	MEX1035946	Prehistoric	Non-Designated	Low
67	Boreham House, Landscape Park	Designed Landscape	1000354	MEX27476	Post-medieval	Grade II Registered Park and Garden	Medium
68	Chelmer And Blackwater Navigation (chelmsford)	Conservation Area	N/A	DEX22922	Post-medieval	Conservation Area	Medium
69	Boreham House	Dwelling	1338403	N/A	Post-medieval	Grade I Listed Building	High
70	Hammonds Farm, Cropmark 2	MON	N/A	MEX19494	Prehistoric	Non-Designated	Medium

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
71	West of Danbury (same as site 5769 on TL70NE)	Cropmark	N/A	MEX19510	Prehistoric	Non-Designated	Medium
72	Lionfield Cottages	MON	N/A	MEX1031236	Uncertain	Non-Designated	Negligible
73	Site of Boreham Windmill	Industrial Building	N/A	MEX1040404	Post-medieval	Non-Designated	Negligible
74	Site of Buckshorn house near Boreham House	Dwelling	N/A	MEX1034910	Uncertain	Non-Designated	Negligible
75	Boreham to Springfield Link Main	Industrial Site	N/A	MEX1040590	Uncertain	Non-Designated	Negligible
76	North of Boreham, Findspot of Bronze Age spearhead	Findspot	N/A	MEX37198	Prehistoric	Non-Designated	Negligible
77	Hammonds Farmhouse	Dwelling	1122074	N/A	Post-medieval	Grade II Listed Building	High
78	Stonhams Lock, Including Lock Gates and Bollards, Chelmer and Blackwater Navigation	Water Transport Site	1264058	N/A	Post-medieval	Grade II Listed Building	High
79	The Wine Barrel	Commerical Building	1237333	N/A	Post-medieval	Grade II Listed Building	High
80	South West of Boreham	MON	N/A	MEX19774	Prehistoric	Non-Designated	Low
81	North of Boreham, Rectilinear Enclosure	MON	N/A	MEX31088	Prehistoric	Non-Designated	Medium
82	Caynton	Dwelling	1122219	N/A	Post-medieval	Grade II Listed Building	High
83	Land rear of 8-10 Oak Cottages, Elm Way, Boreham	MON	N/A	MEX1042076	Uncertain	Non-Designated	Negligible

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
84	Buxted Chicken Factory, Boreham	Findspot	N/A	MEX31378; MEX39737; MEX39738; MEX39739	Prehistoric	Non-Designated	Negligible
85	Water feeder, Chelmer and Blackwater Navigation 3	Water Transport Site	N/A	MEX1033695	Post-medieval	Non-Designated	Negligible
86	Boreham Lodge	Dwelling	1122216	N/A	Post-medieval	Grade II Listed Building	High
87	The Old Vicarage	Dwelling	1122217	N/A	Post-medieval	Grade II Listed Building	High
88	The Old Rectory	Dwelling	1338401	N/A	Medieval	Grade II* Listed Building	High
89	Church of St Andrew	Place of Worship	1122215	N/A	Early Medieval	Grade I Listed Building	High
90	Coppers and Ebenezer Cottage	Dwelling	1122222	N/A	Post-medieval	Grade II Listed Building	High
91	Boreham: Church Road	Conservation Area	N/A	DEX22923	Post-medieval	Conservation Area	Medium
92	Former Hamilton Motors site, Main Road, Boreham	Findspot	N/A	MEX1038579	Modern	Non-Designated	Negligible
93	Babylon	Dwelling	1122221	N/A	Medieval	Grade II Listed Building	High
94	1 and 2, McMillan's Cottages	Dwelling	1122218	N/A	Post-medieval	Grade II Listed Building	High
95	West of depot	MON	N/A	MEX28670	Uncertain	Non-Designated	Negligible
96	Boreham Manor North and Boreham Manor south	Dwelling	1122220	N/A	Post-medieval	Grade II Listed Building	High

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
97	Old Hall	Dwelling	1272405	N/A	Medieval	Grade II Listed Building	High
98	Clock House / Clock House Cottage	Dwelling	1169636	N/A	Post-medieval	Grade II Listed Building	High
99	Maltings / Maltings Cottages / St Andrews	Dwelling	1122226	N/A	Post-medieval	Grade II Listed Building	High
100	Barn north-east of Old Hall	Agricultural Building	1396464	N/A	Post-medieval	Grade II Listed Building	High
101	Boreham: Roman Road/plantation Road	Conservation Area	N/A	DEX22924	Post-medieval	Conservation Area	Medium
102	Six Bells Public House	Eating and Drinking Establishment	1122225	N/A	Post-medieval	Grade II Listed Building	High
103	Shottesbrook	Dwelling	1122223	N/A	Post-medieval	Grade II Listed Building	High
104	The Chestnuts	Dwelling	1264060	N/A	Post-medieval	Grade II Listed Building	High
105	Porters house and moated site (Site of)	Dwelling	N/A	MEX20635; MEX20639	Medieval	Non-Designated	Negligible
106	Land rear of Owls, Waltham Road, Boreham	MON	N/A	MEX1040778	Uncertain	Non-Designated	Negligible
107	Benning Hill	Cropmark	N/A	MEX28627	Prehistoric	Non-Designated	Low
108	GHQ Line Anti-Tank Ditch	Defensive Site	N/A	MEX28472	Modern	Non-Designated	Low
109	The Cock Inn	Eating and Drinking Establishment	1169602	N/A	Post-medieval	Grade II Listed Building	High
110	Hogwells Brickworks at Boreham	Industrial Building	N/A	MEX1037118	Post-medieval	Non-Designated	Negligible

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
111	London to Colchester Roman Road 1	Road Transport Site	N/A	MEX20478	Roman	Non-Designated	Low
112	London to Colchester Roman Road	Road Transport Site	N/A	MEX20478	Roman	Non-Designated	Low
113	West of Toppingshoe	MON	N/A	MEX20600	Uncertain	Non-Designated	Low
114	Garden Wall (part Incorporated In a garage) approximately 30 metres south-west of Toppinghoe Hall	Boundary	1308640	N/A	Post-medieval	Grade II Listed Building	High
115	part of former House and attached garden Wall Approximately 15 metres south of Toppinghoe Hall	Dwelling	1123440	N/A	Post-medieval	Grade II Listed Building	High
116	Damases Lane	MON	N/A	MEX28630	Uncertain	Non-Designated	Negligible
117	Toppinghoe Hall	Dwelling	1147178	MEX20422	Post-medieval	Grade II Listed Building	High
118	Milepost on B1137 (old A12) at Hatfield Peveral 1	Road Transport Site	N/A	MEX1032903	Post-medieval	Non-Designated	Low
119	Toppinghoe Cropmark	Cropmark	N/A	MEX28643	Uncertain	Non-Designated	Negligible
120	Terling Place	Designed Landscape	1000745	N/A	Post-medieval	Grade II Registered Park and Garden	Medium
121	Crix Farm	MON	N/A	MEX20775	Uncertain	Non-Designated	Negligible
122	North of Mowden	MON	N/A	MEX20681	Uncertain	Non-Designated	Medium
123	Berwick Farm	IND	N/A	MEX1035328	Uncertain	Non-Designated	Low
124	Berwick Farmhouse	Dwelling	1123441	N/A	Medieval	Grade II Listed Building	High

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
125	Hatfield Wick Farmhouse	Dwelling	1337812	N/A	Post-medieval	Grade II Listed Building	High
126	Barn approximately 10 metres north-east of Hatfield Wick Farmhouse	Agricultural Building	1147194	N/A	Medieval	Grade II Listed Building	High
127	Barn approximately 60 metres north north-east of Hatfield Wick Farmhouse	Agricultural Building	1277752	N/A	Post-medieval	Grade II Listed Building	High
128	Little Crix	Dwelling	1123429	N/A	Post-medieval	Grade II Listed Building	High
129	Crix House	Dwelling	1147072	N/A	Post-medieval	Grade II Listed Building	High
130	North of Brewhouse wood	MON	N/A	MEX28634	Uncertain	Non-Designated	Negligible
131	Entrance piers to The Priory, approx 90m N of St Andrews Church	Boundary	N/A	MEX1005193	Post-medieval	Non-Designated	Low
132	North of Hatfield Wick	Cropmark	N/A	MEX20707	Prehistoric	Non-Designated	Low
133	Church Field, Hatfield Peverel	Place of Worship	N/A	MEX20640	Uncertain	Non-Designated	Low
134	Church Hills, Deserted Settlement	Deserted Settlement; Findspot	N/A	MEX20586; MEX20590; MEX20591	Uncertain	Non-Designated	Low
135	Crix	Dwelling	N/A	MEX20567	Uncertain	Non-Designated	Low
136	Barn approximately 50 metres west south-west of Botters Farmhouse	Agricultural Building	1308681	N/A	Medieval	Grade II Listed Building	High
137	Barn approximately 40 metres north-east of Whitelands Farmhouse	Agricultural Building	1147205	N/A	Post-medieval	Grade II Listed Building	High

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
138	Crabbs Bridge	MON	N/A	MEX20709	Prehistoric	Non-Designated	Low
139	Hatfield Place	Dwelling	1337808	N/A	Post-medieval	Grade II* Listed Building	High
140	The Crown Public House	Eating and Drinking Establishment	1337810	N/A	Medieval	Grade II* Listed Building	High
141	12 and 14, The Street	Dwelling	1123435	N/A	Post-medieval	Grade II Listed Building	High
142	Wall approximately 12 metres north-west of Hill House	Boundary	1123439	N/A	Post-medieval	Grade II Listed Building	High
143	South of Hatfield Bury	MON	N/A	MEX20585	Uncertain	Non-Designated	Negligible
144	Hill House, Hatfield Peverell	Dwelling	1123438	N/A	Post-medieval	Grade II Listed Building	High
145	Stables approximately 10 metres to north-east of Hill House	Agricultural Building	1147153	N/A	Post-medieval	Grade II Listed Building	High
146	Post Office Stores	Commerical Building	1147129	N/A	Medieval	Grade II Listed Building	High
147	Vinehurst	Dwelling	1308627	N/A	Medieval	Grade II Listed Building	High
148	Fir Tree Cottages	Dwelling	1123436	N/A	Post-medieval	Grade II Listed Building	High
149	Barn approximately 40 metres west north-west of Termitts Farmhouse	Agricultural Building	1123404	N/A	Post-medieval	Grade II Listed Building	High
150	North of Hatfield Peverel, findspot of Palaeolitic and Neolithic axes	Findspot	N/A	MEX20120; MEX20123	Prehistoric	Non-Designated	Negligible

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
151	Termitts Farmhouse	Dwelling	1123403	N/A	Medieval	Grade II* Listed Building	High
152	Chelmer and Blackwater Navigation	Water Transport Site	N/A	MEX40599	Post-medieval	Non-Designated	Low
153	The Limes	Dwelling	1147133	N/A	Post-medieval	Grade II Listed Building	High
154	Peppercorn	Dwelling	1123437	N/A	Post-medieval	Grade II Listed Building	High
155	Shepherds Cottage	Dwelling	1123426	N/A	Post-medieval	Grade II Listed Building	High
156	The Bakery and Unnamed House adjoining to the east	Commerical Building	1147142	N/A	Post-medieval	Grade II Listed Building	High
157	Salvador, Hooks and Sheaves	Dwelling	1337811	N/A	Medieval	Grade II Listed Building	High
158	Milepost on B1137 (old A12) at Hatfield Peveral 2	Road Transport Site	N/A	MEX1032904	Post-medieval	Non-Designated	Low
159	Dancing Dicks Farmhouse	Dwelling	1308692	N/A	Medieval	Grade II Listed Building	High
160	White Hart Cottage, Hatfield Peverell	Dwelling	1123430	N/A	Medieval	Grade II Listed Building	High
161	East of Termitts Farm	Cropmark	N/A	MEX20677	Prehistoric	Non-Designated	Medium
162	Hatfield Priory Landscape Park	Designed Landscape	1000206	N/A	Post-medieval	Grade II Registered Park and Garden	High
163	Parish Church of St Andrew	Place of Worship	1308736	N/A	Medieval	Grade II* Listed Building	High
164	Wall north-east and south of the Vicarage	Boundary	1123427	N/A	Post-medieval	Grade II Listed Building	High

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
165	Hatfield Priory	Dwelling	1002150	N/A	Medieval	Scheduled Monument	High
166	Priory Lodge	Dwelling	1337807	N/A	Medieval	Grade II Listed Building	High
167	The Terrace, Hatfield Peverel	House	N/A	MEX1037939	Post-medieval	Non-Designated	Negligible
168	Lovibond Cottages	Dwelling	1147097	N/A	Post-medieval	Grade II Listed Building	High
169	Ann Cottage and Grange Cottage	Dwelling	1123428	N/A	Post-medieval	Grade II Listed Building	High
170	Brewery House	Dwelling	1308698	N/A	Post-medieval	Grade II Listed Building	High
171	Thatched Cottage, Hatfield Peverell	Dwelling	1337834	N/A	Post-medieval	Grade II Listed Building	High
172	Cold War Nuclear Monitoring Post, Hatfield Peverel	Defensive Site	N/A	MEX1039371	Modern	Non-Designated	Low
173	Cropmarks N of Wood End Farm	Cropmark	N/A	MEX28413	Uncertain	Non-Designated	Negligible
174	North of Sandfords Farm	MON	N/A	MEX27194	Prehistoric	Non-Designated	Low
175	Witham Lodge	MON	N/A	MEX38601		Non-Designated	Negligible
176	Land at Lodge Farm, Hatfield Road, Witham	MON	N/A	MEX1049300	Prehistoric	Non-Designated	Low
177	Sandford Quarry	MON	N/A	MEX40247	Uncertain	Non-Designated	Low
178	Witham - fieldwalking at Maltings Lane (WHML95) 1	Findspot	N/A	MEX41402	Prehistoric	Non-Designated	Negligible
179	Witham - fieldwalking at Maltings Lane (WHML95) 2	MON	N/A	MEX41403; MEX41404	Prehistoric	Non-Designated	Low

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
180	Barn of Knowles Farm	Agricultural Building	1123425	N/A	Post-medieval	Grade II Listed Building	High
181	Sandfords Farm	Findspot	N/A	MEX26854	Uncertain	Non-Designated	Negligible
182	Cropmark NE of Knowle's Farm	Cropmark	N/A	MEX28421	Uncertain	Non-Designated	Negligible
183	Ivy Chimneys	Dwelling	1122615	N/A	Post-medieval	Grade II Listed Building	High
184	Proposed Primary School, Holst Avenue, Witham	Feature	N/A	MEX1039686	Prehistoric	Non-Designated	Low
185	Proposed Primary School Holst Avenue post medieval features	Boundary	N/A	MEX1039687	Medieval	Non-Designated	Negligible
186	Knowies Farm	MON	N/A	MEX27008	Prehistoric	Non-Designated	Medium
187	Maltings Lane, witham, Site Code WHML96	MON	N/A	MEX1033059	Uncertain	Non-Designated	Medium
188	Maltings Lane, Witham	MON	N/A	MEX1035718	Uncertain	Non-Designated	Negligible
189	South of Witham	MON	N/A	MEX27172	Uncertain	Non-Designated	Low
190	Malthouse (Warehouse)	Industrial Building	1169656	N/A	Post-medieval	Grade II Listed Building	High
191	Jacksons Farm	Agricultural Building	1235771	N/A	Medieval	Grade II Listed Building	High
192	Bridge Hospital	Public Building	1338198	N/A	Post-medieval	Grade II Listed Building	High
193	Witham - fieldwalking at Maltings Lane (WHML95) 3	MON	N/A	MEX41397	Prehistoric	Non-Designated	Negligible
194	Near Dengie Farm	MON	N/A	MEX27190	Uncertain	Non-Designated	Negligible

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
195	Witham (chipping Hill)	Conservation Area	N/A	DEX22912	Medieval	Conservation Area	Medium
196	Witham - fieldwalking at Maltings Lane (WHML95) 4	Findspot	N/A	MEX41400; MEX41401	Prehistoric	Non-Designated	Negligible
197	Bridge House, Witham	Dwelling	1338234	N/A	Post-medieval	Grade II Listed Building	High
198	20 and 22, Chippinghill	Dwelling	1338235	N/A	Post-medieval	Grade II Listed Building	High
199	28-40, Church Street	Dwelling	1306450	N/A	Post-medieval	Grade II Listed Building	High
200	42-48, Church Street	Dwelling	1122611	N/A	Post-medieval	Grade II Listed Building	High
201	Smithy	Industrial Building	1306501	N/A	Medieval	Grade II Listed Building	High
202	Barnardiston	Dwelling	1122607	N/A	Post-medieval	Grade II Listed Building	High
203	24 and 26, Church Street	Dwelling	1122610	N/A	Medieval	Grade II Listed Building	High
204	12, Bridge Street	Dwelling	1122603	N/A	Post-medieval	Grade II Listed Building	High
205	4 and 6, Church Street	Dwelling	1122609	N/A	Post-medieval	Grade II Listed Building	High
206	White Horse Public House	Eating and Drinking Establishment	1306449	N/A	Post-medieval	Grade II Listed Building	High
207	Croft House	Dwelling	1338233	N/A	Post-medieval	Grade II Listed Building	High
208	Pondhalton farm, enclosure and ponds	Agricultural Site	N/A	MEX38630	Medieval	Non-Designated	Medium

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
209	23-27, Bridge Street	Dwelling	1122602	N/A	Medieval	Grade II* Listed Building	High
210	Bramstons	Dwelling	1122605	N/A	Post-medieval	Grade II Listed Building	High
211	Recess	Dwelling	1169527	N/A	Post-medieval	Grade II Listed Building	High
212	Jarmyns	Dwelling	1338239	N/A	Medieval	Grade II Listed Building	High
213	149 and 151, Newland Street	Dwelling	1306352	N/A	Post-medieval	Grade II Listed Building	High
214	The Crotchet	Dwelling	1169712	N/A	Post-medieval	Grade II Listed Building	High
215	All Saints Church	Place of Worship	1122533	N/A	Post-medieval	Grade II Listed Building	High
216	126, Newland Street	Dwelling	1122585	N/A	Post-medieval	Grade II Listed Building	High
217	57-59, Collingwood Road	Dwelling	1385899	N/A	Post-medieval	Grade II Listed Building	High
218	Highway Cottage	Dwelling	1169709	N/A	Post-medieval	Grade II Listed Building	High
219	Warehouse occupied By Thomas Cullen and Sons 1	Industrial Building	1264904	N/A	Post-medieval	Grade II Listed Building	High
220	129, Newland Street	Dwelling	1338228	N/A	Post-medieval	Grade II* Listed Building	High
221	125 and 127, Newland Street	Dwelling	1306351	N/A	Post-medieval	Grade II Listed Building	High

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
222	Warehouse occupied By Thomas Cullen and Sons 2	Industrial Building	1169869	N/A	Post-medieval	Grade II Listed Building	High
223	3-17, Guithavon Street	Dwelling	1244823	N/A	Post-medieval	Grade II Listed Building	High
224	121 and 123, Newland Street	Dwelling	1122595	N/A	Post-medieval	Grade II Listed Building	High
225	100, Newland Street	Dwelling	1169707	N/A	Post-medieval	Grade II Listed Building	High
226	117 and 119, Newland Street	Dwelling	1306348	N/A	Post-medieval	Grade II* Listed Building	High
227	South of Olivers Farm	Cropmark	N/A	MEX27036	Prehistoric	Non-Designated	Medium
228	Olivers Farm	MON	N/A	MEX1031756	Uncertain	Non-Designated	Negligible
229	Witham United Reformed Church	Place of Worship	1122574	N/A	Post-medieval	Grade II Listed Building	High
230	92, Newland Street	Dwelling	1122584	N/A	Post-medieval	Grade II Listed Building	High
231	90, Newland Street	Dwelling	1306388	N/A	Post-medieval	Grade II Listed Building	High
232	Howbridge Hall	Dwelling	1306434	N/A	Post-medieval	Grade II Listed Building	High
233	86, Newland Street	Dwelling	1338224	N/A	Post-medieval	Grade II Listed Building	High
234	1, Guithavon Street	Dwelling	1306426	N/A	Post-medieval	Grade II Listed Building	High
235	74 and 76, Newland Street	Dwelling	1122583	N/A	Post-medieval	Grade II Listed Building	High

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
236	London House	Dwelling	1169703	N/A	Post-medieval	Grade II Listed Building	High
237	89 and 91, Newland Street	Dwelling	1338227	N/A	Post-medieval	Grade II Listed Building	High
238	72, Newland Street	Dwelling	1169700	N/A	Post-medieval	Grade II Listed Building	High
239	87, Newland Street	Dwelling	1169784	N/A	Post-medieval	Grade II Listed Building	High
240	85, Newland Street	Dwelling	1122594	N/A	Post-medieval	Grade II Listed Building	High
241	83, Newland Street	Dwelling	1169778	N/A	Post-medieval	Grade II Listed Building	High
242	No. 65 Newland Street	Dwelling	1122593	N/A	Post-medieval	Grade II Listed Building	High
243	68, Newland Street	Dwelling	1338255	N/A	Post-medieval	Grade II Listed Building	High
244	66, Newland Street	Dwelling	1122582	N/A	Post-medieval	Grade II Listed Building	High
245	No. 63 Newland Street	Dwelling	1169773	N/A	Medieval	Grade II Listed Building	High
246	61, Newland Street	Dwelling	1122592	N/A	Post-medieval	Grade II Listed Building	High
247	Cropmark SE of Oliver's Farm Nurseries	Cropmark	N/A	MEX28461	Uncertain	Non-Designated	Negligible
248	64, Newland Street	Dwelling	1338223	N/A	Post-medieval	Grade II Listed Building	High

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
249	62, Newland Street	Dwelling	1122581	N/A	Post-medieval	Grade II Listed Building	High
250	60, Newland Street	Dwelling	1338222	N/A	Post-medieval	Grade II Listed Building	High
251	Witham Town Centre (newland Street)	Conservation Area	N/A	DEX22897	Medieval	Conservation Area	Medium
252	Midland Bank	Commerical Building	1122591	N/A	Post-medieval	Grade II* Listed Building	High
253	56, 58a and 58, Newland Street	Dwelling	1122580	N/A	Post-medieval	Grade II Listed Building	High
254	53 and 55, Newland Street	Dwelling	1306377	N/A	Post-medieval	Grade II Listed Building	High
255	47, Newland Street	Dwelling	1306371	N/A	Post-medieval	Grade II Listed Building	High
256	Spread Eagle Hotel	Eating and Drinking Establishment	1122590	N/A	Post-medieval	Grade II* Listed Building	High
257	House at rear of White Hart Hotel / White Hart Hotel	Dwelling	1122589	N/A	Post-medieval	Grade II Listed Building	High
258	George Inn	Eating and Drinking Establishment	1122579	N/A	Post-medieval	Grade II Listed Building	High
259	Carters	Dwelling	1110983	N/A	Post-medieval	Grade II Listed Building	High
260	29-33, Newland Street	Dwelling	1306367	N/A	Post-medieval	Grade II Listed Building	High
261	9-13, Newland Street	Dwelling	1122588	N/A	Post-medieval	Grade II Listed Building	High

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
262	Red Lion Inn	Eating and Drinking Establishment	1306401	N/A	Medieval	Grade II Listed Building	High
263	Wickham Place Farmhouse	Dwelling	1110981	N/A	Post-medieval	Grade II Listed Building	High
264	Wall enclosing garden to rear (east) of Wickham Place Farmhouse	Boundary	1337377	N/A	Post-medieval	Grade II Listed Building	High
265	22-26, Newland Street	Dwelling	1338221	N/A	Post-medieval	Grade II Listed Building	High
266	Whitehall Cinema	Cinema	1122578	N/A	Post-medieval	Grade II Listed Building	High
267	High House	Dwelling	1122587	N/A	Post-medieval	Grade II* Listed Building	High
268	Nitrovit Limited	Industrial Building	1338218	N/A	Post-medieval	Grade II Listed Building	High
269	Near Maldon Road	Earthworks	N/A	MEX28817	Uncertain	Non-Designated	Low
270	27, Maldon Road	Dwelling	1122616	N/A	Post-medieval	Grade II Listed Building	High
271	Roslyn House	Dwelling	1338220	N/A	Post-medieval	Grade II* Listed Building	High
272	Avenue House / Newbury House	Dwelling	1122576	N/A	Medieval	Grade II* Listed Building	High
273	Freebournes House	Dwelling	1306394	N/A	Post-medieval	Grade II* Listed Building	High
274	Road Bridge	Road Transport Site	1111022	N/A	Post-medieval	Grade II Listed Building	High

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
275	6-12, Newland Street	Dwelling	1122577	N/A	Post-medieval	Grade II Listed Building	High
276	Coach House attached to north-east corner of garden Wall, Wickham Place Farm	Agricultural Building	1110982	N/A	Post-medieval	Grade II Listed Building	High
277	East of Olivers farm, cropmarks 1	Cropmark	N/A	MEX27025	Uncertain	Non-Designated	Negligible
278	River View, Witham	MON	N/A	MEX1040035	Uncertain	Non-Designated	Negligible
279	War Memorial, Witham	Commemorative Monument	1431201	N/A	Modern	Grade II Listed Building	High
280	Wall attached to rear right (south-east) of Wickham Place	Boundary	1110979	N/A	Post-medieval	Grade II Listed Building	High
281	Wickham Place	Dwelling	1337357	N/A	Post-medieval	Grade II* Listed Building	High
282	Mill Bridge and Sluice	Industrial Building	1308916	N/A	Post-medieval	Grade II Listed Building	High
283	Chase House, Wickham Bishops	Dwelling	1110980	N/A	Post-medieval	Grade II Listed Building	High
284	Rivenhall Old Rectory	Dwelling	1122557	N/A	Post-medieval	Grade II Listed Building	High
285	Hillside Cottage	Dwelling	1337378	N/A	Post-medieval	Grade II Listed Building	High
286	Wall to the former house the Grove (that part fronting onto Newland Street)	Boundary	1122586	N/A	Post-medieval	Grade II Listed Building	High
287	Mill Cottage	Dwelling	1337376	N/A	Post-medieval	Grade II Listed Building	High

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
288	Witham - Maldon Road	Findspot	N/A	MEX26432	Uncertain	Non-Designated	Negligible
289	Culvert on the Witham to Maldon dismantled railway line 6	Rail Transport Site	N/A	MEX1032303	Post-medieval	Non-Designated	Negligible
290	Wickham Bishops timber trestle railway viaduct	Rail Transport Site	1002126	N/A	Post-medieval	Scheduled Monument	High
291	East of Olivers Farm, Findspot of Prehistoric flint and medieval pottery	Findspot	N/A	MEX26468; MEX26469	Prehistoric	Non-Designated	Negligible
292	Culvert on the Witham to Maldon dismantled railway line 7	Rail Transport Site	N/A	MEX1032304	Post-medieval	Non-Designated	Negligible
293	Blue Mills Road Crossing (Site of), Witham to Maldon dismantled railway	Rail Transport Site	N/A	MEX1042237	Post-medieval	Non-Designated	Negligible
294	Road Barrier (destroyed), Saul's Bridge, Witham	Defensive Site	N/A	MEX1036599	Modern	Non-Designated	Negligible
295	Witham - Greenfield, Maldon Road	MON	N/A	MEX41255	Uncertain	Non-Designated	Negligible
296	Sauls Bridge	Road Transport Site	1264929	N/A	Post-medieval	Grade II Listed Building	High
297	Culvert on the Witham to Maldon dismantled railway line 5	Rail Transport Site	N/A	MEX1032302	Post-medieval	Non-Designated	Negligible
298	Culvert on the Witham to Maldon dismantled railway line 4	Rail Transport Site	N/A	MEX1032300	Post-medieval	Non-Designated	Negligible

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
299	Two Ammunition Shelters (destroyed), "Hackpits Field", Witham	Defensive Site	N/A	MEX1036600	Modern	Non-Designated	Negligible
300	Grove Cottages	Dwelling	1338226	N/A	Post-medieval	Grade II Listed Building	High
301	A12 Witham bypass bridge, Witham to Maldon dismantled railway	Rail Transport Site	N/A	MEX1042236	Post-medieval	Non-Designated	Negligible
302	Culvert on the Witham to Maldon dismantled railway line 3	Rail Transport Site	N/A	MEX1032299	Post-medieval	Non-Designated	Negligible
303	Culvert on the Witham to Maldon dismantled railway line 2	Rail Transport Site	N/A	MEX1032298	Post-medieval	Non-Designated	Negligible
304	Church of St Peter	Place of Worship	1111019	N/A	Early Medieval	Grade II* Listed Building	High
305	Hornbeam Walk, Witham	MON	N/A	MEX26730	Uncertain	Non-Designated	Negligible
306	Constance Close Crossing (Site of), Witham, Witham to Maldon Dismantled Railway Line	Rail Transport Site	N/A	MEX1042235	Post-medieval	Non-Designated	Negligible
307	Bridge on the Witham to Maldon dismantled railway line.	Rail Transport Site	N/A	MEX1032297	Post-medieval	Non-Designated	Low
308	Culvert on the Witham to Maldon dismantled railway line 1	Rail Transport Site	N/A	MEX1032296	Post-medieval	Non-Designated	Negligible

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
309	River Brain crossing, Witham to Maldon Dismantled Railway Line	Rail Transport Site	N/A	MEX1042234	Post-medieval	Non-Designated	Negligible
310	Spigot Mortar Emplacement, E of Barwell Way, Witham	Defensive Site	N/A	MEX1036602	Modern	Non-Designated	Low
311	Ammunition Shelter (destroyed), Plantation strip rear of The Grove, Witham	Defensive Site	N/A	MEX1036606	Modern	Non-Designated	Negligible
312	Spigot Mortar Emplacement, End of Chess Lane, Witham	Defensive Site	N/A	MEX1036608	Modern	Non-Designated	Low
313	East of Olivers farm, Cropmarks 2	Cropmark	N/A	MEX28417	Prehistoric	Non-Designated	Low
314	Near Mott's Farm	Funerary Site	N/A	MEX27001	Uncertain	Non-Designated	Low
315	Ammunition Shelter (destroyed), opp. Fruit Packing Station, Colchester Rd, Witham	Defensive Site	N/A	MEX1036618	Modern	Non-Designated	Negligible
316	Near Witham	Findspot	N/A	MEX26228	Uncertain	Non-Designated	Negligible
317	Sunday Market Site, Witham, Findspot	Findspot	N/A	MEX1041270	Prehistoric	Non-Designated	Negligible
318	Milepost on B1389 Colchester Road, S verge opposite Crittall Road	Road Transport Site	N/A	MEX40648	Post-medieval	Non-Designated	Low
319	South of Benton Hall	MON	N/A	MEX27151	Uncertain	Non-Designated	Low
320	Cropmarks at sewage works	Cropmark	N/A	MEX28406	Prehistoric	Non-Designated	Low
321	East of Witham	Cropmark	N/A	MEX27046	Prehistoric	Non-Designated	Low

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
322	Thatched Cottage, Rivenhall	Dwelling	1338252	N/A	Post-medieval	Grade II Listed Building	High
323	Taveloc House, English Electric Valve Company (Site of)	Industrial Building	N/A	MEX1034137	Modern	Non-Designated	Negligible
324	Benton Hall	Dwelling	1122561	N/A	Post-medieval	Grade II Listed Building	High
325	480, Rickstones Road	Dwelling	1122559	N/A	Post-medieval	Grade II Listed Building	High
326	Near Witham Cropmarks	Cropmark	N/A	MEX26388	Uncertain	Non-Designated	Low
327	Cropmark SE of Glebe Farm	MON	N/A	MEX38764	Prehistoric	Non-Designated	Low
328	Survey at Benton Hall Golf Course, Witham	FS	N/A	MEX39633	Uncertain	Non-Designated	Negligible
329	Rivenhall	Findspot	N/A	MEX25910; MEX25912; MEX25913; MEX25916; MEX25919	Uncertain	Non-Designated	Negligible
330	Blue Mills Bridge	Road Transport Site	1169876	N/A	Post-medieval	Grade II Listed Building	High
331	Road Barrier (destroyed), Blue Mills Bridge, Witham / Wickham Bishops	Defensive Site	N/A	MEX1036598	Modern	Non-Designated	Negligible
332	Blue Mills	Industrial Building	1122562	N/A	Post-medieval	Grade II* Listed Building	High
333	Machin's mill or Blue mills: site of medieval water mill	Industrial Building	N/A	MEX38638	Medieval	Non-Designated	Low

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
334	Mathyns	Dwelling	1169879	N/A	Post-medieval	Grade II* Listed Building	High
335	Worked flint from E of Colemans Bridge 1	Findspot	N/A	MEX28358	Uncertain	Non-Designated	Negligible
336	Fieldwalking at Rivenhall End	Findspot	N/A	MEX39492; MEX39495; MEX39496; MEX39497	Uncertain	Non-Designated	Negligible
337	Transco Pipeline, Colemans Farm, Rivenhall End	MON	N/A	MEX1037764	Uncertain	Non-Designated	Negligible
338	West of Little Braxted	MON	N/A	MEX27097	Prehistoric	Non-Designated	Low
339	Geophysics at Colemans Farm, Witham	MON	N/A	MEX1041382	Prehistoric	Non-Designated	Low
340	South of Colemans farm, Cropmark	Cropmark	N/A	MEX26983	Prehistoric	Non-Designated	Low
341	Little Braxted	Findspot	N/A	MEX26142	Uncertain	Non-Designated	Negligible
342	Worked flint from E of Colemans Bridge 2	Findspot	N/A	MEX28359	Uncertain	Non-Designated	Negligible
343	Pillbox (destroyed), Little Braxted Lane, Witham	Defensive Site	N/A	MEX1036609	Modern	Non-Designated	Negligible
344	Barn at Ishams Chase	Agricultural Building	1328828	N/A	Post-medieval	Grade II Listed Building	High
345	The Witham to Maldon railway line (dismantled)	Rail Transport Site	N/A	MEX1032294	Post-medieval	Non-Designated	Low
346	Little Braxted Mill and Mill House Including attached Mill Bridge	Industrial Building	1308828	N/A	Post-medieval	Grade II Listed Building	High

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
347	South of Colemans farm, Findspot	Findspot	N/A	MEX26991	Uncertain	Non-Designated	Negligible
348	Little Braxted: possible site of Saxon cemetery	Funerary Site	N/A	MEX26994	Roman	Non-Designated	Low
349	Cropmarks S of Little Braxted	Cropmark	N/A	MEX28410	Uncertain	Non-Designated	Negligible
350	Gatehouse Cottages	Dwelling	1338229	MEX26916	Post-medieval	Grade II Listed Building	High
351	Summer House south-west angle of wall at Little Braxted Hall	Garden Building	1146764	N/A	Post-medieval	Grade II Listed Building	High
352	Garden Wall attached to west of Little Braxted Hall	Boundary	1111065	N/A	Post-medieval	Grade II Listed Building	High
353	North of Colemans Farm	Cropmark	N/A	MEX26726	Prehistoric	Non-Designated	Medium
354	Burgate Field enclosure, Rivenhall End	MON	N/A	MEX38628	Uncertain	Non-Designated	Low
355	Little Braxted Hall and Railings enclosing front garden	Dwelling	1111063	N/A	Medieval	Grade II Listed Building	High
356	Kitchen/Dovecote, approximately 100 metres north of Little Braxted Hall	Agricultural Building	1146757	N/A	Medieval	Grade II* Listed Building	High
357	Church of St Nicholas Monument 8 metres west of Porch	Commemorative Monument	1146792	N/A	Post-medieval	Grade II Listed Building	High
358	Church of St Nicholas	Place of Worship	1111066	N/A	Medieval	Grade I Listed Building	High
359	Manege at Colemans Farm, Little Braxted Road, Rivenhall	Boundary	N/A	MEX1040619	Uncertain	Non-Designated	Negligible

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
360	Hoo Hall	Dwelling	1169797	N/A	Post-medieval	Grade II Listed Building	High
361	Stable Block to Number 188 (Hoo Hall)	Agricultural Building	1122596	N/A	Post-medieval	Grade II Listed Building	High
362	Colemans Farm, Rivenhall - Geoarchaeological evaluation	MON	N/A	MEX1049149	Prehistoric	Non-Designated	Low
363	West of Appleford Bridge	Cropmark; Findspot	N/A	MEX26718; MEX28356	Prehistoric	Non-Designated	Low
364	Barn to west of Pond Farm	Agricultural Building	1264934	N/A	Post-medieval	Grade II Listed Building	High
365	Pond Farmhouse	Dwelling	1122597	N/A	Post-medieval	Grade II Listed Building	High
366	Barn to south of Pond Farm	Agricultural Building	1122575	N/A	Post-medieval	Grade II Listed Building	High
367	Fox and Hounds	Findspot	N/A	MEX26139	Uncertain	Non-Designated	Negligible
368	South East of Hoo Hall	MON	N/A	MEX38768	Uncertain	Non-Designated	Negligible
369	The Fox Inn, London Road, Rivenhall	MON	N/A	MEX1040795	Modern	Non-Designated	Negligible
370	Barn attached to south of Outbuildings Qv 3/178 Sewells Farmhouse	Agricultural Building	1337338	N/A	Post-medieval	Grade II Listed Building	High
371	Farm Outbuildings adjoining Road approximately 40 metres Northwest of Sewells Farmhouse	Agricultural Building	1111067	N/A	Post-medieval	Grade II Listed Building	High
372	Model Farm at Rivenhall End	Agricultural Building	N/A	MEX1035314	Post-medieval	Non-Designated	Low
373	Elm Springs, Great Braxted	MON	N/A	MEX1032136	Prehistoric	Non-Designated	Low

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
374	Sewells Farmhouse	Dwelling	1337337	N/A	Post-medieval	Grade II Listed Building	High
375	Pump approximately 3 metres north of Sewells Farmhouse	Industrial Building	1146800	N/A	Post-medieval	Grade II Listed Building	High
376	West of Appleford Farm, route of Roman Road	Road Transport Site	N/A	MEX28354	Roman	Non-Designated	Low
377	East of Rivenhall End	Findspot	N/A	MEX25949	Uncertain	Non-Designated	Negligible
378	Findspots around Kelvedon and Little Braxted	Findspot	N/A	MEX1036689	Uncertain	Non-Designated	Negligible
379	Woodfield (opp. Rose Cottage) Rivenhall	Findspot	N/A	MEX1035713	Uncertain	Non-Designated	Negligible
380	Rivenhall End	Findspot	N/A	MEX26134	Roman	Non-Designated	Negligible
381	Rivenhall End - Medieval Silver Plated Copper Alloy Ring	Findspot	N/A	MEX1034208	Uncertain	Non-Designated	Negligible
382	A portable Antiquities Scheme findspot of Post Medieval date 6	Findspot	N/A	MEX1046009	Post-medieval	Non-Designated	Negligible
383	North of Appleford Farm, Prehistoric and Roman funerary site	Cropmark	N/A	MEX27089; MEX28353	Prehistoric	Non-Designated	Medium
384	Near Rivenhall Bridge	Findspot	N/A	MEX28350	Uncertain	Non-Designated	Negligible
385	Geophysics at Durwards Field, Colemans Farm, Witham	MON	N/A	MEX1041383	Prehistoric	Non-Designated	Low
386	Appleford Bridge	Road Transport Site	1111108	N/A	Post-medieval	Grade II Listed Building	High
387	South of Clarks Farm, findspot	Findspot	N/A	MEX26988	Uncertain	Non-Designated	Negligible

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
388	Field southwest of Durwards Hall, Rivenhall	Findspot	N/A	MEX1038134	Uncertain	Non-Designated	Negligible
389	Appleford Bridge Cottage	Dwelling	1317172	N/A	Post-medieval	Grade II Listed Building	High
390	Cropmarks S of Durward's Hall 1	Findspot	N/A	MEX28340; MEX28344; MEX28347	Prehistoric	Non-Designated	Medium
391	Possible neolithic long barrow at Colemans Farm, Rivenhall	Earthworks	N/A	MEX28329	Prehistoric	Non-Designated	Medium
392	Possible neolithic long barrow on Colemans Farm	Findspot	N/A	MEX28343	Uncertain	Non-Designated	Negligible
393	Cropmarks S Of Durward's Hall, Rectangular Enclosure	Cropmark	N/A	MEX27054; MEX28333; MEX28336	Prehistoric	Non-Designated	Medium
394	Findspot, Kelvedon	Findspot	N/A	MEX1036673	Uncertain	Non-Designated	Negligible
395	Durward's Hall, Prehistoric and Post-medieval remains	MON	N/A	MEX1033533; MEX1033534	Prehistoric	Non-Designated	Negligible
396	Granary 23 metres south-west of Clark's Farmhouse	Agricultural Building	1123813	N/A	Post-medieval	Grade II Listed Building	High
397	Durwards Hall, Rivenhall	Dwelling	N/A	MEX1033477	Uncertain	Non-Designated	Low
398	Land South of Durwards Hall	Findspot	N/A	MEX52109	Uncertain	Non-Designated	Negligible
399	Rivenhall long mortuary enclosure	Funerary Site	1008980	N/A	Prehistoric	Scheduled Monument	High
400	Clark's Farmhouse	Dwelling	1306239	N/A	Post-medieval	Grade II Listed Building	High
401	Near Hole Farm	Findspot	N/A	MEX27120	Uncertain	Non-Designated	Negligible

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
402	Cartlodge E of Clarks Farmhouse	Agricultural Building	N/A	MEX1039646	Post-medieval	Non-Designated	Low
403	Witham Lodge and Entrance Gates	Dwelling	1337342	N/A	Post-medieval	Grade II Listed Building	High
404	Barn 20m E of Clarks Farmhouse	Agricultural Building	N/A	MEX1005453	Post-medieval	Non-Designated	Low
405	A portable Antiquities Scheme findspot of Post Medieval date 7	Findspot	N/A	MEX1046015	Post-medieval	Non-Designated	Negligible
406	Wall enclosing Braxted Park	Boundary	1111073	N/A	Post-medieval	Grade II Listed Building	High
407	Geophsyical Anomaly: Circular enclosure and field system	Anomaly	N/A	N/A	Prehistoric	Non-Designated	Medium
408	A portable Antiquities Scheme findspot of Medieval to Unknown date 1	Findspot	N/A	MEX1044290	Medieval	Non-Designated	Negligible
409	A portable Antiquities Scheme findspot of Late Iron Age to Unknown date	Findspot	N/A	MEX1043438	Prehistoric	Non-Designated	Negligible
410	A portable Antiquities Scheme findspot of Early Mesolithic to Late Neolithic date	Findspot	N/A	MEX1045298	Prehistoric	Non-Designated	Negligible
411	Hole Farm	MON	N/A	MEX27069	Prehistoric	Non-Designated	Low
412	North of Hole Farm	Findspot	N/A	MEX27076	Uncertain	Non-Designated	Negligible
413	A portable Antiquities Scheme findspot of Early Neolithic to Early Bronze Age date 1	Findspot	N/A	MEX1045505	Prehistoric	Non-Designated	Negligible

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
414	A portable Antiquities Scheme findspot of Medieval date 4	Findspot	N/A	MEX1044292	Medieval	Non-Designated	Negligible
415	A portable Antiquities Scheme findspot of Post Medieval date 8	Findspot	N/A	MEX1046016	Post-medieval	Non-Designated	Negligible
416	A portable Antiquities Scheme findspot of Post Medieval date 9	Findspot	N/A	MEX1046017	Post-medieval	Non-Designated	Negligible
417	A portable Antiquities Scheme findspot of Early Neolithic to Late Neolithic date	Findspot	N/A	MEX1045469	Prehistoric	Non-Designated	Negligible
418	A portable Antiquities Scheme findspot of Early Neolithic to Early Bronze Age date 2	Findspot	N/A	MEX1045506	Prehistoric	Non-Designated	Negligible
419	A portable Antiquities Scheme findspot of Post Medieval date 26	Findspot	N/A	MEX1046796	Post-medieval	Non-Designated	Negligible
420	Hole Farmhouse	Dwelling	1123803	N/A	Medieval	Grade II* Listed Building	High
421	A portable Antiquities Scheme findspot of Post Medieval date 27	Findspot	N/A	MEX1046797	Post-medieval	Non-Designated	Negligible
422	A portable Antiquities Scheme findspot of Late Iron Age date 1	Findspot	N/A	MEX1043439	Prehistoric	Non-Designated	Negligible
423	A portable Antiquities Scheme findspot of Medieval to Post Medieval date 5	Findspot	N/A	MEX1046018	Medieval	Non-Designated	Negligible

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
424	A portable Antiquities Scheme findspot of unknown date 8	Findspot	N/A	MEX1046798	Uncertain	Non-Designated	Negligible
425	A portable Antiquities Scheme findspot of Medieval date 1	Findspot	N/A	MEX1042490	Medieval	Non-Designated	Negligible
426	Cotcroft Cottage	Dwelling	1123800	N/A	Post-medieval	Grade II Listed Building	High
427	A portable Antiquities Scheme findspot of Medieval date 5	Findspot	N/A	MEX1044295	Medieval	Non-Designated	Negligible
428	A portable Antiquities Scheme findspot of Medieval to Post Medieval date 6	Findspot	N/A	MEX1046020	Medieval	Non-Designated	Negligible
429	A portable Antiquities Scheme findspot of Post Medieval date 28	Findspot	N/A	MEX1046800	Post-medieval	Non-Designated	Negligible
430	Geophsyical Anomaly: Square Enclosure	Anomaly	N/A	N/A	Prehistoric	Non-Designated	Medium
431	A portable Antiquities Scheme findspot of Medieval to Post Medieval date 7	Findspot	N/A	MEX1046022	Medieval	Non-Designated	Negligible
432	A portable Antiquities Scheme findspot of Medieval date 6	Findspot	N/A	MEX1044297	Medieval	Non-Designated	Negligible
433	A portable Antiquities Scheme findspot of Roman to Early Medieval date 7	Findspot	N/A	MEX1048107	Roman	Non-Designated	Negligible
434	A portable Antiquities Scheme findspot of Roman date 13	Findspot	N/A	MEX1048893	Roman	Non-Designated	Negligible
435	A portable Antiquities Scheme findspot of unknown date 1	Findspot	N/A	MEX1043446	Uncertain	Non-Designated	Negligible

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
436	West of Ashmans Farm	Cropmark	N/A	MEX27113	Prehistoric	Non-Designated	Low
437	Small Outbuilding Containing a Pigeon House approximately 7 metres to rear (south) of the Mill House	Agricultural Building	1111080	N/A	Post-medieval	Grade II Listed Building	High
438	The Mill House and attached Mill Bridge	Industrial Building	1166135	N/A	Post-medieval	Grade II Listed Building	High
439	Cropmarks along Crane's Lane	MON	N/A	MEX42758	Uncertain	Non-Designated	Negligible
440	A portable Antiquities Scheme findspot of Post Medieval date 10	Findspot	N/A	MEX1046027	Post-medieval	Non-Designated	Negligible
441	A portable Antiquities Scheme findspot of Medieval to Post Medieval date 14	Findspot	N/A	MEX1046802	Medieval	Non-Designated	Negligible
442	A portable Antiquities Scheme findspot of Roman to Unknown date	Findspot	N/A	MEX1047647	Roman	Non-Designated	Negligible
443	Crabb's Farmhouse	Dwelling	1337635	N/A	Medieval	Grade II Listed Building	High
444	Outbuilding approximately 2 metres left (east) of the Mill House	Industrial Building	1111081	N/A	Post-medieval	Grade II Listed Building	High
445	A portable Antiquities Scheme findspot of Medieval date 22	Findspot	N/A	MEX1046028	Medieval	Non-Designated	Negligible
446	A portable Antiquities Scheme findspot of unknown date 6	Findspot	N/A	MEX1046029	Uncertain	Non-Designated	Negligible

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
447	A portable Antiquities Scheme findspot of Post Medieval date 11	Findspot	N/A	MEX1046030	Post-medieval	Non-Designated	Negligible
448	Barn Immediately south-east of Crabb's Farmhouse	Agricultural Building	1170076	N/A	Medieval	Grade II Listed Building	High
449	A portable Antiquities Scheme findspot of Middle Bronze Age to Late Bronze Age date	Findspot	N/A	MEX1042738	Prehistoric	Non-Designated	Negligible
450	A portable Antiquities Scheme findspot of Medieval date 21	Findspot	N/A	MEX1045164	Medieval	Non-Designated	Negligible
451	Kelvedon Lodge	Dwelling	1166087	N/A	Post-medieval	Grade II Listed Building	High
452	A portable Antiquities Scheme findspot of Medieval date 7	Findspot	N/A	MEX1044302	Medieval	Non-Designated	Negligible
453	Entrance Gates adjacent to Kelvedon Lodge Q.V. 2/72	Boundary	1337345	N/A	Post-medieval	Grade II Listed Building	High
454	A portable Antiquities Scheme findspot of Late Iron Age to Roman date 1	Findspot	N/A	MEX1043616	Prehistoric	Non-Designated	Negligible
455	A portable Antiquities Scheme findspot of Medieval date 8	Findspot	N/A	MEX1044304	Medieval	Non-Designated	Negligible
456	A portable Antiquities Scheme findspot of Roman date 1	Findspot	N/A	MEX1047653	Roman	Non-Designated	Negligible
457	A portable Antiquities Scheme findspot of Roman date 2	Findspot	N/A	MEX1047654	Roman	Non-Designated	Negligible
458	Crab's Farm	MON	N/A	MEX26270	Uncertain	Non-Designated	Negligible

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
459	A portable Antiquities Scheme findspot of Late Iron Age to Roman date 4	Findspot	N/A	MEX1047655	Prehistoric	Non-Designated	Negligible
460	A portable Antiquities Scheme findspot of Post Medieval date 12	Findspot	N/A	MEX1046039	Post-medieval	Non-Designated	Negligible
461	Barn approximately 20 metres left (south) of Brick House	Agricultural Building	1166115	N/A	Post-medieval	Grade II Listed Building	High
462	A portable Antiquities Scheme findspot of Post Medieval date 13	Findspot	N/A	MEX1046040	Post-medieval	Non-Designated	Negligible
463	Crabb's Farm	Settlement	N/A	MEX27082	Prehistoric	Non-Designated	Low
464	Lingwoods	Dwelling	1306290	N/A	Post-medieval	Grade II Listed Building	High
465	Lingwoods Cottage	Dwelling	1123846	N/A	Post-medieval	Grade II Listed Building	High
466	Church Hall Farm	MON	N/A	MEX27147	Prehistoric	Non-Designated	Low
467	Brick House, and attached Forecourt Wall	Dwelling	1309072	N/A	Post-medieval	Grade II Listed Building	High
468	Stables approximately 2 metres rear (east) of Brick House	Agricultural Building	1111078	N/A	Post-medieval	Grade II Listed Building	High
469	A portable Antiquities Scheme findspot of Middle Iron Age to Roman date 1	Findspot	N/A	MEX1043451	Prehistoric	Non-Designated	Negligible
470	A portable Antiquities Scheme findspot of Medieval date 9	Findspot	N/A	MEX1044307	Medieval	Non-Designated	Negligible

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
471	Green Leaves	Dwelling	1111079	N/A	Medieval	Grade II Listed Building	High
472	Barn 65 metres north-west of Church Hall Farmhouse	Agricultural Building	1171056	N/A	Medieval	Grade II Listed Building	High
473	Ashmans Farm	MON	N/A	MEX1031677	Prehistoric	Non-Designated	Low
474	The Vicarage, Kelvedon	Dwelling	1337632	N/A	Post-medieval	Grade II Listed Building	High
475	Ancillary Building 25 metres west of Church Hall Farmhouse	Ancillary Building	1123801	N/A	Medieval	Grade II Listed Building	High
476	Gleethorpe / Rose Cottage	Dwelling	1171069	N/A	Post-medieval	Grade II Listed Building	High
477	Parish Church of St Mary	Place of Worship	1337631	N/A	Medieval	Grade I Listed Building	High
478	Church Hall Farmhouse	Dwelling	1171035	N/A	Post-medieval	Grade II Listed Building	High
479	Granary/Cottage 40 metres north of Church Hall Farmhouse	Agricultural Building	1337629	N/A	Medieval	Grade II Listed Building	High
480	Braxted Park	Designed Landscape	1000455	N/A	Medieval	Grade II* Registered Park and Garden	Medium
481	East Boundary Wall of Churchyard of St Mary's Church, extending from the gateway on the axis of the Church approximately 15 metres to the east gateway	Boundary	1123809	N/A	Post-medieval	Grade II Listed Building	High

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
482	Ashman's Farmhouse	Dwelling	1166124	N/A	Post-medieval	Grade II Listed Building	High
483	Lawn Cottage and Railings and Gate to front	Dwelling	1306295	N/A	Post-medieval	Grade II Listed Building	High
484	Fullerthorne and Railings and Gate to front	Dwelling	1123847	N/A	Medieval	Grade II Listed Building	High
485	Gate, Gateway and Railings on dwarf wall, forming the roadside boundary to south-west of Red House	Boundary	1123848	N/A	Post-medieval	Grade II Listed Building	High
486	Red House	Dwelling	1169951	N/A	Medieval	Grade II* Listed Building	High
487	Cropmarks 200m east of Davey House	MON	N/A	MEX42751	Uncertain	Non-Designated	Negligible
488	A portable Antiquities Scheme findspot of Early Medieval date 1	Findspot	N/A	MEX1042491	Early medieval	Non-Designated	Negligible
489	A portable Antiquities Scheme findspot of Roman date 3	Findspot	N/A	MEX1047659	Roman	Non-Designated	Negligible
490	Wall forming the boundary of Church Street, from the vehicle entrance of the Gardens Bungalow, extending 49 metres to the north-west to the splayed entrance of Millers Garden	Boundary	1123807	N/A	Post-medieval	Grade II Listed Building	High
491	Brunswick Cottage / Brunswick House	Dwelling	1123810	N/A	Post-medieval	Grade II Listed Building	High

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
492	Brunswick Villa	Dwelling	1123811	N/A	Post-medieval	Grade II Listed Building	High
493	Brunswick Lodge	Dwelling	1337633	N/A	Post-medieval	Grade II Listed Building	High
494	Old Timbers, Kelveden 1	Dwelling	1123808	N/A	Medieval	Grade II Listed Building	High
495	Ashman Farm	Cropmark	N/A	MEX27174	Prehistoric	Non-Designated	Low
496	North East of Ashman's Farm	Findspot	N/A	MEX26905	Uncertain	Non-Designated	Negligible
497	A portable Antiquities Scheme findspot of Roman date 4	Findspot	N/A	MEX1047660	Roman	Non-Designated	Negligible
498	A portable Antiquities Scheme findspot of Medieval date 10	Findspot	N/A	MEX1044311	Medieval	Non-Designated	Negligible
499	1-5, High Street	Dwelling	1123814	N/A	Medieval	Grade I Listed Building	High
500	Top House	Dwelling	1123767	N/A	Medieval	Grade II Listed Building	High
501	Newman's	Dwelling	1171166	N/A	Medieval	Grade II Listed Building	High
502	7, High Street	Dwelling	1170131	N/A	Post-medieval	Grade II Listed Building	High
503	Rosary Cottage and Shop adjoining to north-east	Dwelling	1337649	N/A	Post-medieval	Grade II Listed Building	High
504	Chase House, Kelveden	Dwelling	1123815	N/A	Post-medieval	Grade II Listed Building	High
505	St Osyth Cottage	Dwelling	1123802	N/A	Post-medieval	Grade II Listed Building	High

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
506	Cobbins	Dwelling	1306157	N/A	Medieval	Grade II Listed Building	High
507	A portable Antiquities Scheme findspot of Medieval date 18	Findspot	N/A	MEX1044906	Medieval	Non-Designated	Negligible
508	The White Hart Inn	Eating and Drinking Establishment	1123787	N/A	Post-medieval	Grade II Listed Building	High
509	Joyes / Lavenders	Dwelling	1171208	N/A	Post-medieval	Grade II Listed Building	High
510	Dial House	Dwelling	1337636	N/A	Post-medieval	Grade II Listed Building	High
511	Old Timbers, Kelveden 2	Dwelling	1123816	N/A	Post-medieval	Grade II Listed Building	High
512	St Mary's House	Dwelling	1305733	N/A	Medieval	Grade II* Listed Building	High
513	Elizabeth House	Dwelling	1170233	N/A	Post-medieval	Grade II Listed Building	High
514	4-8, High Street	Dwelling	1337659	N/A	Medieval	Grade II Listed Building	High
515	Fabia	Dwelling	1123768	N/A	Post-medieval	Grade II Listed Building	High
516	Oakland Cottage	Dwelling	1337637	N/A	Medieval	Grade II Listed Building	High
517	Grangewood	Dwelling	1123788	N/A	Post-medieval	Grade II Listed Building	High
518	The Old School House	Dwelling	1171082	N/A	Medieval	Grade II Listed Building	High

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
519	Number 35 and north-west part of Number 33	Dwelling	1170241	N/A	Medieval	Grade II Listed Building	High
520	County Library and Local History Museum	Public Building	1123804	N/A	Post-medieval	Grade II Listed Building	High
521	Kentwell	Dwelling	1123817	N/A	Post-medieval	Grade II Listed Building	High
522	39, High Street	Dwelling	1170265	N/A	Post-medieval	Grade II Listed Building	High
523	Thomas Sykes Antiques	Commerical Building	1123789	N/A	Post-medieval	Grade II Listed Building	High
524	Kelvedon Lady / Mason's Butchers	Commerical Building	1123818	N/A	Medieval	Grade II Listed Building	High
525	26-30, High Street	Dwelling	1337621	N/A	Medieval	Grade II* Listed Building	High
526	A portable Antiquities Scheme findspot of Early Medieval date 3	Findspot	N/A	MEX1042960	Early medieval	Non-Designated	Negligible
527	A portable Antiquities Scheme findspot of Post Medieval date 14	Findspot	N/A	MEX1046045	Post-medieval	Non-Designated	Negligible
528	A portable Antiquities Scheme findspot of Roman date 5	Findspot	N/A	MEX1047662	Roman	Non-Designated	Negligible
529	A portable Antiquities Scheme findspot of Roman date 14	Findspot	N/A	MEX1048898	Roman	Non-Designated	Negligible
530	Kelvedon Roman cemeteries	Funerary Site	N/A	MEX1031968	Roman	Non-Designated	Medium
531	Red House, Kelvedon	Findspot	N/A	MEX1035736	Uncertain	Non-Designated	Negligible

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
532	Findspot of flake tool close to St. Marys school, Kelvedon	Findspot	N/A	MEX1036581	Prehistoric	Non-Designated	Negligible
533	A portable Antiquities Scheme findspot of unknown date 2	Findspot	N/A	MEX1043454	Uncertain	Non-Designated	Negligible
534	South East Kelvedon, findspot of Roman brooches, pottery and tile	Findspot	N/A	MEX25924; MEX25926; MEX25928; MEX25933	Roman	Non-Designated	Negligible
535	Near Kelvedon, findspot of prehistoric metalwork and Roman coin	Findspot	N/A	MEX26688; MEX26692; MEX26694	Prehistoric	Non-Designated	Negligible
536	Kelvedon, findspot of Roman Tiles	Findspot	N/A	MEX40204	Roman	Non-Designated	Negligible
537	Brimpton House	Dwelling	1337638	N/A	Medieval	Grade II Listed Building	High
538	A portable Antiquities Scheme findspot of Post Medieval date 15	Findspot	N/A	MEX1046046	Post-medieval	Non-Designated	Negligible
539	Little Greys	Dwelling	1171089	N/A	Post-medieval	Grade II Listed Building	High
540	Forge Cottage Including attached Railings and Gate	Dwelling	1306108	N/A	Post-medieval	Grade II Listed Building	High
541	65-69, High Street	Dwelling	1123819	N/A	Post-medieval	Grade II Listed Building	High
542	Spurgeon Cottage / Spurgeon House	Dwelling	1170300	N/A	Post-medieval	Grade II Listed Building	High

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
543	A portable Antiquities Scheme findspot of Post Medieval date 5	Findspot	N/A	MEX1045410	Post-medieval	Non-Designated	Negligible
544	Kelvedon Labour Club	Public Building	1337639	N/A	Post-medieval	Grade II Listed Building	High
545	Road Bridge Over River Blackwater	Road Transport Site	1337630	N/A	Post-medieval	Grade II Listed Building	High
546	Greys east / The Greys	Dwelling	1171108	N/A	Post-medieval	Grade II Listed Building	High
547	Barn 10 metres west of Grey's Cottage	Agricultural Building	1123805	N/A	Post-medieval	Grade II Listed Building	High
548	Grey's Mill, Kelveden	Industrial Building	1123806	MEX40549	Post-medieval	Grade II Listed Building	High
549	Ancillary Building 5 metres south-east of Bridgefoot Farmhouse	Ancillary Building	1123766	N/A	Medieval	Grade II Listed Building	High
550	Warehouse and Workshop at Mellons Timber Yard	Industrial Building	1123820	N/A	Post-medieval	Grade II Listed Building	High
551	Bridgefoot House	Dwelling	1337648	N/A	Post-medieval	Grade II* Listed Building	High
552	91-97, High Street	Dwelling	1170318	N/A	Post-medieval	Grade II Listed Building	High
553	1, The Chase	Dwelling	1123845	N/A	Post-medieval	Grade II Listed Building	High
554	Western Cottage	Dwelling	1123790	N/A	Medieval	Grade II Listed Building	High
555	Ormonde Lodge	Dwelling	1170329	N/A	Post-medieval	Grade II Listed Building	High

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
556	Ormonde Cottage / Ormonde House	Dwelling	1123821	N/A	Post-medieval	Grade II Listed Building	High
557	St Andrews	Dwelling	1170359	N/A	Post-medieval	Grade II Listed Building	High
558	Alma Cottage / Norbury House	Dwelling	1337601	N/A	Post-medieval	Grade II Listed Building	High
559	Number 119 and Railings to front	Dwelling	1123822	N/A	Post-medieval	Grade II Listed Building	High
560	Walnut House	Dwelling	1366145	N/A	Post-medieval	Grade II Listed Building	High
561	A portable Antiquities Scheme findspot of Post Medieval date 16	Findspot	N/A	MEX1046048	Post-medieval	Non-Designated	Negligible
562	The George Inn	Eating and Drinking Establishment	1123823	N/A	Post-medieval	Grade II Listed Building	High
563	133-139, High Street	Dwelling	1170390	N/A	Post-medieval	Grade II Listed Building	High
564	Noah's Ark Cottage	Dwelling	1170973	N/A	Post-medieval	Grade II Listed Building	High
565	Tanners	Dwelling	1123796	N/A	Post-medieval	Grade II Listed Building	High
566	Kelvedon	Conservation Area	N/A	DEX22913	Medieval	Conservation Area	Medium
567	Doucecroft School	Public Building	1123824	N/A	Post-medieval	Grade II Listed Building	High
568	Bell House	Dwelling	1337622	N/A	Medieval	Grade II Listed Building	High

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
569	A portable Antiquities Scheme findspot of Post Medieval date 17	Findspot	N/A	MEX1046050	Post-medieval	Non-Designated	Negligible
570	A portable Antiquities Scheme findspot of Medieval date 11	Findspot	N/A	MEX1044314	Medieval	Non-Designated	Negligible
571	A portable Antiquities Scheme findspot of Medieval date 12	Findspot	N/A	MEX1044315	Medieval	Non-Designated	Negligible
572	A portable Antiquities Scheme findspot of Medieval to Post Medieval date 8	Findspot	N/A	MEX1046051	Medieval	Non-Designated	Negligible
573	Peppercorn Whole Foods	Commerical Building	1123791	N/A	Post-medieval	Grade II Listed Building	High
574	Gages	Dwelling	1123792	N/A	Post-medieval	Grade II Listed Building	High
575	White House	Dwelling	1337623	N/A	Post-medieval	Grade II Listed Building	High
576	A portable Antiquities Scheme findspot of Medieval date 19	Findspot	N/A	MEX1044908	Medieval	Non-Designated	Negligible
577	Belle Couture	Commerical Building	1305900	N/A	Post-medieval	Grade II Listed Building	High
578	Ruskin / Shepherds / Wells Cottage	Dwelling	1170406	N/A	Medieval	Grade II Listed Building	High
579	The Lawn House and Railings and Gate to front	Dwelling	1123793	N/A	Post-medieval	Grade II Listed Building	High
580	Virginia House	Dwelling	1170430	N/A	Post-medieval	Grade II Listed Building	High
581	152, High Street	Dwelling	1247997	N/A	Medieval	Grade II Listed Building	High

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
582	Orchard House / Post Office	Dwelling	1170818	N/A	Medieval	Grade II* Listed Building	High
583	Heigaines	Dwelling	1123826	N/A	Medieval	Grade II Listed Building	High
584	Quaker Meeting House, to rear of Numbers 203-5	Place of Worship	1170446	N/A	Post-medieval	Grade II Listed Building	High
585	Barn at rear of Numbers 156 to 160 (Even)	Agricultural Building	1337624	N/A	Post-medieval	Grade II Listed Building	High
586	T C News	Commerical Building	1123825	N/A	Medieval	Grade II Listed Building	High
587	Chambers / Dormers / Gables	Dwelling	1170862	N/A	Medieval	Grade II* Listed Building	High
588	162 and 164, High Street	Dwelling	1123794	N/A	Post-medieval	Grade II Listed Building	High
589	A portable Antiquities Scheme findspot of Post Medieval date 29	Findspot	N/A	MEX1046807	Post-medieval	Non-Designated	Negligible
590	A portable Antiquities Scheme findspot of Medieval to Post Medieval date 1	Findspot	N/A	MEX1042498	Medieval	Non-Designated	Negligible
591	A portable Antiquities Scheme findspot of Post Medieval date 18	Findspot	N/A	MEX1046052	Post-medieval	Non-Designated	Negligible
592	A portable Antiquities Scheme findspot of Medieval date 2	Findspot	N/A	MEX1042499	Medieval	Non-Designated	Negligible
593	Deacons Newsagents	Commerical Building	1170945	N/A	Post-medieval	Grade II Listed Building	High

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
594	A portable Antiquities Scheme findspot of Medieval date 20	Findspot	N/A	MEX1044910	Medieval	Non-Designated	Negligible
595	219 and 221, High Street	Dwelling	1123827	N/A	Post-medieval	Grade II Listed Building	High
596	A portable Antiquities Scheme findspot of Roman to Early Medieval date 8	Findspot	N/A	MEX1048109	Roman	Non-Designated	Negligible
597	Wyvern House	Dwelling	1123795	N/A	Post-medieval	Grade II Listed Building	High
598	Bridge House, Kelvedon	Dwelling	1170952	N/A	Post-medieval	Grade II Listed Building	High
599	A portable Antiquities Scheme findspot of Post Medieval date 30	Findspot	N/A	MEX1046808	Post-medieval	Non-Designated	Negligible
600	South of Ewell Hall	Cropmark	N/A	MEX27196	Prehistoric	Non-Designated	Low
601	Numbers 180a, B and C, and Wing to east In Swan Street	Dwelling	1337625	N/A	Medieval	Grade II* Listed Building	High
602	A portable Antiquities Scheme findspot of Post Medieval date 19	Findspot	N/A	MEX1046053	Post-medieval	Non-Designated	Negligible
603	A portable Antiquities Scheme findspot of Post Medieval date 1	Findspot	N/A	MEX1042501	Post-medieval	Non-Designated	Negligible
604	A portable Antiquities Scheme findspot of Medieval date 3	Findspot	N/A	MEX1042502	Medieval	Non-Designated	Negligible
605	A portable Antiquities Scheme findspot of Early Medieval date 8	Findspot	N/A	MEX1043081	Early medieval	Non-Designated	Negligible

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
606	Kelvedon, unidentified findspot	Findspot	N/A	MEX26613	Uncertain	Non-Designated	Negligible
607	Kelvedon Hall	Dwelling	1166077	N/A	Post-medieval	Grade II Listed Building	High
608	Stable/Brewhouse approximately 10 metres left (north) of Kelvedon Hall	Industrial Building	1337344	N/A	Post-medieval	Grade II Listed Building	High
609	The Old Cottage	Dwelling	1337650	N/A	Medieval	Grade II Listed Building	High
610	Pigsties approximately 60 metres to rear (east) of Kelvedon Hall	Agricultural Building	1111077	N/A	Post-medieval	Grade II Listed Building	High
611	The Old Bridge House	Dwelling	1171223	N/A	Post-medieval	Grade II Listed Building	High
612	3, Swan Street	Dwelling	1123769	N/A	Post-medieval	Grade II Listed Building	High
613	Ewell Hall	Dwelling	1170980	N/A	Post-medieval	Grade II Listed Building	High
614	A portable Antiquities Scheme findspot of Early Medieval date 4	Findspot	N/A	MEX1042962	Early medieval	Non-Designated	Negligible
615	A portable Antiquities Scheme findspot of Medieval date 13	Findspot	N/A	MEX1044317	Medieval	Non-Designated	Negligible
616	A portable Antiquities Scheme findspot of Early Medieval date 5	Findspot	N/A	MEX1042963	Early medieval	Non-Designated	Negligible
617	A portable Antiquities Scheme findspot of unknown date 3	Findspot	N/A	MEX1043463	Uncertain	Non-Designated	Negligible

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
618	The Sun Inn	Eating and Drinking Establishment	1123832	N/A	Medieval	Grade II* Listed Building	High
619	Sun Cottage	Dwelling	1337605	N/A	Medieval	Grade II* Listed Building	High
620	A portable Antiquities Scheme findspot of Post Medieval date 20	Findspot	N/A	MEX1046057	Post-medieval	Non-Designated	Negligible
621	Bridge House, Feering	Dwelling	1169327	N/A	Post-medieval	Grade II Listed Building	High
622	Timbers	Dwelling	1337607	N/A	Medieval	Grade II Listed Building	High
623	Feering House	Dwelling	1123833	N/A	Medieval	Grade II* Listed Building	High
624	Wall forming the street boundary of Number 9, and extending 25 metres Along the south-west boundary	Boundary	1306660	N/A	Post-medieval	Grade II Listed Building	High
625	The Vicarage, Feering	Dwelling	1123834	N/A	Post-medieval	Grade II Listed Building	High
626	Easterford Mill House	Dwelling	1337651	N/A	Post-medieval	Grade II Listed Building	High

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
627	Complex of Walls, Railings and Gates forming the street boundary of Number 11 (the Vicarage), from the north-east end extending 128 metres to the north-west and then 17 metres to the south-west, and from the south-west end extending 52 metres	Boundary	1169227	N/A	Post-medieval	Grade II Listed Building	High
628	Easterford Mill	Industrial Building	1171251	N/A	Post-medieval	Grade II* Listed Building	High
629	A portable Antiquities Scheme findspot of Post Medieval date 21	Findspot	N/A	MEX1046058	Post-medieval	Non-Designated	Negligible
630	A portable Antiquities Scheme findspot of Roman date 6	Findspot	N/A	MEX1047663	Roman	Non-Designated	Negligible
631	A portable Antiquities Scheme findspot of Post Medieval date 22	Findspot	N/A	MEX1046059	Post-medieval	Non-Designated	Negligible
632	A portable Antiquities Scheme findspot of Roman date 7	Findspot	N/A	MEX1047664	Roman	Non-Designated	Negligible
633	Wall Along the street boundary of Number 15 (St Andrews) and Number 15a (Feering Hill House) from the east corner of the wall of Number 11 (the Vicarage), 42 metres to the north-east	Boundary	1169292	N/A	Post-medieval	Grade II Listed Building	High
634	Feering Hill House / St Andrews	Dwelling	1337606	N/A	Post-medieval	Grade II Listed Building	High

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
635	The Barn and attached Ancillary Buildings	Agricultural Building	1123835	N/A	Post-medieval	Grade II Listed Building	High
636	Highfields Farmhouse and attached Cottage to north-east	Dwelling	1337626	N/A	Post-medieval	Grade II Listed Building	High
637	A portable Antiquities Scheme findspot of Post Medieval date 23	Findspot	N/A	MEX1046061	Post-medieval	Non-Designated	Negligible
638	Highfields Farm, Highfields lane, Kelvedon	Agricultural Building	N/A	MEX1042078	Post-medieval	Non-Designated	Negligible
639	Iron Age Stater from Kelvedon	Findspot	N/A	MEX1034289	Prehistoric	Non-Designated	Negligible
640	A portable Antiquities Scheme findspot of unknown date 4	Findspot	N/A	MEX1043464	Uncertain	Non-Designated	Negligible
641	A portable Antiquities Scheme findspot of Roman to Early Medieval date 3	Findspot	N/A	MEX1047665	Roman	Non-Designated	Negligible
642	A portable Antiquities Scheme findspot of Medieval to Post Medieval date 9	Findspot	N/A	MEX1046062	Medieval	Non-Designated	Negligible
643	A portable Antiquities Scheme findspot of Roman to Early Medieval date 4	Findspot	N/A	MEX1047666	Roman	Non-Designated	Negligible
644	A portable Antiquities Scheme findspot of Medieval date 14	Findspot	N/A	MEX1044320	Medieval	Non-Designated	Negligible
645	A portable Antiquities Scheme findspot of Roman date 8	Findspot	N/A	MEX1047667	Roman	Non-Designated	Negligible
646	Anglo-Saxon cemetery 150m east of Easterford Mill	Funerary Site	1013515	N/A	Early Medieval	Scheduled Monument	Medium
647	Kelvedon Enclosure	Cropmark	N/A	MEX1039971	Prehistoric	Non-Designated	Negligible

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
648	Cropmarks associated with the Anglo-Saxon cemetery at Kelvedon	Cropmark	N/A	MEX26583	Prehistoric	Non-Designated	Low
649	Findspot, near Kelvedon	Findspot	N/A	MEX1036669	Uncertain	Non-Designated	Negligible
650	A portable Antiquities Scheme findspot of Early Medieval date 6	Findspot	N/A	MEX1042968	Early medieval	Non-Designated	Negligible
651	Kelvedon/Messing-cum-Inworth	MON	N/A	MEX1036031	Uncertain	Non-Designated	Low
652	A portable Antiquities Scheme findspot of Post Medieval date 2	Findspot	N/A	MEX1042505	Post-medieval	Non-Designated	Negligible
653	A portable Antiquities Scheme findspot of Late Iron Age date 2	Findspot	N/A	MEX1043466	Prehistoric	Non-Designated	Negligible
654	The Old Anchor Public House	Eating and Drinking Establishment	1169347	N/A	Medieval	Grade II Listed Building	High
655	Highfields Inworth, Boundary Post 1	MON	N/A	MEX1036091	Uncertain	Non-Designated	Low
656	A portable Antiquities Scheme findspot of Early Medieval date 9	Findspot	N/A	MEX1043082	Early medieval	Non-Designated	Negligible
657	Kelvedon Iron Age Warrior	Funerary Site	N/A	MEX26911	Prehistoric	Non-Designated	Low
658	A portable Antiquities Scheme findspot of Medieval date 15	Findspot	N/A	MEX1044324	Medieval	Non-Designated	Negligible
659	A portable Antiquities Scheme findspot of Late Iron Age to Roman date 5	Findspot	N/A	MEX1047672	Prehistoric	Non-Designated	Negligible

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
660	A portable Antiquities Scheme findspot of Late Iron Age to Roman date 2	Findspot	N/A	MEX1043716	Prehistoric	Non-Designated	Negligible
661	A portable Antiquities Scheme findspot of Early Medieval date 7	Findspot	N/A	MEX1042969	Early medieval	Non-Designated	Negligible
662	Cobham Oak Cottages	Dwelling	1123836	N/A	Medieval	Grade II* Listed Building	High
663	Pump approximately 7 metres north-east of Cobham Oak Cottages	Industrial Building	1169412	N/A	Post-medieval	Grade II Listed Building	High
664	A portable Antiquities Scheme findspot of Early Bronze Age date	Findspot	N/A	MEX1042641	Prehistoric	Non-Designated	Negligible
665	A portable Antiquities Scheme findspot of Medieval to Post Medieval date 2	Findspot	N/A	MEX1042655	Medieval	Non-Designated	Negligible
666	Feering	Conservation Area	N/A	DEX22872	Medieval	Conservation Area	Medium
667	A portable Antiquities Scheme findspot of Early Medieval to Medieval date	Findspot	N/A	MEX1043083	Early medieval	Non-Designated	Negligible
668	A portable Antiquities Scheme findspot of Early Medieval date 2	Findspot	N/A	MEX1042511	Early medieval	Non-Designated	Negligible
669	A portable Antiquities Scheme findspot of Roman date 15	Findspot	N/A	MEX1048899	Roman	Non-Designated	Negligible
670	A portable Antiquities Scheme findspot of Roman date 16	Findspot	N/A	MEX1048900	Roman	Non-Designated	Negligible

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
671	Inworth Boundary Post 1	MON	N/A	MEX1036088	Uncertain	Non-Designated	Low
672	A portable Antiquities Scheme findspot of Roman date 9	Findspot	N/A	MEX1047673	Roman	Non-Designated	Negligible
673	West of Inworth Hall	Industrial Site	N/A	MEX26908	Uncertain	Non-Designated	Negligible
674	A portable Antiquities Scheme findspot of Post Medieval to Unknown date 1	Findspot	N/A	MEX1046067	Post-medieval	Non-Designated	Negligible
675	A portable Antiquities Scheme findspot of Post Medieval date 3	Findspot	N/A	MEX1042513	Post-medieval	Non-Designated	Negligible
676	A portable Antiquities Scheme findspot of Roman to Post Medieval date 1	Findspot	N/A	MEX1042514	Roman	Non-Designated	Negligible
677	A portable Antiquities Scheme findspot of Medieval to Post Medieval date 10	Findspot	N/A	MEX1046068	Medieval	Non-Designated	Negligible
678	A portable Antiquities Scheme findspot of unknown date 7	Findspot	N/A	MEX1046543	Uncertain	Non-Designated	Negligible
679	A portable Antiquities Scheme findspot of Roman to Post Medieval date 2	Findspot	N/A	MEX1048149	Roman	Non-Designated	Negligible
680	A portable Antiquities Scheme findspot of Roman date 17	Findspot	N/A	MEX1048901	Roman	Non-Designated	Negligible
681	Highfields Inworth, Boundary Post 2	MON	N/A	MEX1036089	Uncertain	Non-Designated	Low
682	A portable Antiquities Scheme findspot of Medieval date 16	Findspot	N/A	MEX1044325	Medieval	Non-Designated	Negligible

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
683	A portable Antiquities Scheme findspot of Post Medieval date 4	Findspot	N/A	MEX1042515	Post-medieval	Non-Designated	Negligible
684	A portable Antiquities Scheme findspot of Roman to Medieval date	Findspot	N/A	MEX1048132	Roman	Non-Designated	Negligible
685	A portable Antiquities Scheme findspot of Lower Palaeolithic date	Findspot	N/A	MEX1045550	Prehistoric	Non-Designated	Negligible
686	A portable Antiquities Scheme findspot of Roman date 10	Findspot	N/A	MEX1047674	Roman	Non-Designated	Negligible
687	A portable Antiquities Scheme findspot of Post Medieval date 24	Findspot	N/A	MEX1046070	Post-medieval	Non-Designated	Negligible
688	West of Brick Kiln Farm	MON	N/A	MEX26253	Uncertain	Non-Designated	Negligible
689	A portable Antiquities Scheme findspot of unknown date 5	Findspot	N/A	MEX1044326	Uncertain	Non-Designated	Negligible
690	Inworth Boundary Post 2	MON	N/A	MEX1036083	Uncertain	Non-Designated	Low
691	St Michael's Church, Inworth 1	Place of Worship	N/A	MEX26307	Uncertain	Non-Designated	Low
692	St Michael's Church, Inworth 2	Place of Worship	N/A	MEX26308	Uncertain	Non-Designated	Low
693	Inworth Pumping Station	Industrial Building	N/A	MEX1035336	Modern	Non-Designated	Negligible
694	Boundary post (site of), Inworth Hall Farm	MON	N/A	MEX1035288	Uncertain	Non-Designated	Negligible
695	A portable Antiquities Scheme findspot of Medieval to Post Medieval date 12	Findspot	N/A	MEX1046072	Medieval	Non-Designated	Negligible

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
696	Brickfield within Parish of Inworth	Industrial Building	N/A	MEX1037246	Post-medieval	Non-Designated	Negligible
697	A portable Antiquities Scheme findspot of Late Iron Age to Roman date 6	Findspot	N/A	MEX1047677	Prehistoric	Non-Designated	Negligible
698	South of Inworth	MON	N/A	MEX27170	Uncertain	Non-Designated	Negligible
699	A portable Antiquities Scheme findspot of Post Medieval date 31	Findspot	N/A	MEX1046813	Post-medieval	Non-Designated	Negligible
700	A portable Antiquities Scheme findspot of Post Medieval date 25	Findspot	N/A	MEX1046075	Post-medieval	Non-Designated	Negligible
701	Inworth Hall	Dwelling	1224616	MEX26751	Post-medieval	Grade II Listed Building	High
702	A portable Antiquities Scheme findspot of Medieval to Post Medieval date 3	Findspot	N/A	MEX1045174	Medieval	Non-Designated	Negligible
703	Inworth Rectory	Findspot	N/A	MEX26310	Uncertain	Non-Designated	Negligible
704	A portable Antiquities Scheme findspot of Late Iron Age to Roman date 3	Findspot	N/A	MEX1043717	Prehistoric	Non-Designated	Negligible
705	A portable Antiquities Scheme findspot of Roman date 11	Findspot	N/A	MEX1047679	Roman	Non-Designated	Negligible
706	Inworth Hall Moated Site	Agricultural Site	N/A	MEX26751	Medieval	Non-Designated	Medium
707	A portable Antiquities Scheme findspot of Post Medieval to Unknown date 2	Findspot	N/A	MEX1046076	Post-medieval	Non-Designated	Negligible

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
708	Parish Church of All Saints (Inworth)	Place of Worship	1224592	N/A	Early Medieval	Grade I Listed Building	High
709	All Saints' Church, Inworth findspot	Findspot	N/A	MEX26299	Uncertain	Non-Designated	Negligible
710	A portable Antiquities Scheme findspot of Medieval to Unknown date 2	Findspot	N/A	MEX1044334	Medieval	Non-Designated	Negligible
711	Churchman's Farmhouse	Dwelling	1224661	N/A	Medieval	Grade II Listed Building	High
712	Gates and Gatepiers to Inworth Hall	Boundary	1266750	N/A	Post-medieval	Grade II Listed Building	High
713	Theobalds Farmhouse	Dwelling	1224936	N/A	Post-medieval	Grade II Listed Building	High
714	A portable Antiquities Scheme findspot of Middle Iron Age to Roman date 2	Findspot	N/A	MEX1043470	Prehistoric	Non-Designated	Negligible
715	Thatched Cottage, Messing-cum-Inworth	Dwelling	1224615	N/A	Post-medieval	Grade II Listed Building	High
716	1-6, The Street	Dwelling	1224626	N/A	Post-medieval	Grade II Listed Building	High
717	Harborough Cottage	Dwelling	1224587	N/A	Medieval	Grade II Listed Building	High
718	Weatherboarded Outbuildings to Prince of Wales Public House	Ancillary Building	1224655	N/A	Post-medieval	Grade II Listed Building	High
719	Prince of Wales Public House	Eating and Drinking Establishment	1224628	N/A	Post-medieval	Grade II Listed Building	High

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
720	Well Cottage	Dwelling	1224659	N/A	Post-medieval	Grade II Listed Building	High
721	Hill House, Messing-cum-Inworth	Dwelling	1224660	N/A	Post-medieval	Grade II Listed Building	High
722	A portable Antiquities Scheme findspot of Late Iron Age date 3	Findspot	N/A	MEX1043471	Prehistoric	Non-Designated	Negligible
723	A portable Antiquities Scheme findspot of Medieval to Post Medieval date 13	Findspot	N/A	MEX1046080	Medieval	Non-Designated	Negligible
724	A portable Antiquities Scheme findspot of Roman to Early Medieval date 5	Findspot	N/A	MEX1047682	Roman	Non-Designated	Negligible
725	A portable Antiquities Scheme findspot of Roman to Early Medieval date 6	Findspot	N/A	MEX1047683	Roman	Non-Designated	Negligible
726	A portable Antiquities Scheme findspot of Roman date 12	Findspot	N/A	MEX1047684	Roman	Non-Designated	Negligible
727	A portable Antiquities Scheme findspot of Medieval to Post Medieval date 4	Findspot	N/A	MEX1045176	Medieval	Non-Designated	Negligible
728	A portable Antiquities Scheme findspot of Medieval date 17	Findspot	N/A	MEX1044337	Medieval	Non-Designated	Negligible
729	Inworth Pottery Kiln (Site of)	Industrial Site	N/A	MEX26874	Uncertain	Non-Designated	Negligible
730	Prested Hall	Dwelling	1169450	N/A	Medieval	Grade II Listed Building	High

Asset No.	Name	Type	NHLE Ref.	HER Ref.	Period	Designation	Value
731	A Geophysical Survey on land at Bouchiers Hall Farm between Messing and Inworth	Geophysical Anomaly	N/A	MEX1038882	Uncertain	Non-Designated	Negligible
732	Hill Farmhouse	Dwelling	1266749	N/A	Post-medieval	Grade II Listed Building	High
733	Yewtree Farmhouse	Dwelling	1224591	N/A	Medieval	Grade II Listed Building	High
734	Parsonage Farmhouse	Dwelling	1266747	N/A	Post-medieval	Grade II Listed Building	High
735	Kelvedon-Tiptree-Tollesbury Light Railway (Crab and Winkle Line)	Rail Transport Site	N/A	MEX1035683	Modern	Non-Designated	Negligible
853	Copford Green Conservation Area	Conservation Area	N/A	DEX22987	Post-medieval	Conservation Area	Medium

Appendix G. Landscape appendices

G.1 Published landscape character areas

Table G.1: Published national character areas

National Character Area	Key characteristics
NCA 86 South Suffolk and North Essex Clayland	• An undulating chalky boulder clay plateau is dissected by numerous river valleys, giving a topography of gentle slopes in the lower, wider valleys and steeper slopes in the narrower upper parts. • Fragments of chalk give many of the soils a calcareous character, which also influences the character of the semi-natural vegetation cover. • South-east-flowing streams and rivers drain the clay plateau. Watercourses wind slowly across flood plains, supporting wet, fen-type habitats; grazing marsh; and blocks of cricket-bat willows, poplars and old willow pollards. Navigation locks are present on some rivers. • Lowland wood pasture and ancient woodlands support the dormouse and a rich diversity of flowering plants on the clay plateau. Large, often ancient hedgerows link woods and copses, forming wooded skylines. • The agricultural landscape is predominantly arable with a wooded appearance. There is some pasture on the valley floors. Field patterns are irregular despite rationalisation, with much ancient countryside surviving. Field margins support corn bunting, cornflower and brown hare. • Roman sites, medieval monasteries and castles and ancient woodlands contribute to a rich archaeology. Impressive churches, large barns, substantial country house estates and Second World War airfields dot the landscape, forming historical resources. • There is a dispersed settlement pattern of scattered farmsteads, parishes and small settlements around ‘tyes’ (commons) or strip greens and isolated hamlets. The NCA features a concentration of isolated moated farmsteads and numerous well-preserved medieval towns and large villages. • Larger 20th-century development has taken place to the south and east around Chelmsford, Ipswich and the new towns of Harlow and Stevenage. • Traditional timber-frame, often elaborate buildings with exposed timbers, colour-washed render, pargeting and steeply pitched roofs with pegtiles or long straw thatch. Sometimes they have been re-fronted with Georgian red brick or Victorian cream-coloured bricks (‘Suffolk whites’). Clay lump is often used in cottages and farm buildings. Winding, narrow and sometimes sunken lanes are bounded by deep ditches, wide verges and strong hedgerows. Transport infrastructure includes the A14, A12, M11 and Stansted Airport. • A strong network of public rights of way provides access to the area’s archetypal lowland English countryside.

National Character Area	Key characteristics
NCA 111 Northern Thames Basin	• The landform is varied with a wide plateau divided by river valleys. The prominent hills and ridges of the 'Bagshot Hills' are notable to the northwest and extensive tracts of flat land are found in the south. • Characteristic of the area is a layer of thick clay producing heavy, acidic soils, resulting in retention of considerable areas of ancient woodland. • Areas capped by glacial sands and gravels have resulted in nutrient-poor, free-draining soils which support remnant lowland heathlands, although these are now small. Areas that have alluvial deposits present are well drained and fertile. • The water bearing underlying Chalk beds are a main source of recharge for the principal London Basin Chalk aquifer. • A diverse landscape with a series of broad valleys containing the major rivers Ver, Colne and Lea, and slightly steeper valleys of the rivers Stour, Colne and Roman. Numerous springs rise at the base of the Bagshot Beds and several reservoirs are dotted throughout the area • The pattern of woodlands is varied across the area and includes considerable ancient semi-natural woodland. Hertfordshire is heavily wooded in some areas as are parts of Essex, while other areas within Essex are more open in character. Significant areas of wood pasture and pollarded veteran trees are also present. • The field pattern is very varied across the basin reflecting historical activity. Informal patterns of 18th-century or earlier enclosure reflect medieval colonisation of the heaths. Regular planned enclosures dating from the Romano-British period are a subtle but nationally important feature on the flat land to the south-east of the area. In the Essex heathlands 18th and 19th-century enclosure of heathlands and commons followed by extensive 20th-century field enlargement is dominant. • Mixed farming, with arable land predominating in the Hertfordshire plateaux, parts of the London Clay lowlands and Essex heathlands. Grasslands are characteristic of the river valleys throughout. Horticulture and market gardening are found on the light, sandy soils of former heaths in Essex, particularly around Colchester, along with orchards, meadow pasture and leys following numerous narrow rivers and streams. • The diverse range of semi-natural habitats include ancient woodland, lowland heath and floodplain grazing marsh and provide important habitats for a wide range of species including great crested newt, water vole, dormouse and otter. • Rich archaeology including sites related to Roman occupation, with the Roman capital at Colchester and City of St Albans (Verulamium) and links to London. Landscape parklands surrounding 16th and 17th-century rural estates and country houses built for London merchants are a particular feature in Hertfordshire. • The medieval pattern of small villages and dispersed farming settlement remains central to the character of parts of Hertfordshire and Essex. Market towns have expanded over time as have the London suburbs and commuter settlements, with the creation of new settlements such as the pioneering garden city at Welwyn and the planned town at Basildon. • Brick-built dwellings are characteristic from the late 17th-century onwards. Prior to this dwellings and farm buildings tended to be timber built with weatherboarding, now mainly painted white but traditionally black or tarred, and whitewashed plaster walls.

Table G.2: Published regional landscape character

Landscape Character Area	Key characteristics	Published sensitivity to major transportation developments / improvements
Essex Landscape Character Assessment (Chris Blandford Associates, 2003)		
B1 Central Essex Farmland (potentially directly affected)	• Irregular field pattern of mainly medium size arable fields, marked by sinuous hedgerows and ditches. • Many small woods and copses provide structure and edges in the landscape. • Scattered settlement pattern, with frequent small hamlets, typically with greens and ponds. • A concentration of isolated moated farmsteads. • Network of narrow, winding lanes. • Mostly tranquil character away from major roads and Stansted Airport.	Moderate
B4 Gosfield Wooded Farmland (potentially directly affected)	• Flat to gently undulating landform. • Strong pattern of large and small woods, including distinctive ancient limewoods. • Irregular medium size arable fields, bounded by thick hedgerows with mature hedgerow trees. • Enclosed character. • Many small farmsteads, occasional hamlets and villages.	Moderate
C6 Blackwater/Brain and Lower Chelmer Valleys (potentially directly affected)	• Shallow valleys. • Predominantly arable farmland with well hedged medium to large fields. • The Brain and the Upper Blackwater Valleys are narrow with undulating valleysides. • The Lower Chelmer, and the Blackwater near Maldon, have wide flat valley floors, and gentle valley sides. • Extensive linear poplar and willow plantations are a distinctive feature.	Moderate
D4 Tiptree Ridge (potentially directly affected)	• Elevated, broad ridge. • Strongly wooded western ridgeside. • Small to medium scale field pattern. • Enclosed character provided by many tall, thick hedgerows and woodland. • Framed views over the Blackwater Valley and the Blackwater coastal farmlands.	High

Landscape Character Area	Key characteristics	Published sensitivity to major transportation developments / improvements
E2 South Colchester Farmlands (potentially directly affected)	• Mix of small regular pasture and large arable fields. • Dense woodland in the Roman River valley. • Enclosed, intimate character in the north, more open in the south. • Complex settlement pattern of nucleated and linear villages/hamlets, and farmsteads along dispersed lanes. • Distinctive elongated large waterbody of Abberton Reservoir within a shallow valley.	Moderate
G2 Chelmsford and Environs (potentially directly affected)	• Historic town with extensive residential estate development spreading over a gently sloping valleyside landform. • Wide riverside corridors of green space except in the town centre. • Fringe of mixed farmland with variable size hedgerowed fields, with few woods or copses. • Large villages of Writtle and Galleywood physically separated from the town, but with much development of an urban character.	Moderate
G4 Colchester and Environs (potentially indirectly affected)	• Historic town core with a strong grid pattern on a low hill above the River Colne. • Residential and commercial development wraps over valleysides or slightly elevated flatter land. • Uninterrupted valley floor of the Colne forms a ribbon of green space running through the centre of the urban area. • Large blocks of woodlands and open spaces on some valleysides. • Variable size regular hedgerowed fields in the fringing farmland.	Moderate

Table G.3: Published local landscape character

Landscape Character Area	Key characteristics	Suggested landscape planning and land management guidelines (not all relevant to Proposed Scheme)	Published sensitivity to change
Braintree, Brentwood, Chelmsford, Maldon and Uttlesford Landscape Character Assessment (Chris Blandford Associates, 2006)			
A6 Upper Chelmer River Valley (unlikely to be affected)	Whilst this LCA falls within the study area, it is unlikely that it would be directly or indirectly affected because it is approximately 2km from the Proposed Scheme at the nearest point and the urban extent of Chelmsford and intervening vegetation would limit intervisibility between this landscape and the Proposed Scheme.		
A7 Lower Chelmer River Valley (potentially directly affected)	• Shallow valley • Predominantly arable farmland on the valley slopes • The Lower Chelmer where it meets the River Blackwater has gentle valley sides • Overall strong sense of place and tranquillity away from Maldon and the A12 and the railway line. Whilst not assessed within the publication, the adjoining urban edge of Chelmsford is relevant to the Proposed Scheme. Key characteristics of the urban edge character has been defined as part of the scoping study as follows: • Commercial and industrial area west of the A12 on the eastern periphery of Chelmsford, with large scale buildings and areas of car parking. • Strong vegetation belt between the A12 and eastern edge of Chelmsford restricts intervisibility.	• Manage the traffic flows along the minor roads especially those not suitable for heavy goods vehicles (HGV) and lorries due to narrow bridges. • Ensure that new built development is in keeping with landscape character. • Conserve and enhance the landscape setting of settlements. • Enhance the screening of the A12 and the railway line. • Conserve and enhance the existing hedgerow pattern and strengthen through planting, where appropriate, to local landscape character. • Conserve and manage the ecological structure of hedges and ditches within the character area. • Conserve and promote the use of building materials, which are in keeping with local vernacular/landscape character.	High
A9 Blackwater River Valley (potentially directly affected)	• Shallow valley. • The valley sides slope gently up from the valley floor. • Predominantly arable farmland on the valley slopes. • The Lower Blackwater near the confluence with the River Chelmer has gently valley slopes.	• Manage the traffic flows along the minor roads especially those not suitable for HGVs and lorries due to narrow bridges. • Ensure that new built development is in keeping landscape character. • Conserve and enhance the landscape setting of settlements. • Enhance the screening of the A12 and the railway line.	Not published

Landscape Character Area	Key characteristics	Suggested landscape planning and land management guidelines (not all relevant to Proposed Scheme)	Published sensitivity to change
	• Overall strong sense of place and tranquillity away from the settlements of Braintree, Witham and Maldon and the A120, A12 and the railway line. Whilst not assessed within the publication, the adjoining urban edge of Witham is relevant to the Proposed Scheme. Key characteristics of the urban edge character has been defined as part of the scoping study as follows: • Commercial and industrial area west of the A12 on the eastern periphery of Witham (north of Blackwater Lane and the River Brain), with large scale buildings and areas of car parking. • Southern residential edge of Witham (south of Blackwater Lane and the River Brain), comprising typical twentieth century housing. • Strong vegetation belt between the A12 and eastern and southern edges of Witham restricts intervisibility.	• Conserve and enhance the existing hedgerow pattern and strengthen through planting, where appropriate, to local landscape character. • Conserve and manage the ecological structure of hedges and ditches within the character area. • Conserve and promote the use of building materials, which area in keeping with local vernacular/landscape character. • Manage the roadside flytipping and rubbish thrown from cars that lands in the road verges.	
Landscape sub area A9A (potentially directly affected)	• Mixture of arable and pastoral on the valley floor. • The River Blackwater Valley floor north of the A120 is narrow. • The River Blackwater near the confluence with the River Chelmer has a wide flat valley floor. Whilst not assessed within the publication, the adjoining urban edge of Witham is relevant to the Proposed Scheme. Key characteristics of the urban edge character has been defined as part of the scoping study as above under A9.		

Landscape Character Area	Key characteristics	Suggested landscape planning and land management guidelines (not all relevant to Proposed Scheme)	Published sensitivity to change
A10 Brain River Valley (unlikely to be affected)	Whilst this LCA falls within the study area, it is unlikely that it would be directly or indirectly affected because it is approximately 1km from the Proposed Scheme at the nearest point and the urban extent of Witham would limit intervisibility between this low lying valley landscape and the Proposed Scheme.		
B17 Terling Farmland Plateau (potentially indirectly affected)	• Rolling arable farmland. • Irregular pattern of medium to large scale fields. • Scattered settlement pattern, with frequent small hamlets, typically with greens and ponds. • Network of narrow winding lanes. • Mostly tranquil away from the A12 and A131.	• Ensure that new build is in keeping with landscape character. • Conserve and enhance the landscape setting of settlements. • Ensure any new development within the farmland is small-scale, responding to historic settlement pattern, landscape setting and locally distinctive building styles. • Conserve and enhance the existing hedgerow pattern, and strengthen through planting where appropriate to local landscape character. • Conserve and manage areas of semi-natural woodland as important historical, landscape and nature conservation features. • Conserve and manage the ecological structure of woodland, copses and hedges within the character area. • Conserve and promote the use of building materials, which are in keeping with local vernacular/landscape character.	Moderate
B18 Silver End Farmland Plateau (potentially indirectly affected)	• Gently undulating farmland. • Irregular predominantly large arable fields marked by sinuous hedgerows. • Many small woods and copses provide structure and edges in the landscape. • Scattered settlement pattern, with frequent small villages. • Network of narrow winding lanes. • Mostly tranquil character away from the major roads.	• Ensure that new build is in keeping with landscape character. • Conserve and enhance the landscape setting of settlements. • Maintain characteristic open views across the farmland. • Ensure any new development within the farmland is smallscale, responding to historic settlement • pattern, landscape setting and locally distinctive building styles. • Conserve and enhance the existing hedgerow pattern, and strengthen through planting where appropriate to local landscape character.	Moderate to high

Landscape Character Area	Key characteristics	Suggested landscape planning and land management guidelines (not all relevant to Proposed Scheme)	Published sensitivity to change
		• Conserve and manage areas of seminatural woodland as important historic, landscape and nature conservation features. • Conserve and manage the ecological structure of hedges within the character area. • Conserve and promote the use of building materials, which are in keeping with local vernacular/landscape character.	
B19 Langley Green Farmland Plateau (potentially directly affected)	• Flat to gently sloping landform. • Dominated by large arable fields. • Generally gappy and fragmented field boundaries especially adjacent to roads. • Settlement pattern consists of small villages with scattered farmsteads amongst predominantly arable land. • The houses are predominantly modern constructed from brick. • Overall strong sense of place and tranquillity away from the A120, A12 and the railway line.	• Ensure that new built development is in keeping with landscape character. • Conserve and enhance the landscape setting of settlements. • Conserve the mostly rural character of the area. • Consider the introduction of new structure planting to shield/mitigate the visual effects on the A120, A12 and railway line corridor. • Conserve and enhance the existing hedgerow pattern, and strengthen through planting where appropriate to local landscape character. • Conserve and manage the ecological structure of hedges and ditches within the character area. • Conserve and promote the use of building materials, which are in keeping with local vernacular/landscape character.	Low to moderate
B21 Boreham Farmland Plateau (potentially directly affected)	• Irregular field pattern of mainly medium size arable and pastoral fields, marked by hedgerows, banks and ditches. • Small woods and copses provide structure and edges in the landscape. • Scattered settlement pattern, with frequent small villages. • A concentration of isolated farmsteads.	• Consider the visual impact of new residential development and farm buildings in the surrounding agricultural fields. • Ensure any new development is small scale, responding to historic settlement pattern, landscape setting and locally distinctive building styles. • Conserve and enhance the existing hedgerow pattern, and strengthen through planting where appropriate to local landscape character.	Low to moderate

Landscape Character Area	Key characteristics	Suggested landscape planning and land management guidelines (not all relevant to Proposed Scheme)	Published sensitivity to change
	• Network of narrow winding lanes.	• Conserve and manage areas of ancient and seminatural woodland as important historical, landscape and nature conservation features. • Conserve and manage the ecological structure of woodland, copses and hedges within the character area. • Strengthen the recreational role of the water filled sand and gravel pits. • Conserve and promote the use of building materials, which are in keeping with local vernacular/landscape character.	
F3 Totham Wooded Farmland (potentially directly affected)	• Wooded ridges and hillsides to the east of the River Blackwater. • Predominantly agricultural fields enclosed by woodland patches or hedgerows with mature trees. • Filed boundaries vary; some thickly enclosed, as at Beacon Hill; some more open with gappy hedges. • Interest created by colour washed buildings both in villages and scattered in the landscape.	• Conserve and protect open views from Mountain Road, Braxted Lane and other rural lanes. • Ensure that any new development responds to historic settlement pattern and scale, and uses materials and colours that are appropriate to the local landscape character; such development should be well integrated into the surrounding landscape. • Conserve and restore existing hedgerow network where gappy and depleted especially on property boundaries or on field margins. • Conserve and enhance the ecological structure of woodland, copses and hedges within the character area. • Conserve, manage and enhance areas of semi natural and ancient woodland as important heritage, nature conservation and landscape features. • Conserve historic lanes and unimproved roadside verges. • Introduce arable field margins as a means to ensure that ploughing does not disturb mature trees within hedgerows. • Conserve and promote the use of local building materials which are in keeping with the local vernacular and landscape character.	High

Landscape Character Area	Key characteristics	Suggested landscape planning and land management guidelines (not all relevant to Proposed Scheme)	Published sensitivity to change
Colchester Borough Landscape Character Assessment (Chris Blandford Associates 2005)			
A2 Wooded Roman River Valley (potentially indirectly affected)	• Relatively steep and wooded slopes of narrow v-shaped Roman River valley (tributary of the Colne River). • Large areas of deciduous and coniferous (mixed) woodland on the valley slopes (e.g. Donyland Wood, Friday Wood and Chest Wood). • Small patches of ancient woodland on the valley sides. • Large regular fields on northern valley slopes with a concentration of smaller irregular fields at High Park Corner. • Several areas of historic parkland, often associated with halls, overlooking the valley Floor. • Views across and within the valley restricted by large woodland areas.	• Conserve the historic quay at Rowhedge, which makes a positive contribution to local landscape character. • Consider the landscape pattern and structure of large woodland areas, and the role that they have in the composition of views to and from the area. • Conserve and manage areas of ancient and semi-natural woodland as important landscape, historical and nature conservation features. • Conserve and manage the ecological structure of woodland, copses and hedges within the character area. • Strengthen the recreational role of the woodland resource.	Not published
A5 Colne River Valley Slopes (potentially indirectly affected)	• Relatively steep v-shaped valley slopes facilitate attractive and open views across and along the River corridor. • Principal road network consisting of narrow tree-lined (sometimes sunken) lanes traversing the valley sides to the north and south. • A mosaic of medium to large-sized irregular and regular, predominantly arable fields with medium hedgerows containing semi-mature/ mature hedgerow trees. • Some larger semi-enclosed arable fields to the west of Wakes Colne; and concentrations of smaller fields with intact hedge boundaries adjacent to settlements.	• Ensure any new small-scale development in, or on the edges of Fordham, Wivenhoe, West Bergholt and Colchester is of an appropriate scale, form and design and uses materials which respond to historic settlement pattern, landscape setting and locally distinctive building styles and materials. (Development opportunities are limited around Fordham due to the Woodland Trust site). • Ensure any new development on valley sides is small-scale, responds to historic settlement pattern, form and building materials. • Maintain cross-valley views. • Conserve views of the river and floodplain.	Not published

Landscape Character Area	Key characteristics	Suggested landscape planning and land management guidelines (not all relevant to Proposed Scheme)	Published sensitivity to change
	• Settlement pattern consists of small linear village settlements such as Wakes Colne and Eight Ash Green, adjacent to the north-south roads, which cross the River Valley; small hamlets and farmsteads.	• Ensure that new woodland planting is designed to enhance existing landscape character and species composition reflects local provenance. • Conserve and manage existing hedgerows (especially failing elm hedges). • Restore hedgerows using hawthorn and plant new hedgerow trees, particularly in areas of arable farmland. • Conserve and manage existing valleyside woodlands. • Encourage the planting of native alder and willow riverside trees where appropriate.	
B2 Easthorpe Farmland Plateau (potentially directly affected)	• Raised farmland plateau, dissected by the wooded Roman River valley in the east. • A mixture of small, medium and large irregular, predominantly arable fields. • Small patches of deciduous woodland and several ponds/ reservoirs. • Area crossed by a network of narrow, sometimes winding lanes. • Airfield, surrounded by large open fields has a dominant influence on the landscape character in the south of the area. • Settlement pattern consists of small villages and hamlets with scattered farmsteads amongst predominantly arable agricultural land.	• Conserve the mostly rural character of the area. • Ensure that any appropriate new development responds to historic settlement pattern and uses materials, which are appropriate to landscape character (refer to the Essex Design Guide for Residential and Mixed Use Areas, Essex Planning Officer Association, 1997, for further information). Such development should be well integrated into the surrounding landscape. • Ensure that any development on the edges of Marks Tey and Copford responds to traditional settlement patterns and uses design and materials, which are appropriate to local landscape character. • New farm buildings such as sheds should be sensitively located within the landscape to respect local character and avoid the skyline. • Consider the introduction of new structure planting to shield/ mitigate the visual effects on the A12 / railway and settlement corridor (B2a). • Strengthen and enhance hedgerows with hawthorn where gappy and depleted.	Not published
Landscape sub area B2A (potentially directly affected)	• Linear settlement corridor extending from the western edge of Colchester Urban Area, including the western edges of Stanway, Copford village and Marks Tey in the west.		

Landscape Character Area	Key characteristics	Suggested landscape planning and land management guidelines (not all relevant to Proposed Scheme)	Published sensitivity to change
	• Northern boundary delineated by main A12 and railway corridor which is a dominant visual feature within the character area. • Visually dominant major road junctions/ roundabouts within the character area. • Landscape character is disturbed by the visual, movement and noise intrusion of cars on the A12 and also by frequent trains on the main railway line.	• Conserve and manage areas of ancient and semi-natural woodland (for example to the north east of Messing Lodge) as important landscape, historical and nature conservation features. • Conserve historic lanes and unimproved roadside verges.	
B3 Southern Colchester Farmland Plateau (potentially indirectly affected)	• An area of sloping farmland plateau (with a mixture of small, medium and large predominantly arable fields) bordered by Colchester settlement fringes to the north and the wooded Roman River Valley to the south. • Influence of the military (East Donyland military training area & Middlewick Rifle Ranges) – disturbs tranquillity whilst firing practice is taking place. • Several large patches of woodland extend from the northern slopes of the Roman River valley, onto the plateau. • Several small lakes and ponds, within disused sand and gravel works. • Character area provides physical and visual separation between Colchester urban area and the Roman River Valley. • Fragmented and sometimes chaotic landscape structure with numerous unrelated land uses.	• The reuse of redundant agricultural buildings, particularly black timber-framed and boarded barns, should be encouraged. • Ensure any new development responds to historic settlement pattern and uses materials which are appropriate to landscape character. • Screen existing visually intrusive modern housing development along the southern edges of Colchester (adjacent and north of Gosbecks archaeological park) with new structure planting. • Conserve and manage small patches of woodland which play an important role in framing views within and into/ out of the area. • Ensure any extensions to existing housing developments avoid visual intrusion. • Protect and manage areas of archaeological importance, including Gosbecks Park and the Iron-Age dyke system. • Strengthen and restore hedgerows where gappy and depleted.	Not published

Landscape Character Area	Key characteristics	Suggested landscape planning and land management guidelines (not all relevant to Proposed Scheme)	Published sensitivity to change
		• Seek ways to restore sand and gravel pits in ways which are enhance local landscape character (for example, creation of nature parks and diverse wildlife areas). • Avoid the use of visually intrusive tape fences surrounding and dividing horse paddocks. • Review the condition and use of existing PRoWs within the character area and prioritise action to repair and review footpaths.	
B4 Great Tey Farmland Plateau (potentially indirectly affected)	• Gently sloping farmland plateau consisting of a mixture of medium to large-scale enclosed, predominantly arable fields. • Linear belts and small patches of predominantly deciduous woodland. • Small nucleated settlements and scattered farmsteads. • Comprehensive network of footpaths and winding lanes. • Peaceful and tranquil atmosphere.	• Conserve the mostly rural character of the area. • Encourage the screening of visually intrusive modern farm buildings by using tree belts. • Ensure that any appropriate new development responds to historic settlement pattern and uses materials, which are appropriate to local landscape character (refer to the Essex Design Guide for Residential and Mixed Use Areas, Essex Planning Officers Association, 1997, for further information). • Conserve open views to landmark churches. • New farm buildings such as sheds should be sensitively located within the landscape to respect local character and avoid the skyline. • Conserve and enhance orchards as distinctive landscape features. • Encourage sensitive conversion of vernacular barns which respect traditional materials and built fabric and landscape character. • Conserve and manage the ecological structure of woodland, copses and hedges within the character area. • Conserve and manage areas of ancient and semi-natural woodland as important landscape, historical and nature conservation features.	Not published

Landscape Character Area	Key characteristics	Suggested landscape planning and land management guidelines (not all relevant to Proposed Scheme)	Published sensitivity to change
		• Strengthen existing hedgerows through planting of hawthorn and management of elm.	
F1 Messing Wooded Farmland (potentially directly affected)	• Sparse settlement pattern consisting of the small village of Messing, and a number of small isolated farmsteads. • Elevated plateau landform which is situated on a broad ridge and dissected by small streams, providing undulations in topography. • Large areas of mixed woodland (for example Layer Wood and Pods Wood). • Number of small ponds and lakes. • Single mature trees at field boundaries or standing within fields.	• Conserve the mostly rural character of the area. • Ensure that any appropriate new development responds to historic settlement pattern and uses materials, which are appropriate to local landscape character (refer to the Essex Design Guide for Residential and Mixed Use Areas, Essex Planning Officers Association, 1997, for further information). Such development should be well integrated with the surrounding landscape. • Encouraging restoration of redundant rural buildings. • Encourage screening, through tree planting, of visually intrusive modern farm buildings. • Maintain panoramic views across farmland plateau to the north. • Ensure that new farm buildings are sensitively designed and located within the landscape to accord with existing landscape character. • Conserve and restore the existing hedgerow network where gappy and depleted. • Conserve, manage and enhance large areas of woodland such as Pods Wood and Layer Wood (consider the use of traditional methods, such as coppicing and pollarding in keeping with existing landscape character). • Conserve and enhance areas of semi-natural and ancient woodland as important heritage, nature conservation and landscape features. • Conserve, manage and enhance smaller patches of woodland, taking into consideration the role that they play in	Not published

Landscape Character Area	Key characteristics	Suggested landscape planning and land management guidelines (not all relevant to Proposed Scheme)	Published sensitivity to change
		the creation of a distinctive landscape pattern to the north west of Tiptree. • Conserve historic lanes and unimproved roadside verges. • Introduce arable field margins as a means of ensuring that mature trees within hedgerows are not disturbed by ploughing. • Plant half-standard trees within field hedgerow boundaries to succeed over mature trees.	
F2 Tiptree Wooded Farmland (unlikely to be affected)	Whilst this LCA falls within the study area, it is unlikely that it would be directly or indirectly affected because it is approximately 2km from the Proposed Scheme at the nearest point and intervening vegetation would limit intervisibility between this landscape and the Proposed Scheme.		
G2 Tiptree Urban Landscape	Urban areas are not assessed within the publication.		
G4 Colchester Urban Landscape			

G.2 Representative viewpoints

Table G.4: Representative viewpoints (illustrated on figure 8.3)

Representative viewpoint	Justification
1	View from New Hall registered park and garden taken from Centenary Circle long distance path towards junction 19.
2	View west from junction of Main Road, Boreham with Paynes Lane (PRoW). Possible photomontage location to illustrate views towards junction 19.
3	View from the Chelmer and Blackwater Navigation conservation area where the Centenary Circle long distance path meets the eastbound towpath (PRoW) looking towards junction 19 and Boreham House registered park and garden.
4	View to show pinch point at Station Road, Hatfield Peverel
5	View west from new development towards junction 20.
6	View from overbridge looking east to show widening and potential borrow pit in arable field to the right beyond hedgerow.
7	View from residential properties north along Maldon Road towards A12 crossing. Possible photomontage location to illustrate potential bridge widening and loss of vegetation.
8	View north east along Blackwater Rail Trail Country Park to show A12 crossing and potential borrow pit to the east.
9	View west of A12 from Whetmead local nature reserve.
10	View south from Little Braxted Lane/National Cycle Route.
11	View north east across Colemans Farm Quarry. Possible photomontage location to show Proposed Scheme in context of quarry restoration plan.
12	View looking west from Braxted Park registered park and garden over Blackwater Valley towards A12.
13	View west from Henry Dixon Road/Braxted Road, Rivenhall.
14	View south west from residential properties in Cranes Lane, Kelvedon.
15	View south from Ewell Hall Lane/Kelvedon conservation area across proposed balancing pond towards A12.
16	View south east from Brockwell Meadows local nature reserve or PRoW along World's End Lane, Kelvedon.
17	View north west from Inworth Lane (or nearby PRoW), near Inworth Hall (grade II listed) across potential borrow pit towards A12.

Representative viewpoint	Justification
18	View of north west along Prested Hall drive from PRoW towards A12. Possible photomontage location to illustrate views towards junction 24.
19	View west from PRoW, Easthorpe Road.
20	View from PRoW near Easthorpe Green Farm.
21	View north from PRoW, Easthorpe village.
22	View south east from PRoW near Doggets Hammer Farm (grade II listed), Potts Green. Possible photomontage location.
23	View south east from PRoW at Marks Tey recreation ground.
24	View west from PRoW next to Marks Tey Hall (grade II* listed building).
25	View north west from residential area London Road, Marks Tey
26	View west from new housing Oakwood Meadows, Stanway towards A12 junction 25.

Appendix H. Arboricultural survey strategy

H.1 Purpose of arboricultural survey strategy

H.1.1 The purpose of this arboricultural survey strategy is to set out the approach, rationale and strategy for identifying and recording arboricultural features that may be lost or impacted upon by the Proposed Scheme.

H.1.2 The intention is to allow for a proportionate and appropriate survey approach to tree data collection to provide category and definition criteria, together with information to provide adequate tree protection during the construction phases in line with guidance given in British Standard 5837 2012: Trees in Relation to Design, Demolition and Construction – Recommendations.

H.2 Approach to arboricultural surveys

H.2.1 The arboricultural surveys have a focus on capturing tree data on woodlands, potential and verified veteran/ancient trees and on notable/mature trees that are likely to be lost or impacted upon by the Proposed Scheme. For B and C grade trees (BS5937 categories) these will be grouped where possible. The approach (whilst deviating from the British Standard) ensures an efficient and pragmatic approach to tree data collection.

H.2.2 Table H.1 sets out the survey elements and proposed approach for each, and demonstrates the targeted methodology proposed to allow for a proportionate and appropriate survey approach.

H.2.3 Existing public domain data such as the Woodland Trust's Ancient Tree Inventory will be referenced to identify known ancient and veteran trees that may be located in or close to (15m buffer zone) the scheme's Order Limits.

H.2.4 Desk study information will be used to identify where field surveys are required. This strategy will adopt the British Standard calculation for root protection zones. A desk study will assist in locating potentially notable trees prior to and, as appropriate, site assessments as detailed in table H.1.

H.2.5 In addition to providing information detailing preliminary root protection areas (RPA), ad-hoc site visits may be required to provide detailed RPA information for tree groups and woodlands, as well as confirm above ground constraints i.e. low branch formation and enabling pruning works to BS 3998 2010: Tree Work-Recommendations.

H.2.6 The arboricultural survey method will also draw upon the following parallel programs of work:

- engagement with environmental regulators, public bodies and other stakeholders
- ongoing design development, identification of potential mitigation measures
- construction planning, and the draft Code of Construction Practice and Environmental Management Plan

H.3 Arboricultural surveying methodology

H.3.1 The surveying methodology will make the most of detailed desk study data, high-resolution digital aerial photography, GIS, known ancient and veteran trees data and ecological identified tree features together with other project information available at the time of assessment. This will target resources to key areas that may need further study, including field surveys. This approach is detailed in table H.1.

Table H.1: Arboricultural survey elements and proposed survey methodology

Feature and justification for scoping in/out	Proposed approach and benefits	Best practice and details of any deviations	Justification, precedents and solutions
Desk study	A data search using the following sources: • available web-based data, including those held by MAGIC map, and the Woodland Trust • local authority records on Tree Preservation Orders and Conservation Areas • historical aerial photography • data from project ecology surveys • design information	N/A	Desk studies will focus field surveys on notable trees likely to be affected, and where information from other sources is not available.

Feature and justification for scoping in/out	Proposed approach and benefits	Best practice and details of any deviations	Justification, precedents and solutions
Tree data collection	The study area will encompass the proposed order limits (scheme boundary), plus a buffer extending 15m beyond. The rows below set out the criteria for tree features to be included within the survey.	Consistent with best practice and BS5837: 2012	In open ground areas the risk to tree roots from excavation activities are increased e.g. ground compaction and soil stripping. BS5837: 2012 provides a maximum root protection area of 15m for any given tree feature. The suggested protection distances from Natural England and the Forestry Commission for ancient and veteran trees will be applied for those trees verified as such (as per the Woodland Trust's Ancient Tree inventory) and identifiable on the ground.
Woodlands	Where appropriate, woodlands within the survey zone will be recorded and the largest tree will be measured and stem diameter used for off-setting the root protection area across the woodland block.	Consistent with BS5837: 2012	Applying the largest protection off set will protect all trees within the woodland area.
Groups and Highways trees	Wherever possible trees will be grouped and, where appropriate, the largest measurements recorded and used for off-set calculations of root protection areas. Highway vegetation will be grouped and recorded as either forming one continuous canopy block or as sparsely planted plots.	Consistent with BS5837: 2012	It is likely that existing highway vegetation is at risk of removal and is suitable to be grouped for mitigation purposes. Note: Any observed large legacy trees within groups will be surveyed as individual trees.
Hedgerows	Alignment of hedgerows will be indicated on plans, however, will not form part of the tree assessment unless deemed to be of exceptional quality and contain old coppiced or layered tree stems.	Deviation from BS5837: 2012	Hedgerows are being assessed as part of the project's ecology surveys.

Feature and justification for scoping in/out	Proposed approach and benefits	Best practice and details of any deviations	Justification, precedents and solutions
Individual trees	Only deemed notable trees will be recorded. It is envisaged that all trees with a stem diameter less than 300mm will be discounted and potentially others with a larger stem size if not considered notable. Where veteran, ancient or notable tree designation, as per the Ancient Tree Inventory, is confirmed during the survey this will be noted in the survey data. If the surveyors consider a tree to potentially fall into one of these designations but it is unverified or not identified as such, then this will also be noted within the survey data.	Deviation from BS5837: 2012	The survey strategy aims to highlight the larger notable trees that may be impacted, for this reason the stem diameter size has been increased from the BS guidance >75mm to >300mm.

H.4 Site data collection

H.4.1 This section lays out a pragmatic approach to collecting tree information whilst seeking to reduce the number of features surveyed by grouping trees where appropriate. An example of the standard data collected for each feature is contained within table H.2

H.4.2 The collection of tree data will be targeted to include notable arboricultural features which will be verified across the scheme to include trees over certain stem diameters only (see table H.1 for details). Where the presence of Tree Preservation Orders are known prior to site work, these will be included within the tree survey.

H.4.3 Each individual tree, group of trees, or woodland block will be given a unique reference number based on its location with regards to the Proposed Scheme. Note: only hedgerows meeting our criteria will be given a unique reference number.

H.4.4 T, G, W or H will be used to reference trees, groups of trees, woodland and those hedgerows meeting the criteria referenced in table H.1 respectively.

H.4.5 Data recorded for tree groups, woodland blocks and hedgerows will provide a generic root protection offset based on the largest stem size recorded.

H.4.6 The tree surveyors will use their judgement and experience based on observed features and proposed distances to construction areas to determine the extent of the trees to be surveyed (the maximum protection radius applied within BS5837 is 15m). Fixed point information and handheld GPS devices will be used to assist surveyors.

H.4.7 As far as reasonably practical vegetation will be surveyed in groups with the largest tree measurements recorded. Information relating to the total number of trees likely to be impacted within a group or woodland will be estimated. Arboricultural surveyors will use distometers, clinometers and diameter measuring tapes for recording tree measurements. Common names will be used for tree species.

H.4.8 The following data are to be collected for features surveyed:

- Unique tree reference number.
- Height of tree features will be measured to the nearest metre.
- Stem diameter will be recorded in millimetres.
- The cardinal points will be used to determine crown spread and recorded to the nearest metre.
- Life stage will be recorded using young, semi-mature, early mature, mature and over-mature.
- Overall condition will be based on ground based visual tree assessment techniques and will consider structural and physiological factors.
- General observations and comment will detail where applicable particular tree features and significant defects such as habitat holes, storm damage fractures and prolific ivy.
- Category grading will follow that of BS5837: 2012
- Veteran and ancient trees will be recorded as such where verification of this status has been previously obtained (i.e. Ancient Tree Inventory). Trees considered as potential veteran or ancient trees (i.e. not verified or easily identifiable as such during the survey) by the surveyors will be indicated as such within the survey data although the survey methodology does not include a specific assessment for either of these status groups.

H.4.9 Table H.2 indicates the data fields to be collected for the tree survey.

Table H.2: Adapting the guidance in BS5837: 2012 the following data fields will be collected

Tree Ref. No.	Species	Height (m)	DBH (mm)	Crown spread (m)				Life stage	Overall condition.	General observations and comments	BS category grading	Designation status (ancient woodland or verified veteran/ancient/notable tree - or potential candidate)
				N	E	S	W					

H.5 Reporting

H.5.1 Following the completion of the tree survey the data will be used to produce an Arboricultural Impact Assessment (AIA) report with an accompanying Tree Constraints Plan developed within GIS.

H.5.2 The GIS based model will comprise of all features included within the survey shown as follows:

- Individual trees – tree stem location based on either aerial imagery or GPS enabled device, canopy extents based on the four cardinal compass point measurements and a calculated RPA as a circular area.
- Tree groups, woodlands and hedgerows– an indicative polygon shape representing the canopy area, as per the aerial imagery used during the survey and plotted whilst in the field. The RPA buffer applied to the polygon based on the largest tree stem diameter recorded for that feature. This would be applied as either a buffer to the canopy extents or; off-set with canopy spread data for the group thus reducing the RPA to extend from generic tree stem locations.

Appendix I. Species survey scope and methodology

Survey	Methodology	Survey area and timeframe	Surveys undertaken and proposed programme
Desktop records	• The Barn Owl Conservation Network (BOCN) will be contacted for their barn owl breeding records for a 1.5km buffer to update those obtained in 2017. • Essex Badger Group will be contacted for their badger records to update those obtained in 2017. • Essex Bat Group will be contacted for their bat records to update those obtained in 2017.	• Records for a 1km buffer (1.5km for barn owls) to be obtained prior to statutory consultation	• Records obtained in 2017, and to be updated prior to statutory consultation
Badger	Walk over survey in key habitats (woodlands, field edges etc.) to identify potential setts and habitats (Harris et al., 1989). If deemed necessary and based on results of sett identification survey, setts will be monitored to determine sett classification (main breeding sett; annex; subsidiary; or outlier) and whether the sett is in active use (Harris et al., 1989). If deemed necessary, based on results of sett identification survey and likely impact, a badger territory survey will be conducted by leaving peanuts (baited with different coloured balls and mixed in syrup / molasses) at main setts and other appropriate locations (Delahey et al., 2000). The bait would be provided daily for at least 10 - 21 consecutive days and the area searched each day for latrines, which would indicate the territorial area of each main sett.	• 250m • All year round possible	• First survey - March to July 2017 • Full updated survey – November 2019 to September 2020

Survey	Methodology	Survey area and timeframe	Surveys undertaken and proposed programme
Barn owl	Barn owl habitat will be surveyed in accordance with Shawyer (2011). This is a four-stage process; an initial desktop study, stage 1 field surveys to scope habitats and broadly define habitat features of potential value, stage 2 field surveys to identify potential nest sites, active roosts and potential foraging and commuting habitat, and lastly, stage 3 surveys to confirm the presence of occupied breeding sites.	• For stages 1 and 2: • 200m buffer for online widening sections • 1.5km buffer for offline sections • 50m for borrow pits For stage 3, surveys will only be undertaken up to 500m from offline sections (a deviation from best practice but considered sufficient to provide a robust baseline and consistent with the approach on other HE schemes). Stage 1 and 2 can be undertaken at any time. Stage 3 surveys should avoid March to May when young may be more susceptible to disturbance.	• First survey - July to October 2017 • Full updated survey – November 2019 to September 2020
Bats (activity and roosts)	All bat surveys will be carried out with reference to standard survey methodology (Collins, 2016). Ground roost assessments for trees, buildings bridges/culverts were undertaken in accordance with Collins, 2016. Trees identified as having potential to support roosting bats (as well as previously confirmed roosts) will be subject to climbing inspections where it is safe to do so. Climbing surveys will replace dusk emergence / dawn re-entry surveys where they can be safely undertaken as it is evidenced that these surveys are more effective at detecting roosts (Bat Tree Habitat Key, 2018). Climbers will inspect potential roost features for signs of use by bats (e.g. droppings, presence of live or dead bats). Data collected will be used to up or down grade roost categories and to inform the need for additional climbing surveys throughout the summer.	• Roosts (structures and trees) – up to 100m from order limits; footprint of borrow pits • Activity – up to 1km – dependent on transect route • April to October with the exception of hibernation surveys from November to February	• First survey - April 2017 through February 2018 • Ground roost assessments updated between November 2019 and September 2020, with the majority of work completed by March 2020 • Full updated survey (transects, statics, dusk/dawn

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<tr><th>Survey</th><th>Methodology</th><th>Survey area and timeframe</th><th>Surveys undertaken and proposed programme</th></tr>
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Survey effort is shown in the table below. Trees with low potential will not be surveyed. A hibernation (winter) tree climb will be undertaken for trees winter 2019/20 or 2020/21.
<table>
<tr><th rowspan="2">Roost suitability</th><th colspan="2">Offline</th><th colspan="2">Online</th><th rowspan="2">Borrow pits</th></tr>
<tr><th>Up to 50m</th><th>50-100m</th><th>Up to 25m</th><th>25-100m</th></tr>
<tr><td>Confirmed</td><td>3</td><td>2</td><td>3</td><td>2</td><td>3</td></tr>
<tr><td>High</td><td>3</td><td>2</td><td>2</td><td>1</td><td>3</td></tr>
<tr><td>Moderate</td><td>2</td><td>1</td><td>2</td><td>0</td><td>2</td></tr>
<tr><td>Low</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
</table>
Buildings, structures and trees which cannot be inspected from ground level or safely climbed, which have been identified as having moderate or high potential to support roosting bats (and low potential for building, bridges and culverts) will be subject to dusk/dawn emergence and re-entry surveys. Survey effort for buildings and bridges/culverts is shown in the table below.
Any buildings, bridges/culverts with hibernation roost potential will be surveyed in winter 2020/21.
Bat activity surveys in the form of walked transects will be undertaken along pre-determined routes walked previously in 2017. Sixteen transects designed to be representative of bat foraging and commuting habitats along the scheme and associated borrow pits will be walked by a team of two ecologists stopping at listening points at regular intervals during the survey period.
Five additional transects designed using methods specified by Berthinussen & Altringham et al., (2015), have been designed to detect changes in bat activity in relation to the Proposed Scheme. Each transect will be walked by a team of two ecologists stopping for 10
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<td>emergence/re-entry surveys and summer climbing surveys) - April 2020 to October 2020
• Outstanding hibernation surveys to be completed November 2020 – February 2021.</td>
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<tr><th>Survey</th><th>Methodology</th><th>Survey area and timeframe</th><th>Surveys undertaken and proposed programme</th></tr>
<tr><td></td><td>
minute spot checks at pre-determined stopping locations. These transects will be walked twice a year, once walking away from the Proposed Scheme in June and once walking towards the Proposed Scheme in July.
Thirty-six static bat detectors will be deployed on site to monitor bat flight lines and levels of bat activity. Static detectors will be deployed for a minimum of five nights a month for six months (May to October).

<table>
<tr><th rowspan="2">Roost suitability</th><th colspan="2">Offline</th><th colspan="2">Online</th><th rowspan="2">Borrow pits</th></tr>
<tr><th>Up to 50m</th><th>50-100m</th><th>Up to 25m</th><th>25-100m</th></tr>
<tr><td>Confirmed</td><td>3</td><td>2</td><td>3</td><td>2</td><td>3</td></tr>
<tr><td>High</td><td>3</td><td>2</td><td>3</td><td>2</td><td>3</td></tr>
<tr><td>Moderate</td><td>2</td><td>1</td><td>2</td><td>0</td><td>2</td></tr>
<tr><td>Low</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td></tr>
</table>

Surveys designed to identify the presence and relative frequency of bats crossing the scheme are being undertaken monthly between May and October. These crossing point surveys are being completed at five locations by a team of two ecologists at each location. The locations were determined during surveys completed in 2017. Each survey involves a team of two ecologists recording the number of times bats cross the scheme. Where possible the species and height will also be recorded. The ecologists will use bat detectors and an infra-red camera and lighting to help identify the bats crossing the scheme.
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Survey	Methodology	Survey area and timeframe	Surveys undertaken and proposed programme
Breeding birds	Key habitats within 250m of the Proposed Scheme have been identified using aerial maps and Phase 1 habitat data. Breeding bird surveys comprise walking pre-determined transects through habitats with the potential to be impacted by the Proposed Scheme. Surveys will be undertaken following best practice guidance (Gilbert et al., 1998). Up to 11 transects will be visited once a month for four months between April and July. Up to four transects will be walked by two survey teams beginning at dawn and finishing before midday.	• 250m • April to July • Survey results from 2017 are considered valid and therefore 2020 surveys will aim to fill in any gaps in survey coverage due to previous land access issues or design changes.	• First survey - April to July 2017 • Gap fill survey - April to July 2020
Dormouse	Nest tubes are to be installed and checked once per month (Bright et al., 2006). The number of tubes will be appropriate for the habitats to be surveyed, with at least ten tubes in each sample area. Habitats to be surveyed will include the most suitable habitats for dormouse and checks will ensure that 20 index points are achieved to ascertain presence / likely absence.	• Up to 250m from Proposed Scheme where habitat linkages exist. • April to November. • Surveys in 2020 will include any sites not previously surveyed in 2017 and any site that failed to meet the minimum index score required to determine absence at that time. Surveys will also target areas of good connectivity with areas of good habitat within the wider landscape.	• First survey - June to November 2017 • Focused repeat and new survey area - April to November 2020

Survey	Methodology	Survey area and timeframe	Surveys undertaken and proposed programme
Freshwater environment (fish, invertebrates, aquatic habitats and plants)	River Habitat Survey (RHS): Ten spot checks at 50m intervals (Environment Agency, 2003) along watercourse recording channel morphology and modification, bank structure, flow type and surrounding land use. These surveys give a high-resolution survey of the physical habitat structure of the river reach and can be used to indicate the variety and quality of channel, bank and riparian habitat types, along with modifications to the habitat. Once completed, RHS data is sent to the Environment Agency and compared to a nationwide network of reference sites. Outputs of RHS surveys are the Habitat Quality Score (HQS) and Habitat Modification Score (HMS).	• Waterbodies within 500m • Spring to autumn	• First survey - May to October 2017 • Full updated survey - Spring to Autumn 2020
	Macrophyte surveys: Plant species will be identified and assigned a cover value, based upon their distribution throughout the reach (Environment Agency, 2011). Data collected will be used to calculate standard WFD macrophyte metrics.	• 100m of each watercourse crossed by the Proposed Scheme • Summer	• New survey - Summer 2020
	Aquatic macro-invertebrates: At each site a macro-invertebrate sample will be collected alongside associated environmental information using a handheld water quality instrument and visual assessment by a two-person team. Following standard guidance (Environment Agency, 2008) one surveyor will enter the water to collect a standard 3-minute kick sample, using a pond net to disturb the substrate and margins. This will be followed by a 1-minute hand search of rocks/submerged objects/plants. Samples will be preserved in Industrial Methylated Spirit and returned to the laboratory for analysis.	• 100m of each watercourse crossed by the Proposed Scheme • Two surveys, one in Spring and one in Autumn	• New survey - Spring 2020 • New survey - Repeat in Autumn 2020

Survey	Methodology	Survey area and timeframe	Surveys undertaken and proposed programme
	White Clawed Crayfish: If suitable habitats are identified, white-clawed crayfish will be surveyed following standard monitoring protocol (Peay, 2003). Surveys will be undertaken under a Natural England class licence. One member of the team will work within the channel setting baited traps and undertaking manual searches. If water is clear and less than approximately 60cm deep manual searching will conducted, searching under stones for crayfish, sweep netting in vegetation and under tree roots for up to 45 minutes. Trapping is used in watercourses that are too deep or turbid for manual searching. Plastic mesh traps with funnel entrances are baited with scraps of fish, although cat food can be used. Funnel traps are normally set one day and inspected the next morning. Traps are set from the bank with no need to enter the water and fix discretely to the bank edge. Any white-clawed crayfish will be identified, measured (carapace length) and returned to the watercourse. Any non-native crayfish are not permitted by law to be returned to the watercourse, they will be humanely destroyed in accordance with statutory guidance.	• 100m of each watercourse crossed by Proposed Scheme • Habitat suitability – March/April • Species survey – between Spring and Autumn	• New survey - Habitat suitability – March/April 2020 • New survey - Species survey – between Spring and Autumn 2020

Survey	Methodology	Survey area and timeframe	Surveys undertaken and proposed programme
	Electric fishing surveys: Where desk data is deficient, electric fishing surveys will be carried out by qualified and experienced ecologists in accordance with standard guidelines (Beaumont, 2002, Environment Agency, 2011, Environment Agency, 2007, British Standards Institution, 2003). Surveys are conducted by placing a stop net at two points across the watercourse to create a 100m section from which fish cannot escape. Survey teams will be comprised of a minimum of three surveyors (when using the backpack in small watercourses) and maximum of four surveyors (watercourses over 5m in width and/or when using a boat). The lead surveyor will operate the anode and a hand net and where required will be followed by another surveyor to capture any fish missed and to operate the emergency stop button on the backpack (on very small watercourses this can be done by the surveyor on the bank). Wider sections of watercourses up to 5m wide may require the use of two surveyors with linked anodes and one surveyor to capture missed fish (leaving the fourth surveyor on the bank to man the control box and offer assistance). Sections requiring the use of the boat will require two surveyors in the boat with the electric fishing gear one with the anode another with a net. The other two surveyors will be towing the boat/providing assistance. Conditions at the time of survey will dictate the requirement for one or two anodes. Data collected including the species of fish recorded and their abundances.	• 100m of each watercourse crossed by Proposed Scheme • Habitat suitability – March/April • Species survey – between spring and autumn	• New survey - Habitat suitability – March/April 2020 • New survey - Species survey – between Spring and Autumn 2020
	PSYM (Predictive System for Multimetrics) pond surveys: Ponds will be sampled using the PSYM methodology (Pond Action, 2002) developed by the Freshwater Habitats Trust (previously known as Pond Action). This is carried out by means of a kick sample. Additionally, an assessment will be made of aquatic flora. In addition, physical water quality measurements will be taken using a hand-held water quality probe. The results of the surveys are sent to the Freshwater Habitats Trust who provide the PSYM output.	• Only ponds that will be lost to the Proposed Scheme or those which are hydrologically connected to it will be considered for survey	• New survey - Summer 2020

Survey	Methodology	Survey area and timeframe	Surveys undertaken and proposed programme
Great crested newt	Great crested newt surveys were undertaken in 2017. However, since then Natural England have introduced 'District Level Licensing (DLL)', which is applicable, in 2020, to the Proposed Scheme. No further surveys are proposed. Continuing liaison with Natural England's DLL team.	• N/A	• Habitat Suitability Index (August 2016 to February 2018); population surveys (April to June 2017); eDNA (April to June 2017) • Habitat Suitability Index updated for a large proportion of ponds between 2019 and March 2020
Otter	The otter survey will reference standard survey methodology (Chanin, 2003) and involve systematically walking all pre-determined watercourse and waterbodies to search for evidence of otter, including: holts, spraints, footprints, slides, feeding signs (fish scales etc.) and actual sightings.	• All waterbodies within 200m of the online sections of the Proposed Scheme • 500m of offline sections • All year-round surveys possible, dependent on water levels	• First survey - August and September 2017 • Full updated survey – spring/summer 2020

Survey	Methodology	Survey area and timeframe	Surveys undertaken and proposed programme
Phase 1 habitat survey, including invasive species, important hedgerow assessment and National Vegetation Classification of key areas	Phase 1 habitat surveys (JNCC, 2010) were undertaken in 2019 and 2020 to infill gaps in previous years surveys. Further detailed botanical survey in line with National Vegetation Classification is proposed for Whetmead LNR and other potential Priority Habitats (up to 30 sites).	• 600m from the Proposed Scheme	• Phase 1 (August to October 2016, July to September 2017, September to November 2018, October to December 2019 and February 2020); Hedgerow (July to October 2017); National Vegetation Classification (September 2017). • Botanical survey of potential priority habitats – summer 2020.
Reptiles	Surveys were undertaken in 2017 which identified the presence of common reptile species. As it is possible to provide precautionary mitigation along the length of the scheme in construction by assuming presence in all suitable habitats (unless absence has previously been proven and we are confident the results are still valid), there is no requirement for updated field survey until preconstruction. Desk study will be updated.	• Footprint of the Proposed Scheme	• First survey - August to October 2017 • No further survey proposed in 2020

Survey	Methodology	Survey area and timeframe	Surveys undertaken and proposed programme
Terrestrial invertebrates	Phase 1 surveys and aerial photographs will be used to identify suitable habitats that may be optimal for terrestrial invertebrates. If suitable habitats are identified a two-person survey team will carry out standard surveying protocols including, but not limited to, sweep netting, beating, aerial netting and hand searching of suitable habitats. Surveys will be carried out in line with Natural England's Surveying Terrestrial and Freshwater Invertebrates for Conservation Evaluation (Report NERR005). Each site will be subject to a visual appraisal and separated into stations for survey according to the size of the site, habitats, and likely species present. All samples will be timed to allow analysis by Natural England's Pantheon system if required.	• Within 600m of the combined extent of option routes • Four visits between May and September	• Habitat survey - August to October 2016, July to September 2017, September to November 2018, October to December 2019 and February 2020 • Species survey – May to September 2020
Water vole	Water vole survey will be undertaken with reference to Dean et al., 2016. Search for evidence of water vole, including: burrows, latrines, footprints, runs, feeding signs (grazed 'lawns') and actual sightings. Two surveys necessary, approximately two months apart.	• All waterbodies within 200m of the online sections of the Proposed Scheme • 500m of offline sections • April to October	• First survey - August to November and September 2017 • Full updated survey – April to September 2020
Wintering birds	Field surveys were undertaken in winter 2019/20 following guidance from British Trust for Ornithology Winter Farmland Bird Survey (Gillings, *et al.*, 2008). The purpose of the survey was to identify the importance of habitats around the Proposed Scheme for target bird species, defined as: species listed as qualifying features of nearby Special Protection Areas (SPA) and Ramsar sites that could be affected by the scheme; winter farmland birds; waders and waterfowl; and uncommon bird species, using professional judgement. Transects that extended approximately 500m from the Proposed Scheme were surveyed three times.	• n/a	• January to February 2017; November 2017 to February 2018 • Gap fill survey - winter 2019/2020 • No further survey

Appendix J. Public rights of way and other routes which meet or cross the A12 in the study area

PRoW / Route	Location	Baseline issues
Centenary Circle (regional trail)	Crosses study area in Springfield area of Chelmsford	Likely an important route for pedestrians and cyclists to use as a commute into Springfield Industrial Estate as well as for long distance walkers. Largely urban context for this trail within the study area.
Generals Lane	Leads from New Hall School to Boreham Interchange	Could potentially offer a useful route for cyclists to access Springfield Industrial Estate but it does not link with any settlement except for the boarding school so limited population to use the route.
Bridleway 23 and 45 (Boreham)	Close to junction 19 Boreham Interchange	Bridleway is severed by A12 and is therefore unlikely to be used. It connects with further bridleways on the north side of the A12.
Footpath 24 and 25 (Boreham)	Close to west side of Boreham	Footpath is severed by A12 and is therefore unlikely to be used. There are networks of PRoW that this footpath could connect to both north and south of the A12.
Footpath 21 (Boreham)	North side of A12, north of Boreham	Footpath is truncated by A12 and is therefore unlikely to be used at the point where it meets the A12.
Waltham Road	Crosses A12 on east side of Boreham	Provides main access across A12 for walkers, cyclists and horse riders. However there are no drop kerbs to reach the footway on the bridge so access would be difficult for wheelchair users/mobility scooters.
Terling Hall Road (Regional Route 50)	Crosses A12 approximately 950m west of Hatfield Peverel	Terling Hall road crosses the A12 via a bridge and links to Main Road (B1137). The bridge will be regularly used by recreational road cyclists as it forms part of cycle route 50 and also offers a means of crossing the A12 for walkers and horse riders.
Footpath 34 (Hatfield Peverel)	Crosses A12 via an underpass approximately 450m west of Hatfield Peverel	Public footpath provides a means for walkers to cross A12. Footpath may be used to walk between a small number of properties along Terling Hall Road north of A12 and Hatfield Peverel.
Bury Lane, Station Road and B1137	All cross A12 via bridges in Hatfield Peverel	Provide local road access across A12 allowing residents in Hatfield Peverel to cross between north and south of the village. Hatfield Peverel train station is on north side of village. The B1137 slip road bridge is used by substantial numbers of cyclists who use it to access the shared use path along the eastbound side of A12 as far as Witham.

PRoW / Route	Location	Baseline issues
Footpath 2 (Hatfield Peverel)	North side of A12 in Hatfield Peverel	Public footpath finishes at B1137 slipway where there is a footway and access into Hatfield Peverel via a bridge. Footpath is likely used by local residents for recreation.
Footpath 40 (Hatfield Peverel)	South side of A12 on east side of Hatfield Peverel	Public footpath follows a route of approximately 830m from Maldon Road in Hatfield Peverel to the point where it meets the A12 where there is a shared use path alongside the westbound carriageway of A12. The access from the footpath to the shared use path is stepped.
Footpath 29 (Hatfield Peverel)	South side of A12, terminates at B1389 Hatfield Road, junction 21 (Witham Interchange)	Public footpath heads southwards across fields from B1389 Hatfield Road. It links with the footway and can be used to walk into Witham.
Howbridge Hall Road	South side of A12 south of Witham	There is public access along this lane to the point where it meets the A12 where public access ceases. The lane then runs parallel to the A12 to Dengie Farm. It is unlikely to be used by the general public as it does not offer a meaningful route.
Footpath 95 (Witham)	Either side of A12 at Witham	A12 severs this public footpath. Aerial imagery does not indicate this footpath is in regular use.
B1018 Langford Road/Maldon Road	Passes under A12 at Witham	Key road connecting residential areas north and south of A12 in Witham. Road has footways either side.
Blackwater Rail Trail	Passes under A12 at Witham	Country park route which follows former railway line, passing under the A12 via an underpass. Likely used by walkers and cyclists for recreation. It also provides a cycle link between Witham and Maldon.
Footpath 101 (Witham)	Passes under A12 at Witham	Public footpath likely used by walkers for recreation. Can also be used to access Whetmead local nature reserve.
Footpath 103 (Witham)	Crosses A12 at grade at Witham	Public footpath could potentially provide access between Witham and fishing lakes at Little Braxted. However, this requires crossing the A12 at grade which would be extremely hazardous due to dual carriageway conditions. As a consequence it is likely that this footpath is used very rarely.
Little Braxted Lane (NCN Route 16)	South side of A12, terminates at junction 22 (Colmans Interchange)	Minor lane that connects hamlet of Little Braxted with Witham. There is a footway along the lane from the point at which an off-road cycleway meets the lane just south of the interchange. This lane also accommodates the Braintree to Colchester cycle route which is also part of National Cycle Network route 16 and so is likely used by a lot of cyclists negotiating the Colmans Interchange.

PRoW / Route	Location	Baseline issues
Oak Road	Rivenhall End	Oak Road in Rivenhall End is severed by the A12 but vehicles can get to/from the southern part of Oak Road from the westbound carriageway of the A12, and the northern part via the eastbound carriageway of the A12. There is no footway along the westbound A12 carriageway west of the junction but there is a footway which follows the westbound A12 carriageway east of the junction. There is a shared use path parallel with the eastbound carriageway which may be accessed from the northern side of Oak Road.
Henry Dixon Road	Rivenhall End	This road connects the north and south of Rivenhall End by passing under the A12 via an underpass. The road has a footway along one side and also has steps up to the footway on the westbound side of the A12 where there is a bus stop.
Footpaths 45 (Rivenhall), 36 (Rivenhall), 46 (Rivenhall), 32 (Kelvedon), 27 (Kelvedon) and also Snivellers Lane	Between Rivenhall End and junction 23 (Kelvedon South Interchange)	Each of these footpaths and the lane (unmetalled) terminates at the A12. The ones which meet the eastbound carriageway have access onto the shared use path that runs parallel to the A12, while the ones which meet the westbound carriageway have access to the footway. However, there are no crossing points across the A12 for any of these PRoW meaning pedestrians would have to cross at Rivenhall End or at junction 23 (Kelvedon South Interchange) where at grade crossings are required for the roads which pass under the A12 at the interchange.
Footpath 30 (Kelvedon)	Meets the A12 at junction 23 (Kelvedon South Interchange)	This footpath meets the on-slip at junction 23 (Kelvedon South Interchange) where an at grade crossing is required to get to the footway that follows the road under the A12. Further at grade crossings are then required to the shared use path along the B1024 London Road.
Maldon Road	Crosses A12 via bridge near Kelvedon	Connects Kelvedon to network of lanes and Tiptree south of A12. Likely to be popular with recreational road cyclists but may also be used by walkers seeking to access PRoW network to the south of the A12.
Footpath 25 (Kelvedon) / Ewell Chase	Crosses A12 via bridge near Kelvedon	Public footpath follows Ewell Chase. Likely to be a popular route for recreational walkers. Strava Global Heatmap data also indicates use of Ewell Chase by cyclists. It is likely these are off-road cyclists since Ewell Chase is unmetalled.
B1023 Inworth Road	Crosses A12 via underpass near Kelvedon	Provides access to Kelvedon from residents south of A12. There is no footway provision.
Footpath 18 (Feering)	A12 close to Feering	Public footpath links Feering with PRoW network east of A12, crossing the A12 via a farm access bridge.

PRoW / Route	Location	Baseline issues
New Lane, Feering	Meets A12 on north side at junction 24 (Kelvedon North Interchange)	There is a line of residential properties along New Lane. New Lane has a footway and connects to the shared use path that follows the eastbound carriageway of the A12. There is no means for pedestrians, cyclists or horse riders to cross the A12 at this location.
Footpath 15 (Feering)	Meets the A12 on the south side approximately 80m east of junction 24 (Kelvedon North Interchange)	Public footpath terminates at A12 where there are some properties. Due to the lack of crossing facilities it is likely that Footpath 18 (Feering) is more commonly used by local residents seeking recreational access.
Byway 5 (Feering), Footpath 3 (Feering), Domsey Chase (lane), Footpath 25 (Copford) and Footpath 11 (Marks Tey)	Meet the A12 eastbound carriageway between Hanover Bridge, Feering and Dobbies Lane, Marks Tey	These PRoW and lane all terminate at the A12 eastbound. There are no crossing points but they do link with the shared use path that follows the eastbound carriageway of the A12. They may be used by local residents to access bus stops along the A12 as well as to get to the shared use path. Domsey Chase is a metaled lane with a junction directly onto the A12 and so provides access to farms and isolated residential properties north of the A12.
Easthorpe Road, Dodding's Lane	Meet the A12 westbound between junction 24 (Kelvedon North Interchange) and junction 25 (Marks Tey Interchange)	These two lanes terminate at the A12 but there are no pedestrian or cyclist facilities at these points so they are likely only used by local motorised traffic. There are also three further lanes which provide direct access from the A12 westbound carriageway to individual properties.
Footpaths 22 (Copford), 19 (Marks Tey), 18 (Marks Tey)	Meet the A12 between Dodding's Lane and junction 25 (Marks Tey Interchange)	There is no footway at the A12 to offer Public Footpath 22 an onward route. However there is a footway where Footpaths 19 and 18 meet the A12 meaning these can be reached by residents at Marks Tey on the south side of the A12. There are no means of crossing the A12 at these locations, however.

PRoW / Route	Location	Baseline issues
Dobbies Lane, Marks Tey	Meets the A12 approximately 700m west of junction 25 (Marks Tey Interchange)	This lane provides an access between a large residential estate at Long Green, Marks Tey and Old London Road parallel to the A12 and the shared use path. There are several residential properties along Old London Road so there is potential that this lane is regularly used, potentially by schoolchildren heading to the school in Long Green, Marks Tey.
Footpath 15 (Marks Tey) and Footpath 16 (Marks Tey)	Meet the A12 approximately 430m and immediately west of junction 25 (Marks Tey Interchange)	These public footpaths follow the edge of Marks Tey Recreation Ground and link with Old London Road and the shared use path. Footpath 15 also connects to the large residential estate at Long Green, Marks Tey.
Footpath 17 (Marks Tey) and Footpath 20 (Marks Tey)	London Road and B1408 London Road in vicinity of junction 25 (Marks Tey Interchange) south of A12	These two footpaths connect with each other in fields south of residential properties in Marks Tey. They are therefore likely regularly used for local recreational walks by residents in Marks Tey south of the Marks Tey Interchange as a circular route can be made.
Station Road / North Lane / A120 / B1408 and junction Tey Marks Tey Interchange	Junction 25 (Marks Tey Interchange)	There are several residential properties along these streets. Evidence from Strava Global Heatmap indicates this road and Marks Tey Interchange are regularly used by runners and cyclists. There is a footbridge that crosses the A12 at Marks Tey and a staggered light controlled crossing over the A120. However the A12 and interchange effectively sever Marks Tey as access from the south side to the north side for pedestrians and cyclists is convoluted and difficult. The junction is likely regularly negotiated by cycle commuters heading to and from Colchester.

Appendix K. Preliminary WFD assessment

A12 Chelmsford to A120 Widening scheme

WATER FRAMEWORK DIRECTIVE PRELIMINARY ASSESSMENT

HE551497-JAC-EWE-SCHW-RP-LE-0006 | P02

20/10/20

HE551497

Contents

1. Introduction

1.1.1 This preliminary Water Framework Directive (WFD) compliance assessment report has been prepared for the Proposed A12 Chelmsford to A120 Widening scheme.

1.1.2 The purpose of this compliance assessment is to consider the impacts of any new activities in the water environment for the Proposed Scheme, and to ensure no change in the water body status of any connected water body.

1.2 Directive background

1.2.1 The WFD needs to be considered in the planning of all new activities in the water environment. The Environment Agency (EA), as competent authority in England and Wales, are responsible for delivering the Directive through the Environment (Water Framework Directive) (England and Wales) Regulations 2017[1].

1.2.2 EU Member states must meet the conditions of the WFD unless they meet the criteria laid out in Article 4.7. Any new activity must be reviewed against Article 4.7 for compliance. To be compliant, the following condition must be met: "*the beneficial objectives served by the modifications or alterations of the water body cannot, for reasons of technical feasibility or disproportionate cost be achieved by other means, which are a significantly better environmental option*."

1.3 National Networks National Policy Statement

1.3.1 The National Networks National Policy Statement (NNNPS) sets out the Government's policies to deliver the development of Nationally Significant Infrastructure Projects (NSIP) on the national road and rail networks in England. The Secretary of State uses the NNNPS as the primary basis for making decisions on Development Consent Order (DCO) applications.

1.3.2 Key policies from the NNNPS relevant to WFD include:

- Paragraph 5.219 notes that infrastructure development can have adverse effects on the water environment which could lead to adverse impacts on protected species and habitats and could, in particular, result in surface waters, groundwaters or protected areas failing to meet environmental objectives established under the WFD.
- Paragraph 5.222 states that for those projects that are improvements to the existing infrastructure, such as road widening, opportunities should be taken, where feasible, to improve upon the quality of existing discharges where these are identified and shown to contribute towards WFD commitments.
- Paragraph 5.226 states that in terms of WFD compliance, the overall aim of projects should be no deterioration of ecological status in watercourses, ensuring that Article 4.7 of the WFD Regulations does not need to be applied.

[1] 2017 SI No. 407 WATER RESOURCES, ENGLAND AND WALES. The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017

1.4 WFD objectives

1.4.1 The WFD requires that environmental objectives (as shown in table 1.1) are set for all surface and groundwater bodies.

1.4.2 Specific mitigation measures have been set for each River Basin District (RBD) to achieve the environmental objectives of the WFD. These measures are to mitigate impacts that have been or are being caused by human activity and to enhance and restore the quality of the existing environment. These mitigation measures will be delivered through the River Basin Management Plan (RBMP) through different organisations.

Table 1.1: Environmental objectives of the WFD

Objectives
Member States shall implement the necessary measures to prevent deterioration of the status of all bodies of surface water.
Member States shall protect, enhance and restore all bodies of surface water, subject to the application of subparagraph (iii) for artificial and heavily modified bodies of water, with the aim of achieving good surface water status by 2015.
Member States shall protect and enhance all artificial and heavily modified bodies of water, with the aim of achieving good ecological potential and good surface water chemical status by 2015. Where this is not possible and subject to the criteria set out in the Directive, aim to achieve good status by 2021 or 2027.
Progressively reduce pollution from priority substances and cease or phase out emissions, discharges and losses of priority hazardous substances.
Prevent deterioration in status and prevent or limit input of pollutants to groundwater.

Preventing deterioration in ecological status or potential

1.4.3 The WFD stipulates that all surface water bodies should meet good ecological status (GES) (or good ecological potential (GEP) if classified as an artificial or heavily modified water body) by a set timeframe. Overall ecological status (or potential) is made up of a number of biological, hydromorphological and chemical quality characteristics called elements. The overall status is determined by the lowest element status.

1.4.4 Any activity which has the potential to have an impact on ecology will need consideration in terms of whether it could cause deterioration in the ecological status or water body potential. It is, therefore, necessary to consider the possible changes associated with the Proposed Scheme.

1.4.5 Where there are sites protected under EU legislation, the Directive aims for compliance with any relevant standards or objectives for these sites. For the Proposed Scheme, this relates to designated sites that are within the study area and designated under the Habitats Directive, Nitrates Directive and others (see table 3.1).

Environmental objectives

1.4.6 The generic environmental objectives set out below (based on Article 4.1 of the Directive and as described in table 1.1) will be used for the assessment of the Proposed Scheme in relation to the Directive:

- no changes affecting high status sites
- no changes that will cause failure to meet surface water GES or GEP or result in a deterioration of surface water Ecological Status or Potential
- no changes which will permanently prevent or compromise the Environmental Objectives being met in other water bodies
- no changes that will cause failure to meet good groundwater status or result in a deterioration groundwater status

1.4.7 In addition, Article 4(1)(b) outlines the following objectives for the protection of groundwater bodies:

- prevent or limit the input of pollutants into groundwater
- prevent the deterioration in the status of groundwater
- protect, enhance and restore groundwater bodies with the aim of achieving 'Good' groundwater status by 2021 (or 2027 at the latest)
- implement measures necessary to reverse any upward trends in the concentration of pollutants resulting from human activity

1.5 Assessment stages

1.5.1 The following stages need to be followed to complete the assessment of the Proposed Scheme for its compliance with the Regulations. To undertake this assessment, the following methodology has been undertaken:

- **Data collection:** identification of relevant water bodies potentially affected by the Scheme
- **Scoping:** identifies the receptors and water body elements that are potentially at risk from the Proposed Scheme and need impact assessment
- **Impact assessment:** considers the potential impacts of the Proposed Scheme, identifies ways to avoid or minimise impacts, and indicates if the Proposed Scheme may cause deterioration or jeopardise the water body achieving GES or GEP.

2. Overview of the scheme

2.1.1 The A12 Chelmsford to A120 Widening Scheme (the 'Proposed Scheme') comprises improvements to the A12 between junction 19 (Boreham) at TL 741094, and junction 25 (Marks Tey) at TL 917238, a distance of approximately 24km, or 15 miles. Further information is provided in the Scoping Report Chapter 2.

2.1.2 In summary, the Proposed Scheme involves widening the A12 to three lanes throughout. It also includes safety improvements, including closing off existing at grade accesses, and removing access to cyclists along the scheme by providing an alternative route for walkers, cyclists and horse riders.

2.1.3 The Proposed Scheme would involve construction of a highway where the speed limit for any class of vehicle is expected to be 50 miles per hour or greater and would have a footprint greater than 12.5ha. The Proposed Scheme is therefore classed as a Nationally Significant Infrastructure Project (NSIP) under the Planning Act (2008), triggering the need to apply for a Development Consent Order.

2.1.4 The Proposed Scheme would require new crossings of watercourses and potential improvements to existing culvert and bridge crossings. This includes twenty proposed new culvert structures, and improvements to ten existing culvert structures and two existing bridges.

2.1.5 The Proposed Scheme falls under the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the 'EIA Regulations'). It falls under Schedule 2, section 10f, infrastructure projects, construction of roads unless included in Schedule 1. The selection criteria in Schedule 3 of the EIA Regulations have been used to screen the Proposed Scheme and identified the potential for significant effects. The Proposed Scheme will therefore require a statutory EIA to support the application for development consent.

2.1.6 The Proposed Scheme elements are listed below, which are assessed in this document:

- construction of borrow pits
- creation of construction compounds
- haul roads (both construction and use)
- highway structure (including highways drainage structure, watercourse crossings, culverts and outfalls)
- below ground structures including cuttings

3. Assessment

3.1 Data collection

3.1.1 A desk-based study has been carried out to inform this assessment, reviewing existing information for the Proposed Scheme and study area to develop an initial baseline for the WFD water bodies. The following are the key data sources:

- Environment Agency Catchment Data Explorer (CDE) (Environment Agency, 2020)
- Anglian River Basin Management Plan (Environment Agency, 2018)
- Designated areas (MAGIC map application, Defra, 2020)
- Drinking Water Safeguard Zones and Nitrate Vulnerable Zone maps (Environment Agency 2020)
- Urban Waste Water Treatment Directive maps (Defra, 2019)
- Geological maps (British Geological Society, 2020)
- Aerial photography (Google Earth, 2020)

Waterbodies in the study area

3.1.2 There are 10 WFD water bodies which could directly and/or indirectly interact with the Proposed Scheme; seven are WFD surface water bodies, two are transitional and coastal (TraC) (see figure 1 in Annex A); and there is one groundwater body (see figure 2 in Annex A). All are listed below and described in tables 3.1 – 3.3.

3.1.3 The seven WFD surface water bodies are:

- Chelmer (downstream confluence with Can) (GB105037033530)
- Boreham Tributary (GB105037033910)
- Ter (GB105037033940)
- Brain (GB105037041140)
- Domsey Brook (GB105037033870)
- Blackwater (Combined Essex) (GB105037041160)
- Roman River (GB105037034150)

3.1.4 The two transitional water bodies are the Blackwater (GB520503714000) and Colne (GB520503713800) (table 3.2), which lie downstream of the study area (circa 15-20 km), and receive flows from the Rivers Chelmer, Blackwater and the Roman River. However, considering the distance between these TraC WFD water bodies and the study area (approximately 20km), they have been scoped out of the assessment.

3.1.5 The single groundwater body is the Essex Gravels (GB40503G000400), which is detailed in table 3.3. This relates to a superficial aquifer. The bedrock underlying the site is principally the London Clay which is designated by the Environment Agency as unproductive strata (Defra, 2020).

Table 3.1: Surface WFD water body parameters

WFD water body name	Blackwater (Combined Essex)	Boreham Tributary	Brain	Chelmer (d/s confluence with Can)	Domsey Brook	Roman River	Ter
WFD water body ID	GB105037041160	GB105037033910	GB105037041140	GB105037033530	GB105037033870	GB105037034150	GB105037033940
NGR	TL7614124485	TL7541309223	TL7177325726	TL7859409063	TL8984119820	TL9350723073	TL7170117603
Length (km)	38.63	2.68	30.52	19.80	7.27	19.52	31.37
Catchment area (km^2)	131.63	17.37	69.94	54.48	24.15	61.11	79.55
Hydromorphological designation	Heavily Modified	Not designated	Heavily Modified	Heavily Modified	Heavily Modified	Heavily Modified	Not designated
Current overall status/potential (2016 data)	Moderate	Good	Moderate	Poor	Good	Moderate	Moderate
Status objective (overall)	Moderate	Good	Moderate	Moderate	Good	Moderate	Moderate
Reasons for not achieving good status:	Physical modifications; Pollution (both point and diffuse sources); Flow (surface and groundwater abstractions)	Not Applicable	Physical modifications; Pollution (both point and diffuse sources)	Physical modification; Groundwater and surface water abstraction; Point and diffuse sources of pollution	Not Applicable	Physical modifications; Point and diffuse sources of pollution; Surface water abstraction	Point and Diffuse sources of pollution

WFD water body name	Blackwater (Combined Essex)	Boreham Tributary	Brain	Chelmer (d/s confluence with Can)	Domsey Brook	Roman River	Ter
Protected area designation	Nitrates Directive; Drinking Water Protected Area; Drinking Water Safeguard Zone; Urban Wastewater Treatment Directive	Nitrates Directive	Nitrates Directive; Urban Wastewater Treatment Directive	Nitrates Directive; Habitats and Species Directive; Safeguard zone; Conservation of Wild Birds Directive; Drinking Water Protected Area; Urban Wastewater Treatment Directive	Nitrates Directive	Nitrates Directive	Nitrates Directive
Hydromorphological supporting elements	None Recorded	Supports Good	Supports Good	Supports Good	Supports Good	Supports Good	Supports Good
Current ecological status (and status objective)	Moderate	Good	Moderate	Poor	Good	Moderate	Moderate
Biological quality elements	Moderate	Good	High	Poor	Good	Moderate	Moderate
Physico-chemical quality elements	Moderate	Good	Moderate	Moderate	Good	Moderate	Moderate
Chemical status	Good	Good	Good	Good	Good	Good	Good

Table 3.2: Transitional WFD water body parameters

WFD water body name	Blackwater	Colne
WFD water body ID	GB520503714000	GB520503713800
NGR	TL9864008915	TM0606817194
Surface area (km^2)	42.94	9.33
Hydromorphological designation	Heavily Modified	Heavily Modified
Current overall status/potential (2016 data)	Moderate potential	Moderate Potential
Status objective (overall)	Moderate	Good
Reasons for not achieving good status:	Sector under investigation, classification elements related to the waterbody not achieving good status are, Hydrological regime, Phytoplankton, Dissolved Inorganic Nitrogen, Macroalgae and Invertebrates	Sector under investigation, classification elements related to the waterbody not achieving good status are, Dissolved Inorganic Nitrogen and Hydrological Regime
Protected area designation	Nitrates Directive; Shellfish Water Directive; Conservation of Wild Birds Directive; Urban Wastewater Treatment Directive	Nitrates Directive; Shellfish Water Directive; Conservation of Wild Birds Directive; Urban Wastewater Treatment Directive; Bathing Water Directive
Hydromorphological supporting elements	Supports Good	Supports Good
Current ecological status (and status objective)	Moderate	Moderate
Biological quality elements	Moderate	High
Physico-chemical quality elements	Moderate	Moderate
Chemical status	Good	Good

Table 3.3: Groundwater WFD water body parameters

Element	Essex Gravels
ID	GB40503G000400
Area	1275 km^2
Overall water body classification	Poor (chemical status)
Quantitative status	Good
Quantitative Saline Intrusion	Good
Quantitative Water Balance	Good
Quantitative groundwater dependent terrestrial ecosystem (GWDTE) test	Good
Quantitative Dependent Surface Water Body Status	Good
Chemical status	Poor
Chemical Drinking Water Protected Area	Poor (agriculture and rural land management - poor livestock management, poor nutrient management)

Element	Essex Gravels
General Chemical Test	Poor (agriculture and rural land management - poor livestock management, poor nutrient management)
Chemical Groundwater Dependent Terrestrial Ecosystems (GWDTEs) test	Good
Chemical Dependent Surface Water Body Status	Good
Chemical Saline Intrusion	Good

3.2 Scoping of water body elements

Table 3.4 scopes the water body elements that are taken forward into the impact assessment for the relevant water bodies. Table 3.5 considers the groundwater elements to be taken forward as part of the assessment.

Table 3.4: WFD surface water body elements for further consideration

Element	Description	Scoped in or out
Biological status quality elements		
Fish	Composition, abundance and age of structure of fish fauna, presence of sensitive species	In
Invertebrates	Composition and abundance of benthic invertebrate fauna	In
Freshwater aquatic plants (macrophytes) and diatoms (phytobenthos)	Composition and abundance of aquatic flora	In
Hydromorphological status quality elements		
Hydromorphology (i.e. hydrological regime and morphology)	Quantity and dynamics of water flow	In
	Connection to groundwater bodies	In
	River continuity	In
	River depth and width variation	In
	Structure and substrate of the river bed	In
	Structure of the riparian zone	In
Physico-chemical status quality elements		
	Acid neutralising capacity	In
	Ammonia	In
	Dissolved Oxygen	In
	pH	In
	Phosphate	In
	Temperature	In

Element	Description	Scoped in or out
Chemical status quality elements		
Priority substances	Pollution including: ▪ All priority substances identified as being discharged into the water body. ▪ Other substances identified as being discharged in significant quantities into the water body.	In

Table 3.5: WFD groundwater body elements for further consideration

Element	Scoped in or out
Quantitative status quality elements	
Groundwater dependent terrestrial ecosystems	In
Saline intrusion	Out. Given the distance of the works from the coast and transitional waters, and that inland no saline groundwater bodies have been identified, there will be no saline intrusion.
Water balance	In
Surface water	In
Chemical status quality elements	
Drinking Water Protected Area	In
Groundwater dependent terrestrial ecosystems	In
Saline intrusion	Out. Given the distance of the works from the coast and transitional waters, and that inland no saline groundwater bodies have been identified, there will be no saline intrusion.
Surface water	In
General quality	In

3.2.1 The impacts of the Proposed Scheme upon the in-scope elements are considered in section 3.3.

3.2.2 As seven WFD waterbodies are designated as heavily modified water bodies (HMWB), an assessment of the morphological mitigation measures, which are either ‘in-place’ or ‘not in-place’ would be required. Details of these, for each HMWB have been requested from the Environment Agency and will be assessed during the detailed assessment.

3.3 Impact assessment

For brevity, the likely generic impacts of the Proposed Scheme elements within the study area are detailed in table 3.6 for surface waters and table 3.7 for groundwater. The impacts are colour coded to highlight the impact of the Proposed Scheme on each WFD quality element, which are detailed in tables 3.6 and 3.7. Where impacts are considered to be more site-specific than described in table 3.6, they will be evaluated in more detail as part of the detailed WFD assessment.

Table 3.6. General impacts to WFD surface bodies

Key to Impact							
Negative		Negligible		Positive		No change	

Scheme element	WFD element likely to be impacted (and description of impact)	Possible ways to mitigate impact
Blackwater (combined Essex), Boreham Tributary, Brain, Chelmer (d/s confluence with Can), Domsey Brook, Roman River, Ter		
Changes to the road drainage and outfalls. **During construction**	**Fish, Macrophytes, Invertebrates:** The accidental release of fine sediment and pollutants during the construction of the outfalls could alter nutrient conditions and change sediment loading, leading to localised smothering of bed substrate material. Impact would be localised and temporary. Impacts are based on assumptions that species would be impacted, mitigation could alter based on the individual species identified during the detailed assessment.	Safeguards to be put in place to reduce the likelihood of spillages and clean-up systems deployed if any spillage occurs. Mitigations would be adaptive based on species within each WFD water body. All works should be carried out in accordance with legislation and good practice guides as stated in CIRIA C786 (CIRIA, 2019), for example.
	Physico-chemical elements: Changes to the quantity and composition of pollutants in runoff, and location from where runoff is released may have an impact on the pH, temperature, DO (Dissolved Oxygen) concentration and nutrient conditions of the river. Impact would be localised and temporary.	
	Hydromorphology elements: The accidental release of fine sediment and pollutants, and bank destabilisation during the construction of the outfalls could alter nutrient conditions and change sediment loading, leading to localised smothering of bed substrate material. Impact would be localised and temporary.	

Scheme element	WFD element likely to be impacted (and description of impact)	Possible ways to mitigate impact
Changes to the road drainage and outfalls. **During operation**	**Fish, Macrophytes and Invertebrates:** Changes in water quality and quantity have the potential to result in modification to biological community composition and functioning. Surface runoff may include fuels, oils, hydrocarbons, sediment and salts that can affect biological functioning. Impact would be localised and permanent.	Safeguards to be put in place to reduce the likelihood of spillages and clean-up systems deployed if any spillage occurs. Suitable attenuation will be designed into the drainage system. This will reduce contaminant reaching the watercourse and reduce peak flows.
	Physico-chemical: Changes to the quantity and composition of pollutants in runoff and where the runoff is released may have an impact on the pH, temperature, DO concentration and nutrient conditions of the river.	Suitable mitigation measures will be incorporated into the design, e.g. attenuation ponds. Bespoke mitigation may be required to reduce the risk.
	Hydromorphology elements – Flow regime and Flow dynamics, River Width and Depth, Structure and substrate of the river bed: Changes in the flow regime of the channel could lead to localised increases in peak discharge, whilst the local flow dynamics would alter leading to increased turbulence in the channel. These changes in flow regime and flow dynamics could facilitate localised bed and bank scour depending on rates of discharge and magnitude of events.	All works should be carried out in accordance with good practice guides as stated in CIRIA C786 (CIRIA, 2019). These should consider, attenuation of discharge, aligning the outfalls downstream, setting back from the bank and submerging them below the water line.
	Hydromorphological elements – river continuity, connection to groundwater body, structure of riparian zone: Localised impacts to lateral connectivity and groundwater connection at the site of the assumed outfalls, whilst the outfall would replace the local riparian zone.	Consider minimising the removal of riparian vegetation, whilst the headwall of the outfall should be kept to a minimal size in relation to the size of the outfall. Good practice guides should be followed.
Highway Structure (including extension of culverts and widening of bridges) **During construction**	**Fish, Macrophytes**, **Invertebrates:** In-channel works during construction have the potential to result in fish mortality or loss of macrophyte habitat. Impact would be localised and temporary.	All works should be carried out in accordance with legislation and good practice guides as stated in and CIRA C786 (CIRIA, 2019). Timing of in-channel works to avoid sensitive fish spawning/migratory periods. Fish rescue required for any dewatering works.

Scheme element	WFD element likely to be impacted (and description of impact)	Possible ways to mitigate impact
	Physico-chemical: Potential change to pH, DO, light and turbidity within the channel as a result of works.	Pollution prevention guidelines would be produced in a Construction Environmental Management Plan (CEMP), which would outline mitigation relating to contaminant pathways.
	Hydromorphology: The accidental release of fine sediment, and bank destabilisation during the construction of the culverts, bridges and highway could lead to localised smothering of bed substrate material. The effect would be localised and temporary, and potentially not much different to background conditions.	All works should be carried out in accordance with legislation and good practice guides as stated in CIRIA C786 (CIRIA, 2019).
Highway Structure (including extension of culverts and widening of bridges) **During operation**	**Fish, Macrophytes and Invertebrates:** Culvert extension may make watercourses less accessible to migratory species and shading may reduce the potential habitat available to aquatic plant and plankton species. Fish dislike dark shaded culverts (the tunnelling effect). Impact would be localised and permanent.	Sensitive culvert/bridge design to maximise easement of fish and eel passage. Minimise overall structure size to maximise total area available to macrophytes and plankton. Need to minimise length of culverts to attract fish and comply, wherever possible, with EA guidance on culvert length.
	Physico-chemical elements: Culverts and bridges would likely impact water temperature. Impacts would be localised and inconsequential to WFD water bodies.	N/A
	Flow regime and Flow Dynamics: Increased length of culvert could exacerbate the pre-existing 'funnelling effect' on flow, increasing local flow velocity and leading to localised changes in flow dynamics at the outlet, when flow interacts with natural bed material.	Consider upgrading the culvert width to accommodate the natural channel width. Submerge the culvert bed below the bed substrate. Consider baffles/deflectors to create semi-sinuous flow to naturalise artificial channel form, if sufficient space is available in the culvert.
	Connection to groundwater: Localised loss of groundwater connection at the site of the culvert.	Consider steepening any embankments to shorten the culvert length.

Scheme element	WFD element likely to be impacted (and description of impact)	Possible ways to mitigate impact
	River continuity: Localised loss of lateral connectivity with the floodplain at the site of the culverts. Sediment transport dynamics could alter at the culvert, where fine sediment deposition could take place at the inlet of the culvert if designed inappropriately.	Consider steepening any embankments to shorten the culvert length. Submerge the culvert beneath the bed substrate to allow sediment to naturally pass through it.
	Channel width and depth: Constrained and unnatural channel dimensions. Lack of natural channel form. Localised changes in flow dynamics could lead to localised bank scour.	Consider wing walls to tie-in the extended culverts with the banks. Consider baffles/deflectors to create semi-sinuous flow to naturalise artificial channel form.
	Structure and substrate of the river bed: Culvert could cause localised silt to build up on the upstream of this structure, causing a decrease in the amount of fine sediment being transported downstream. Need to consider consistent levels above the bed and ensure sediment does not accrete. Changes in flow dynamics could also lead to localised bed scour, if culvert is designed inappropriately.	Consider coarse bottom as substitute for a channel bed to trap sediment.
	Structure of riparian zone: Localised removal of riparian vegetation, changes to the long-term structure of riparian zone along the length of each culvert.	Consider steepening any embankments to shorten the culvert length.
Construction of site compounds	**Fish, macrophytes and Invertebrates:** these elements at risk of indirect impacts due to impacts listed below.	Measures below
	Physico-chemical: Increased risk of sediments being mobilised, and new runoff pathways being created. Increased risk of pollutants running off stockpiles especially where works are close or adjacent to the watercourse.	Pollution prevention guidelines would be outlined in a Construction Environmental Management Plan (CEMP) to mitigate changes in contaminant pathways.

Scheme element	WFD element likely to be impacted (and description of impact)	Possible ways to mitigate impact
	Hydromorphological: Discharge of construction drainage could increase local peak discharge and flow dynamics, which in turn could initiate bed and bank erosion, causing local alteration in channel width and depth. The release of fine sediment could then lead to fine sediment deposition of local downstream substrate material.	All works should be carried out in accordance with legislation and good practice guides as stated in CIRA C786 (CIRIA, 2019). Consider aligning any outfall downstream and attenuate construction drainage discharge to mitigate local flow dynamics and regime, and fine sediment entrainment respectively. Consider construction site compounds away from water courses to prevent extensive impacts to riparian zone.
Construction of Borrow pits	**Fish, Macrophytes and Invertebrates:** Smothering of habitats due to increased sediment loading following excavations of borrow pits. Impacts would be localised and temporary.	Safeguards to be put in place to reduce the impacts include measures for sediment removal such as silt-busters. All works should be carried out in accordance with legislation and good practice guides as stated in and CIRA C786 (CIRIA, 2019).
	Physico-chemical: Increases in sediment would likely alter nutrient conditions within the channel arising from silt-laden runoff. Impacts likely to be localised and temporary.	
	Hydromorphological: Silt-laden runoff arising from the borrow pits could introduce fine sediment within the channel and smother the bed substrate material. Impacts would be localised and temporary.	
Invasive Non-Native Plant Species (INNS)	**Fish, Macrophytes and Invertebrates:** Smothering of habitats due to increased sediment loading during winter months when INNS have died back and no longer occupy the bank (Himalayan Balsam in particular). INNS could be spread further along the study area due to lack of awareness by construction workers.	Himalayan Balsam is known to be common in the vicinity of the study area. Although not currently identified within the study area, its presence and density will need to be assessed during the detailed assessment. If identified during the assessment or during the construction and operation of the Proposed Scheme, appropriate mitigation should be put in place. INNS are reportable, and control measures should be put in place to prevent spread. This needs to be identified in the Construction Environmental
	Physico-chemical quality elements: Silt-laden runoff and fine sediment entrainment along the banks during the winter months when INNS have died and exposed riparian soils and bank material to erosion, leading to increases in sediment loading. INNS could be spread further along the study area by contractors.	

Scheme element	WFD element likely to be impacted (and description of impact)	Possible ways to mitigate impact
	Hydromorphological quality elements: INNS would likely replace the indigenous riparian vegetation along the banks of the watercourses potentially during construction. As they are generally seasonal in nature, INNS would die during winter months, leaving bank material and riparian soils exposed to erosion. Sediment loading would likely increase as a result of bank destabilisation and silt-laden runoff during precipitation events, which would likely smother the bed substrate downstream. INNS could be spread further along the study area.	Management Plan (CEMP) and a requirement for control measures to be included to prevent spread.

Table 3.7: Potential impacts to the Essex Gravels groundwater body

Scheme element	WFD element likely to be impacted (and description of impact)	Possible ways to mitigate impact
Quantitative elements		
Construction of the road and haul roads and creation of construction compounds **During construction**	**GWDTEs:** Removal of vegetation and shallow soils has the potential to alter recharge characteristics which could locally affect groundwater flows to a GWDTE.	Undertake works in line with good construction practice and produce a Construction Environmental Management Plan (CEMP).
	Water balance: Removal of vegetation and shallow soils has the potential to alter recharge characteristics. However, given the area of works compared to the area available for recharge of the groundwater body and the temporary nature of these works, there would be no impact at the groundwater body scale.	
	Dependent surface water: Removal of vegetation and shallow soils has the potential to alter recharge characteristics which could locally affect groundwater flows to a groundwater dependent surface water.	
Construction of borrow pits **During construction**	**GWDTEs:** Construction of borrow pits, including any associated dewatering if needed to allow for working in dry pits, could affect groundwater flows to, and levels in, a GWDTE.	Undertake works in line with good construction practice and produce a CEMP. Locate the borrow pits at sufficient distances from GWDTEs or groundwater dependent surface water receptors. Implement any dewatering practices so as to limit the impact on GWDTEs or groundwater dependent surface water receptors. Provide recharge to groundwater to compensate for any groundwater losses.
	Water balance: Construction of borrow pits, including any associated dewatering if needed to allow for working in dry pits, could reduce recharge to the aquifer. However, given the area of works compared to the area available for recharge of the groundwater body and the temporary nature of these works, there would be no impact at the groundwater body scale.	
	Dependent surface water: Construction of borrow pits, including any associated dewatering if needed to allow for working in dry pits, could affect groundwater flows to a groundwater dependent surface water.	

Scheme element	WFD element likely to be impacted (and description of impact)	Possible ways to mitigate impact
Below ground structures, including cuttings **During construction**	**GWDTEs:** Construction of below ground structures may require dewatering for the works and the presence of these structures, may alter groundwater flowpaths such that groundwater discharge rates to a GWDTE may be affected.	Undertake works in line with good construction practice and produce a CEMP. Reduce the depth of cuttings or other below ground structures so that dewatering is not required or is reduced. Implement any dewatering practices so as to limit the impact on GWDTEs or groundwater dependent surface water receptors. Provide recharge to groundwater to compensate for any groundwater losses.
	Water balance: Construction of below ground structures, including any associated dewatering, could reduce recharge to the aquifer. However, given the area of works compared to the area available for recharge of the groundwater body and the temporary nature of these works, there would be no impact at the groundwater body scale.	
	Dependent surface water: Construction of below ground structures, including any associated dewatering, could affect groundwater flows to a groundwater dependent surface water.	
Below ground structures, including cuttings **During operation**	**GWDTEs:** Ongoing dewatering to maintain groundwater levels below the road level in cuttings may alter groundwater flow paths such that groundwater discharge rates to, or levels in, a GWDTE may be affected. The presence of below ground structures may alter groundwater flow paths such that groundwater discharge rates to GWDTEs are affected.	Undertake works in line with good construction practice and produce a CEMP. Reduce the depth of cuttings or other below ground structures so that dewatering is not required or is reduced. Implement any dewatering practices so as to limit the impact on GWDTEs or groundwater dependent surface water receptors. Provide recharge to groundwater to compensate for any groundwater losses.
	Water balance: Construction of below ground structures, including any associated dewatering, could reduce recharge to the aquifer. However, given the area of works compared to the area available for recharge of the groundwater body, there would be no impact at the groundwater body scale.	
	Dependent surface water: Ongoing dewatering to maintain groundwater levels below the road level in cuttings may alter groundwater flow paths such that groundwater discharge rates to a groundwater dependent surface water may be affected. The presence of below ground structures may alter groundwater flow paths such that groundwater discharge rates to groundwater dependent surface waters are affected.	

Scheme element	WFD element likely to be impacted (and description of impact)	Possible ways to mitigate impact
Road runoff **During operation**	**GWDTEs:** Road runoff, if discharged to ground, has the potential to recharge groundwater and maintain groundwater levels in GWDTEs.	None required
	Water balance: Road runoff, if discharged to ground, has the potential to recharge groundwater. However, given the area of road compared to the area available for recharge of the groundwater body, there would be no impact at the groundwater body scale.	
	Dependent surface water: Road runoff, if discharged to ground, has the potential to recharge groundwater and maintain groundwater levels in groundwater dependent surface waters.	
Chemical status quality elements		
Construction of the road and haul roads and creation of construction compounds **During construction**	**Drinking Water Protected Area:** Changes to groundwater quality from the removal of vegetation and disturbance of shallow ground could lead to increased suspended solid concentrations in the underlying groundwater. However, in gravel aquifers such as the Essex Gravels groundwater body, there is limited potential for suspended solids to migrate to groundwater abstractions.	Undertake works in line with good construction practice and produce a CEMP. Locate construction compounds away from sensitive receptors.
	GWDTEs: Changes to groundwater quality from the removal of vegetation and disturbance of shallow ground could lead to increased suspended solid concentrations in the underlying groundwater. Mobilisation of suspended solids below the water table could lead to migration of sediment to a GWDTE via spring discharges. However, in gravel aquifers such as the Essex Gravels groundwater body there is limited potential for suspended solids to migrate significant distances to a GWDTE.	

Scheme element	WFD element likely to be impacted (and description of impact)	Possible ways to mitigate impact
	Dependent surface water: Changes to groundwater quality from the removal of vegetation and disturbance of shallow ground could lead to increased suspended solid concentrations in the underlying groundwater. Mobilisation of suspended solids below the water table could lead to migration of sediment to a groundwater dependent surface water. However, in gravel aquifers such as the Essex Gravels groundwater body there is limited potential for suspended solids to migrate significant distances to a groundwater dependent surface water.	
	General quality: Changes to groundwater quality from the removal of vegetation and disturbance of shallow ground could lead to increased suspended solid concentrations in the underlying groundwater. However, in gravel aquifers such as the Essex Gravels groundwater body, there is limited potential for suspended solids to migrate.	
Construction of borrow pits **During construction**	**Drinking Water Protected Area:** Changes to groundwater quality due to works below the water table could lead to increased suspended solid concentrations in the underlying groundwater. However, in gravel aquifers such as the Essex Gravels groundwater body, there is limited potential for suspended solids to migrate to groundwater abstractions.	Undertake works in line with good construction practice and produce a CEMP. Locate the borrow pits at sufficient distances from GWDTEs, groundwater dependent surface water receptors or groundwater abstractions.
	GWDTEs: Changes to groundwater quality due to works below the water table could lead to increased suspended solid concentrations in the underlying groundwater. Mobilisation of suspended solids below the water table could lead to migration of sediment to a GWDTE via spring discharges. However, in gravel aquifers such as the Essex Gravels groundwater body there is limited potential for suspended solids to migrate significant distances to a GWDTE.	

Scheme element	WFD element likely to be impacted (and description of impact)	Possible ways to mitigate impact
	Dependent surface water: Changes to groundwater quality due to works below the water table, could lead to increased suspended solid concentrations in the underlying groundwater. Mobilisation of suspended solids below the water table could lead to migration of sediment to a groundwater dependent surface water. However, in gravel aquifers such as the Essex Gravels groundwater body there is limited potential for suspended solids to migrate significant distances to a groundwater dependent surface water.	
	General quality: Changes to groundwater quality due to works below the water table could lead to increased suspended solid concentrations in the underlying groundwater. However, in gravel aquifers such as the Essex Gravels groundwater body, there is limited potential for suspended solids to migrate.	
Below ground structures, including cuttings **During construction**	**Drinking Water Protected Area:** Changes to groundwater quality due to works below the water table could lead to increased suspended solid concentrations in the underlying groundwater. However, in gravel aquifers such as the Essex Gravels groundwater body, there is limited potential for suspended solids to migrate to groundwater abstractions.	Undertake works in line with good construction practice and produce a CEMP. Reduce the depth of cuttings or other below ground structures so that the water table is not intercepted. Where feasible, locate below ground structures away from GWDTEs, groundwater dependent surface water receptors or groundwater abstractions.
	GWDTEs: Changes to groundwater quality due to works below the water table could lead to increased suspended solid concentrations in the underlying groundwater. Mobilisation of suspended solids below the water table could lead to migration of sediment to a GWDTE via spring discharges. However, in gravel aquifers such as the Essex Gravels groundwater body there is limited potential for suspended solids to migrate significant distances to a GWDTE.	

Scheme element	WFD element likely to be impacted (and description of impact)	Possible ways to mitigate impact
	Dependent surface water: Changes to groundwater quality due to works below the water table could lead to increased suspended solid concentrations in the underlying groundwater. Mobilisation of suspended solids below the water table could lead to migration of sediment to a groundwater dependent surface water. However, in gravel aquifers such as the Essex Gravels groundwater body there is limited potential for suspended solids to migrate significant distances to a groundwater dependent surface water	
	General quality: Changes to groundwater quality due to works below the water table could lead to increased suspended solid concentrations in the underlying groundwater. However, in gravel aquifers such as the Essex Gravels groundwater body, there is limited potential for suspended solids to migrate.	
Below ground structures, including cuttings **During operation**	**Drinking Water Protected Area:** The presence of below ground structures will not affect the groundwater quality.	Presence of below ground structures would not introduce pollutants to groundwater.
	GWDTEs: The presence of below ground structures will not affect the groundwater quality.	
	Dependent surface water: The presence of below ground structures will not affect the groundwater quality.	
	General quality: The presence of below ground structures will not affect the groundwater quality.	
Road runoff **During operation**	**Drinking Water Protected Area:** There is potential that groundwater abstractions if located close to the Proposed Scheme may be negatively impacted by any spills, fuel leaks, or from routine runoff which may result from the Proposed Scheme. This could cause a deterioration in groundwater quality within the Drinking Water Protected Area.	Undertake site-specific risk assessments for discharge points to ground/groundwater. Discharge road runoff to surface waters and ensure drains, attenuation ponds etc. are lined to prevent groundwater recharge.

Scheme element	WFD element likely to be impacted (and description of impact)	Possible ways to mitigate impact
	GWDTEs: There is potential that GWDTEs, if located close to the Proposed Scheme, may be negatively impacted by any spills, fuel leaks, or from routine runoff which may result from the Proposed Scheme. This could cause a deterioration in groundwater quality and the chemical status of the GWDTE. Further searches will be undertaken, as part of the detailed assessment, to confirm the location of GWDTEs and to define additional impacts and mitigation measures.	Install pollution control measures such as cut-off valves.
	Dependent surface water: There is potential that groundwater dependent surface waters if located close to the Proposed Scheme may be negatively impacted by any spills, fuel leaks, or from routine runoff which may result from the Proposed Scheme. This could cause a deterioration in groundwater quality and the chemical status of the groundwater dependent surface water.	
	General quality: Operation of the Proposed Scheme may negatively impact the chemical status of the groundwater body should fuel spills/leaks occur from general use, maintenance, routine runoff and from accidents. However, as the Proposed Scheme is principally to upgrade an existing road, overall operational impacts at a water body scale are unlikely to change significantly from the current status.	

4. Conclusions

4.1.1 The preliminary compliance assessment exercise presented in tables 3.6 and 3.7 has demonstrated that overall there are potential negative impacts on water body quality elements in the WFD water bodies. However, mitigation has been proposed to reduce any risk of overall water body deterioration. This is dependent on detailed design and implementation.

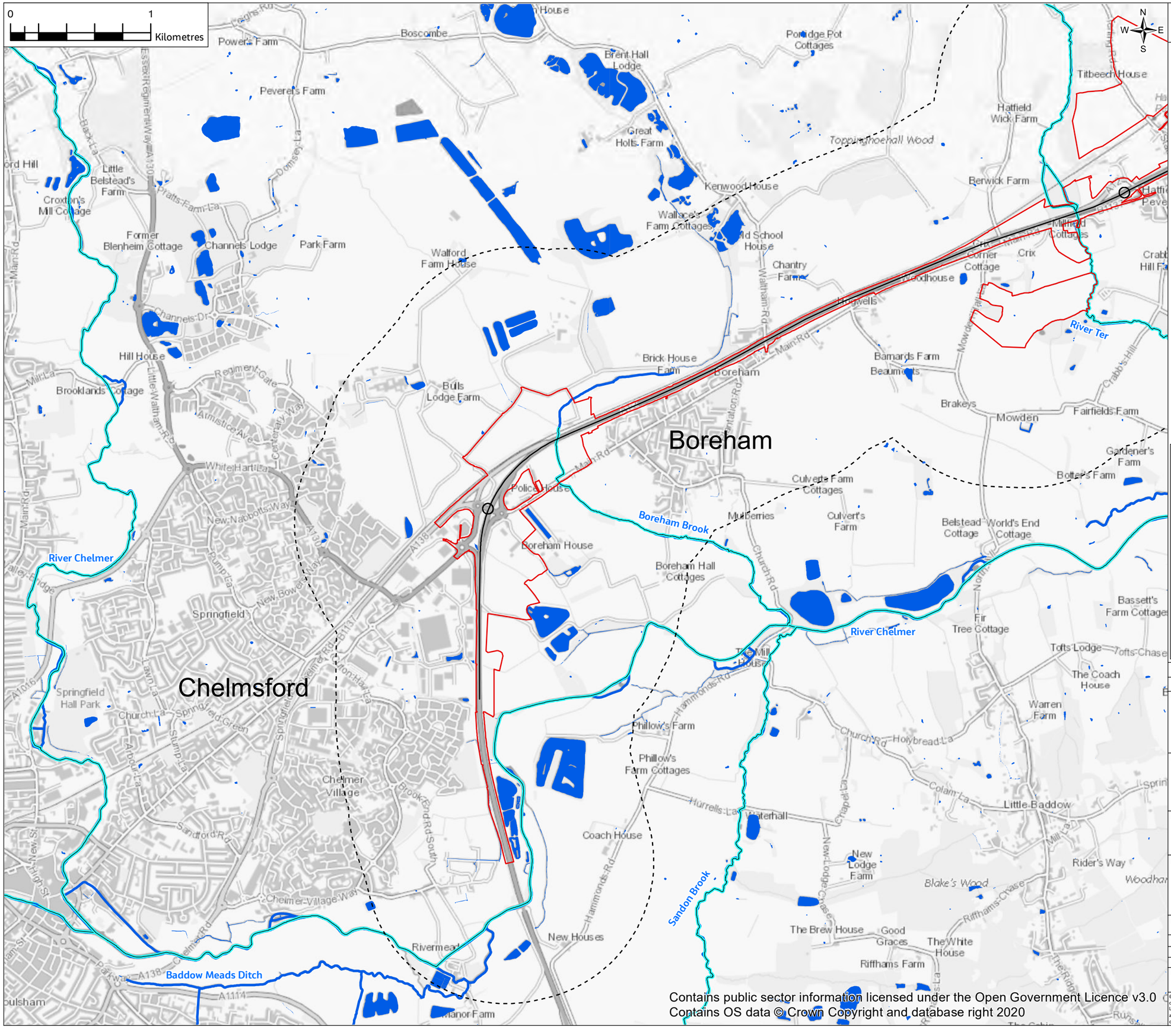
4.1.2 Compliance with the key objectives against which the impacts of proposed works on a water body need to be assessed are outlined in table 4.1. As this assessment is based on assumptions in the design and a provisional development boundary, all WFD water bodies to be crossed will require further investigation in a detailed WFD assessment. It is probable that compliance will be achieved; however, this conclusion is subject to monitoring findings.

Table 4.1: Compliance with the environmental objectives of the Water Environment (WFD) Regulations

Environmental objective	Conclusions for the Proposed Scheme	Compliant with the Regulations
No changes affecting high status sites	Not applicable – no high-status water bodies present.	Yes
No changes that will cause failure to meet surface water Good Ecological Status or Potential or result in a deterioration of surface water Ecological Status or Potential	The Proposed Scheme as outlined will not cause deterioration in the status of any water body, but this needs to be confirmed.	Probable but this needs to be confirmed for multiple elements of the Proposed Scheme. Detailed assessment to be undertaken, and more data is required to provide certainty.
No changes which will permanently prevent or compromise the Environmental Objectives being met in other water bodies	The Proposed Scheme elements will not cause a permanent exclusion or compromise achieving the objectives in other bodies of water within the same River Basin District.	Yes
No changes that will cause failure to meet good groundwater status or result in a deterioration groundwater status	The Proposed Scheme elements will not cause deterioration in the status of any groundwater body.	Probable but this needs to be confirmed for multiple elements of the Proposed Scheme. Detailed assessment to be undertaken and more data are required to provide certainty.

Annex A. Figures

FIGURE 1



Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Study Area
- Water Bodies
- Main Rivers
- WFD Fluvial Water Bodies

Rev.	Rev. Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
P02	12/10/20	Final	ML	RW	RW	SG

Contractor: COSTAIN

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6 Cherry Orchard Road, Croydon, CR9 6BE, UK.
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www.jacobs.com

Client: highways england

Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: PRELIMINARY WFD ASSESSMENT
SURFACE WFD WATER BODIES
SHEET 1 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

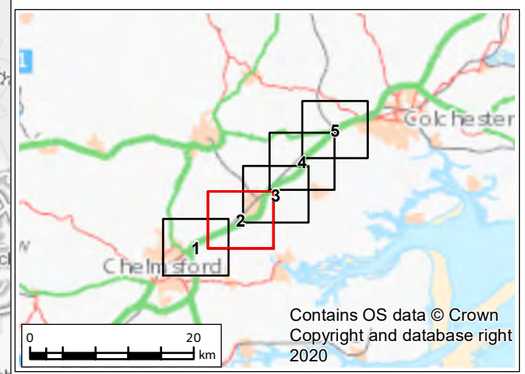
Scale @ A3	1:26000	DO NOT SCALE
Jacobs No.	B229H130	
Client No.	HE551497	Rev P02

Drawing Number: HE551497-JAC-EWE-SCHW-SK-GI-0013

FIGURE 1

Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Study Area
- Water Bodies
- Main Rivers
- WFD Fluvial Water Bodies



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Drawing Title: PRELIMINARY WFD ASSESSMENT SURFACE WFD WATER BODIES SHEET 2 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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Jacobs No.	B229H130	
Client No.	HE551497	Rev P02

Drawing Number: HE551497-JAC-EWE-SCHW-SK-GI-0014

FIGURE 1

Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Study Area
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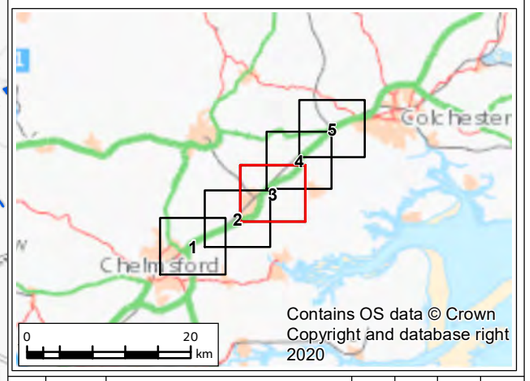
- WFD Fluvial Water Bodies



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Drawing Title: PRELIMINARY WFD ASSESSMENT
SURFACE WFD WATER BODIES
SHEET 3 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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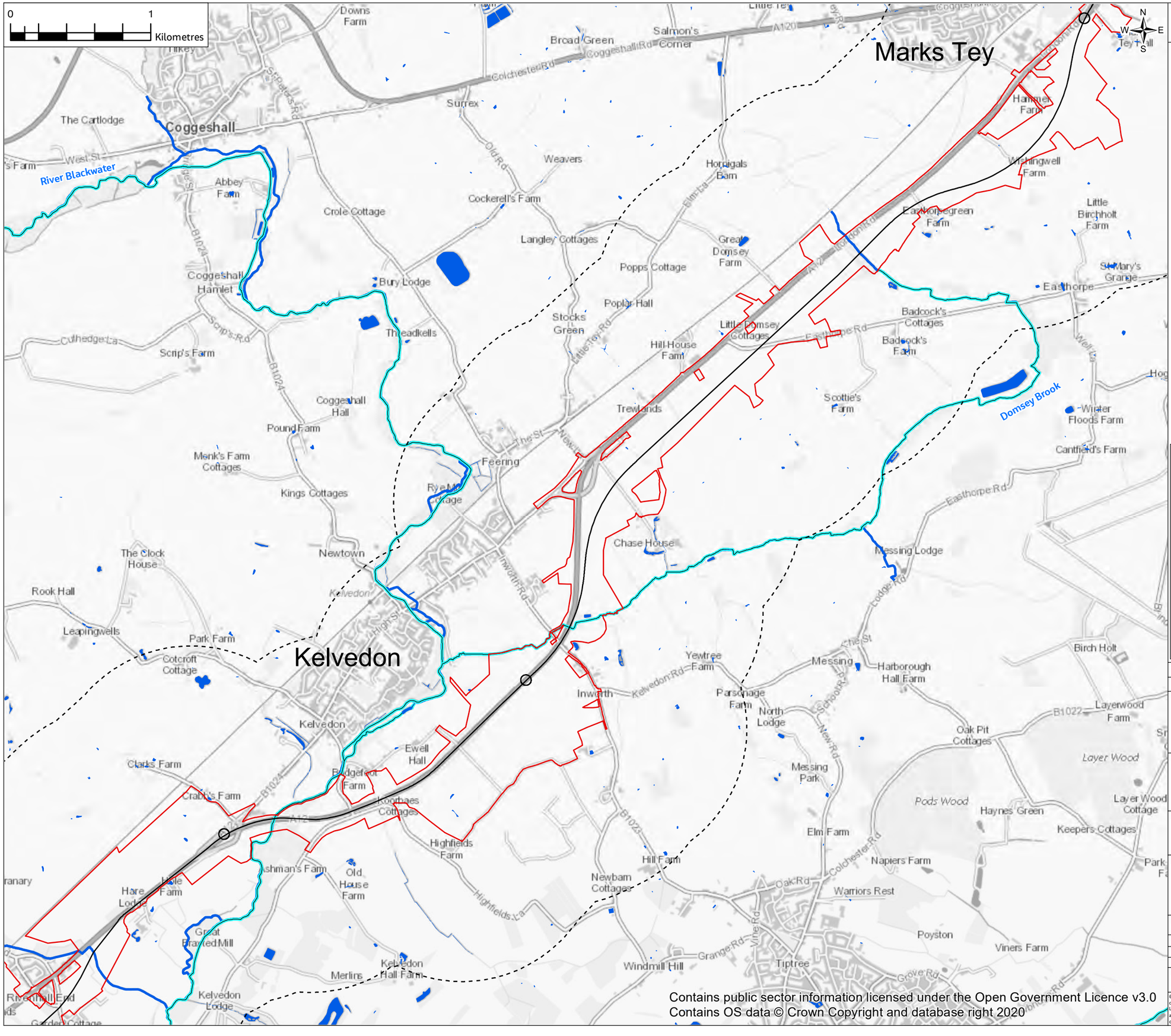
Client No.	HE551497	Rev P02

Drawing Number: HE551497-JAC-EWE-SCHW-SK-GI-0015

FIGURE 1



Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Study Area
- Water Bodies
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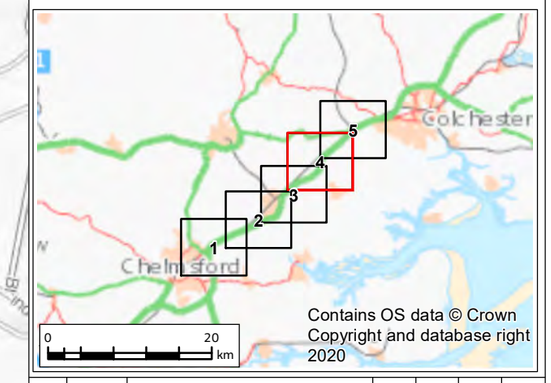

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Drawing Title: PRELIMINARY WFD ASSESSMENT
SURFACE WFD WATER BODIES
SHEET 4 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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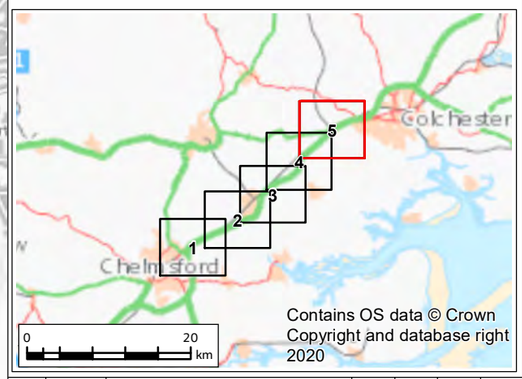
Client No.	HE551497	Rev P02

Drawing Number: HE551497-JAC-EWE-SCHW-SK-GI-0016

FIGURE 1

Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Study Area
- Water Bodies
- Main Rivers
- WFD Fluvial Water Bodies



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Drawing Title: PRELIMINARY WFD ASSESSMENT
SURFACE WFD WATER BODIES
SHEET 5 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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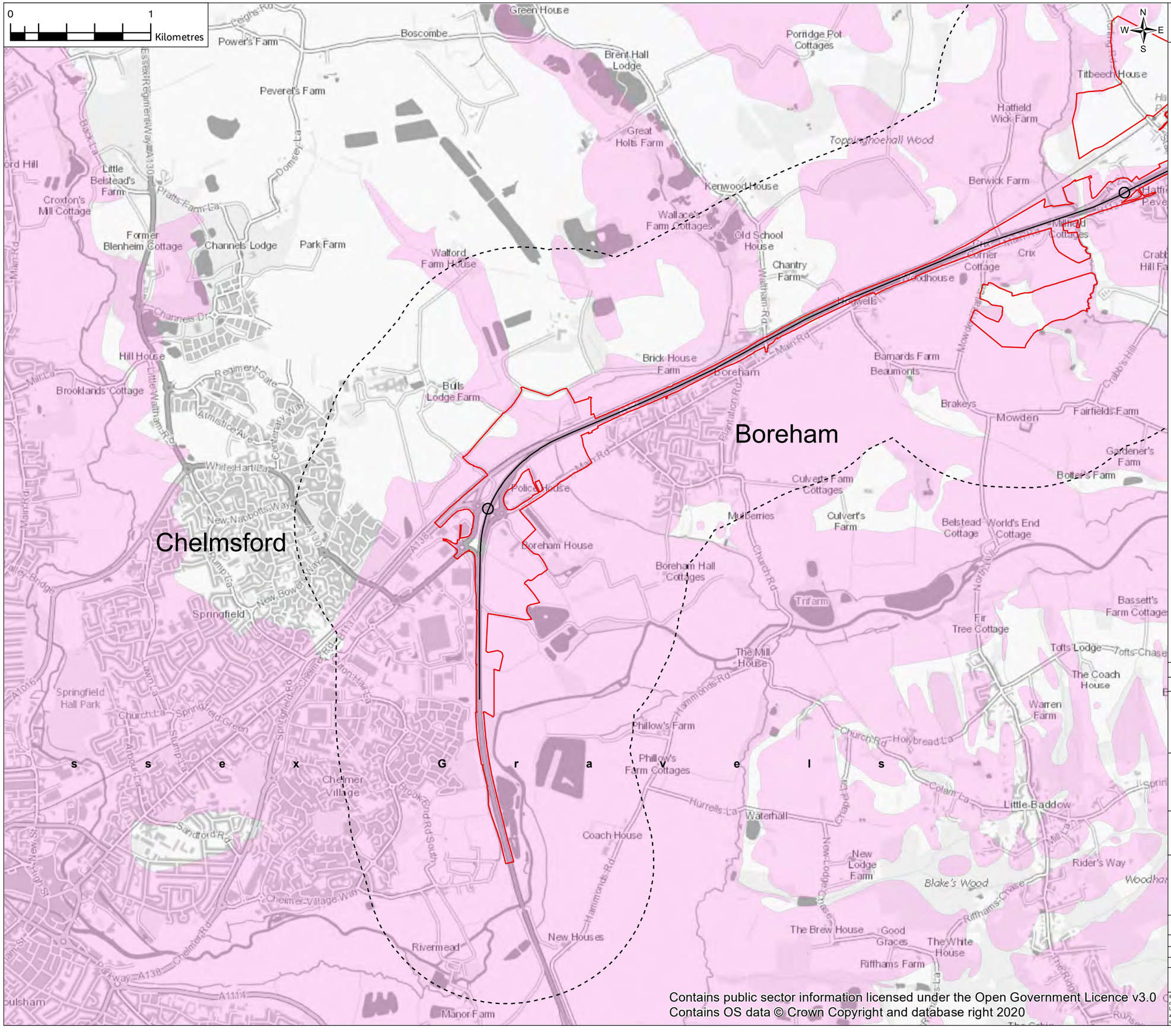
Jacobs No.	B229H130	
Client No.	HE551497	Rev P02

Drawing Number: HE551497-JAC-EWE-SCHW-SK-GI-0017

FIGURE 2



Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Study Area

Groundwater WFD Water Bodies:

- Essex Gravels

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Project: A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: PRELIMINARY WFD ASSESSMENT
GROUNDWATER WFD WATER BODIES
SHEET 1 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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Drawing Number: HE551497-JAC-EWE-SCHW-SK-GI-0018

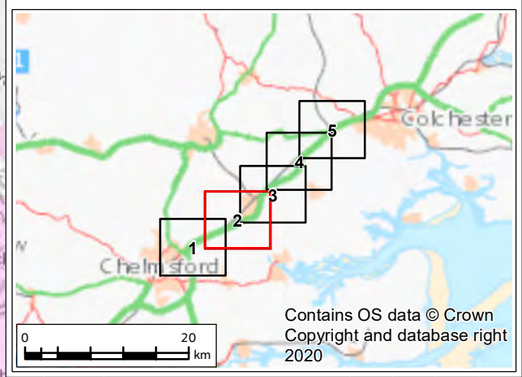
FIGURE 2

Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Study Area

Groundwater WFD Water Bodies:

- Essex Gravels



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Drawing Title: PRELIMINARY WFD ASSESSMENT
GROUNDWATER WFD WATER BODIES
SHEET 2 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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Drawing Number: HE551497-JAC-EWE-SCHW-SK-GI-0019

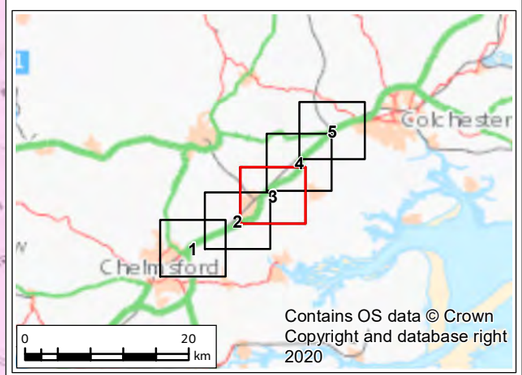
FIGURE 2

Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Study Area

Groundwater WFD Water Bodies:

- Essex Gravels



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GROUNDWATER WFD WATER BODIES
SHEET 3 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

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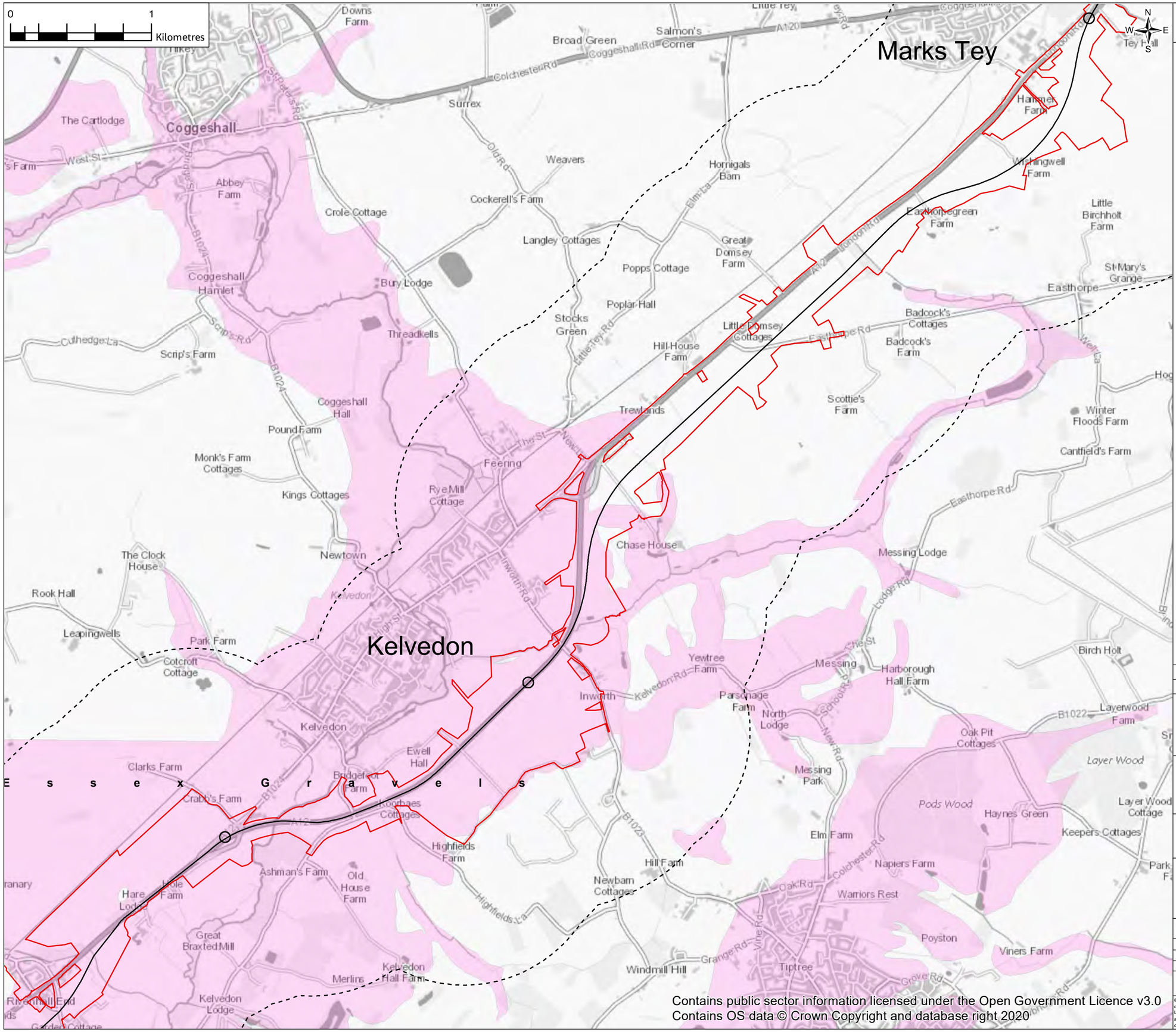
Client No.	HE551497	Rev P02

Drawing Number: HE551497-JAC-EWE-SCHW-SK-GI-0020

FIGURE 2

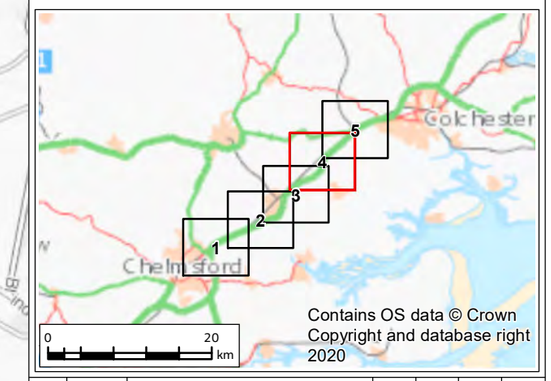


Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Study Area

Groundwater WFD Water Bodies:

- Essex Gravels



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GROUNDWATER WFD WATER BODIES
SHEET 4 OF 5

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Client No.	HE551497	Rev P02

Drawing Number: HE551497-JAC-EWE-SCHW-SK-GI-0021

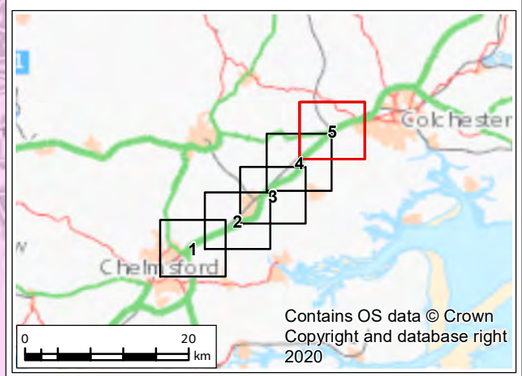
FIGURE 2

Legend

- Proposed Scheme Alignment
- Provisional Order Limits
- Study Area

Groundwater WFD Water Bodies:

- Essex Gravels



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GROUNDWATER WFD WATER BODIES
SHEET 5 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

Scale @ A3	1:26000	DO NOT SCALE	
Jacobs No.	B229H130	Rev	P02
Client No.	HE551497		

Drawing Number: HE551497-JAC-EWE-SCHW-SK-GI-0022

Appendix L. Cumulative effects assessment

L.1 Matrix for the identification of 'other development' for CEA (PINS Advice Note Seventeen, 2019)

Matrix 1 provides a means of summarising Stage 1 and Stage 2 of the CEA and will be used to demonstrate that a systematic approach to identifying development for inclusion in CEA has been adopted.

'Other development' details						Stage 1		Stage 2			
ID	Application reference	Applicant for 'other development' and brief description	Distance from project	Status	Tier	Within ZOI?	Progress to Stage 2?	Overlap in temporal scope?	Scale and nature of development likely to have a significant effect?	Other factors	Progress to Stage 3/4?

L.2 Assessment matrix (PINS Advice Note Seventeen, 2019)

The assessment matrix will provide a means of summarising the potential adverse or beneficial cumulative effects of the Proposed Scheme with 'other development' and will be used to demonstrate that a systematic approach to CEA has been adopted.

ID	Tier	Application reference	Applicant for 'other development' and brief description	Assessment of cumulative effect with Proposed Scheme	Proposed mitigation applicable to Proposed Scheme including any apportionment	Residual cumulative effect

L.3 Preliminary long list of 'other development' for CEA

Development details							Stage 1	
ID	Application reference	Applicant or proponent	Brief description	Distance from project (km)	Application status	Tier	Within ZOI?	Progress to Stage 2?
Braintree District Council								
1	19/01525/FUL	Braintree District Council	Construction of two access points into the site through a fourth arm from the A131/Cuckoo Way roundabout and a left in/left out junction from the A131.	9.42	Approved Application	Tier 1	Population and health	No – size of development not likely to generate significant cumulative effects on population and health
2	20/01264/OUT	Gladman Developments Limited	Demolition of the existing buildings and for the redevelopment of the site for up to 130 dwellings.	1.50	Submitted Application	Tier 1	Landscape, biodiversity, population and health, water	Yes
3	15/01186/FUL	Gold Care Homes Ltd	Construction of a 60-bed care home development.	0.00 (adjacent to or within PRA)	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
4	16/00545/OUT	Gladman Developments Limited	Construction of up to 80 dwellings.	1.20	Approved Application	Tier 1	Landscape, biodiversity, population and health, water	Yes
5	16/01538/FUL	Redrow Homes	Construction of a primary road network for Phase 1 with associated footpaths, cycleways, necessary drainage infrastructure including a foul water pumping station, and other minor access roads where appropriate.	0.00 (adjacent to or within PRA)	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
6	15/00430/OUT	Mr Chris Gatland	Construction of up to 750 dwellings, a Primary School and early years centre.	1.00	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
7	15/00237/FUL	Clearserve Ltd	Construction of 11 two bed timber framed flats and associated works.	1.00	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	No – size of development not likely to generate significant cumulative effects
8	16/00982/COUPA	Mick Williams	Change of use of a building from office use Class B1 (a) to 16 no. dwellings/houses.	1.00	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	No – the nature of development is not likely to generate significant cumulative effects
9	18/00425/COUPA	Go Estates Ltd	Change of use of a building from office use (Class B1 (a)) to a dwelling/house (Class C3) - change from office to form 10 apartments.	1.00	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	No – the nature of development is not likely to generate significant cumulative effects
10	20/00707/FUL	St. Dominics Residential Home Ltd	Construction of a two-storey 21 bed care home, 13 x 1 bed close-care bungalows and a two-storey 12 x 1 bed close-care apartment block.	1.00	Submitted Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	No – size of development not likely to generate significant cumulative effects
11	17/02246/OUT	Bovis Homes Limited	Construction of up to 300 dwellings.	1.00	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
12	17/00359/OUT	Trine Developments Ltd	Demolition of all existing buildings, erection of 6 no. residential units, with all matters reserved for up to a maximum of an additional 42 no. residential units and new public space off West Street, Coggeshall.	1.00	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
13	18/00442/OUT	L A Jordan 1989 Rivenhall Settlement	Construction of up to 45 new dwellings, with public open space incorporating equipped area of play, and associated development.	6.00	Approved Application	Tier 1	Population and health	No – under >50 dwelling threshold – unlikely to be of a scale to have a noticeable cumulative influence on cycling activity at this distance

Development details							Stage 1	
ID	Application reference	Applicant or proponent	Brief description	Distance from project (km)	Application status	Tier	Within ZOI?	Progress to Stage 2?
14	16/01653/OUT	M. Scott Properties	Construction of up to 50 dwellings.	4.58	Approved Application	Tier 1	Population and health	No – under >50 dwelling threshold – unlikely to be of a scale to have a noticeable cumulative influence on cycling activity at this distance
15	15/01004/OUT	Bidwells LLP	Construction of up to 60 dwellings.	4.50	Approved Application	Tier 1	Population and health	Yes
16	15/00280/OUT	Redrow Homes	Construction of up to 350 dwellings.	3.38	Approved Application	Tier 1	Population and health	Yes
17	15/00949/FUL	Cressing Solar Farm Ltd	Construction of a solar farm and associated infrastructure.	4.44	Approved Application	Tier 1	Population and health	No – nature of development not likely to generate notable cycling activity, therefore not relevant to ZOI
18	19/01092/FUL	GRIDSERVE Sustainable Energy Ltd	Construction of an Electric Forecourt, comprising of 24 core electric vehicle charging points.	8.25	Approved Application	Tier 1	Population and health	No – nature of development not likely to generate notable cycling activity, therefore not relevant to ZOI
19	16/02095/FUL	Western Homes PLC	Construction of a single 7,010.5 m^2 GEA unit.	9.95	Approved Application	Tier 1	Population and health	No – size of development not likely to generate significant cumulative effects on population and health
20	19/00001/LDO	Horizon 120 (assumed not clear)	Construction of a business and innovation park comprising office, industrial process, general industrial, storage or distribution uses.	9.70	Approved Application	Tier 1	Population and health	Yes
21	18/00920/FUL	Inland Limited	Demolition of existing buildings on site and erection of 78 residential dwellings.	5.94	Approved Application	Tier 1	Population and health	Yes
22	16/02144/OUT	Countryside Properties PLC	Construction of up to 225 residential dwellings.	6.10	Approved Application	Tier 1	Population and health	Yes
23	16/00397/OUT	M Scott Properties Ltd	Construction of up to 118 house units and the creation of a pedestrian footway link to Cressing Station, via Bulford Mill Lane.	6.20	Approved Application	Tier 1	Population and health	Yes
24	18/00921/FUL	Inland Limited	Demolition of existing buildings on site and erection of 65 residential dwellings.	6.00	Submitted Application	Tier 1	Population and health	Yes
25	18/02263/FUL	E Hobbs (Farms) Ltd	Construction of a 2 storey office building (B1a and B1b), with ancillary café at ground floor level, with associated access, parking, landscaping and open space.	8.00	Submitted Application	Tier 1	Population and health	Yes
26	17/01157/OUT	Trustees of Marks Hall Estate	Construction of up to 10,220m^2 of B1, B2 and B8 employment floor space.	8.49	Approved Application	Tier 1	Population and health	Yes
27	18/02048/FUL	Braintree Designer Outlet Village	Construction of a new slip road and associated access improvements off Millennium Way / B1018, with extension to the existing northern car park to create up to 400 additional car parking spaces; amendments to the southern car park entrance and exit; and associated landscaping improvements.	8.18	Approved Application	Tier 1	Population and health	Yes
28	18/00121/OUT	Countryside Properties PLC	Construction of up to 90 dwellings.	8.48	Approved Application	Tier 1	Population and health	Yes
29	16/01475/FUL	Crest Nicholson Eastern	Construction of up to 50 dwellings.	7.11	Approved Application	Tier 1	Population and health	No – under >50 dwelling threshold – unlikely to be of a scale to have a noticeable cumulative influence on cycling activity at this distance

Development details							Stage 1	
ID	Application reference	Applicant or proponent	Brief description	Distance from project (km)	Application status	Tier	Within ZOI?	Progress to Stage 2?
30	18/00371/REM	CALA Homes (North Home Counties) Ltd	Construction of up to 56 dwellings and associated open space, landscaping, new access road, highway improvements and associated development.	8.31	Approved Application	Tier 1	Population and health	Yes
31	19/02234/REM	Bloor Homes Eastern	Construction of 162 dwellings, new public open space, car parking and associated infrastructure works.	0.30	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
32	WIN7H	Braintree District Council	Allocation for 10 or more new dwellings. Construction of 20 homes between 2017-2033.	0.51	Proposed Allocation	Tier 3	Cultural heritage, landscape, biodiversity, population and health, water	No - under >50 dwelling threshold – unlikely to be of a scale to have a noticeable cumulative influence on cycling activity at this distance
33	17/00341/OUT	The Honourable J F Strutt	Construction of up to 51 dwellings (use Class C3), public open space, vehicular access and associated infrastructure.	0.00 (adjacent to or within PRA)	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
34	16/02096/OUT	Arla Foods UIK	Construction of residential development for up to 145 dwellings (use Class C3) with public open space, vehicular access and associated infrastructure.	0.01	Application Approved	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
35	06/01143/OUT	The Landowners	Construction of circa 268 dwellings, B1 business park, primary school, neighbourhood centre, community facilities, open space, landscaping and ancillary infrastructure.	0.00 (adjacent to or within PRA)	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
36	12/01071/OUT	Churchmanor Estates PLC	Revised masterplan for a mixed use development.	0.00 (adjacent to or within PRA)	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
37	08/01171/REM	Barratt Eastern Counties	Construction of 55 new dwellings with associated access, play area and landscaping - Land Parcel 14.	0.27	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, noise, population and health, water	Yes
38	14/00100/REM	Taylor Wimpey UK Ltd	Construction of 135 new dwellings, associated access, infrastructure, parking and landscaping, provision of playing fields and associated changing facilities.	0.12	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
39	12/01620/FUL	Bloor Homes Eastern	Construction of 94 new dwellings with new site access, estate roads, drainage, carports, parking, landscaping and acoustic barrier to A12 boundary together with all ancillary works.	0.00 (adjacent to or within PRA)	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
40	14/00005/COUPA	Swanvale Management Ltd	Change of use of an office building to 32 flats.	0.18	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
41	16/00082/FUL	Simarco Holdings	Demolition of existing Pickford warehouse and associated office, total footprint area 945 m^2. Erection of a distribution warehouse B8 with associated office B1, total footprint area 7,698 m^2.	0.00 (adjacent to or within PRA)	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes

Development details							Stage 1	
ID	Application reference	Applicant or proponent	Brief description	Distance from project (km)	Application status	Tier	Within ZOI?	Progress to Stage 2?
42	15/00799/OUT	Mrs Sarah Cornwell	Hybrid planning application comprising: (i) full application for 222 dwellings including affordable homes, 279 m^2 gross floorspace for retail (Class A1), public open space including local equipped area for play, sustainable drainage systems, landscaping and associated development: and, (ii) outline application with all matters reserved for up to 148 dwellings including affordable homes, public open space including allotments, sustainable drainage systems, landscaping and associated development.	0.02	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
43	15/00926/FUL	Mr S Brice	Operational golf course development.	0.02	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
44	17/00418/OUT	Parker Strategic Land Ltd	Construction of up to 250 new dwellings, including the demolition of two properties (Kings Villas) to facilitate the access.	0.81	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
45	14/01617/FUL	Colemans Cottage Fisheries	Construction of holiday cabins and mega pods.	0.00 (adjacent to or within PRA)	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
46	16/02156/OUT	David Wilson Homes Eastern	Construction of up to 120 dwellings, public open space, landscaping, new vehicular and pedestrian access, highway work, and drainage infrastructure works.	0.00 (adjacent to or within PRA)	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
47	15/00962/FUL	Greenfields Community Housing	Demolition of existing properties and erection of 7 no. 1 bed flats, 12 no. 2 bed houses and 6 no. 2 bed flats.	0.16	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
48	16/01813/OUT	Gladman Developments Ltd.	Construction of up to 140 dwellings, introduction of structural planting and landscaping, informal public open space and children's play area, surface water mitigation and attenuation, site access off Stone Path Drive with associated ancillary works.	0.15	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
49	15/00012/SCR	The Crown Estate	Screening & scoping opinion request – residential development comprising of 180 dwellings.	0.04	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
50	16/00569/OUT	The Crown Estate	Construction of up to 165 dwellings (C3), vehicular access from London Road, public open space, landscaping, associated infrastructure, drainage works and ancillary works.	0.04	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes

Development details							Stage 1	
ID	Application reference	Applicant or proponent	Brief description	Distance from project (km)	Application status	Tier	Within ZOI?	Progress to Stage 2?
51	14/01557/FUL	Greenfields Community Housing Ltd	Construction of 18 new houses.	0.70	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
52	14/01559/FUL	Greenfields Community Housing Ltd	Construction of 17 no. flats and 1 no. bungalow.	0.74	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
53	14/01556/FUL	Greenfields Community Housing	Construction of 4 no. flats and 9 no. houses.	0.62	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
54	15/01498/FUL	Nexus Land Ltd	Construction of 25 no. dwellings.	0.35	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
55	14/01644/FUL	Greenfields Community Housing	Construction of 31 no. dwellings.	0.51	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
56	16/01907/FUL	Framar Developments Ltd	Construction of 13 no. apartments and houses.	0.62	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
57	17/00973/FUL	Countryside Properties (UK) Ltd	Construction of 50 no. dwellings.	0.00 (adjacent to or within PRA)	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
58	17/00679/OUT	Barkley Projects (Kelvedon) LLP	Construction of up to 250 dwellings, a school site, health centre, employment area, local retail area, open space and landscape buffers, with two accesses onto London Road.	0.02	Submitted Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
59	N/A	East of England Strategic Health Authority	Demolition of existing building and redevelopment of 65 flats.	0.70	Pre-Application Advice Sought	Tier 3	Cultural heritage, landscape, biodiversity, population and health, water	Yes
60	N/A	Pre-app -TBC	Construction of 50 no. dwellings.	0.90	Pre-Application Advice Sought	Tier 3	Cultural heritage, landscape, biodiversity, population and health, water	Yes
61	17/01145/FUL	Churchill Retirement Living	Redevelopment to form 60 retirement living apartments, including lodge manager's accommodation, communal facilities, access, car parking and landscaping.	0.74	Refused Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	No – application refused (to be reviewed again for potentially successful appeals)
62	17/01092/FUL	Bellway Homes	Construction of 163 no. one, two, three and four bedroom houses and apartments.	0.02	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
63	17/01730/OUT	Mrs Sarah Cornwell	Construction of up to 65 dwellings.	0.93	Refused Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	No – application refused (to be reviewed again for potentially successful appeals)
64	17/01979/OUT	Mr Coster	Construction of up to 125 dwellings and up to 2,000 m^2 of employment floorspace (Class B1).	0.00 (adjacent to or within PRA)	Submitted Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
65	17/02315/COUPA	Inspired Asset Management	Change of use of a building from office use (Class B1(a)) to dwelling house (Class C3) - office to dwellings.	0.68	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	No – scale too small for a likelihood of significant cumulative effects

Development details							Stage 1	
ID	Application reference	Applicant or proponent	Brief description	Distance from project (km)	Application status	Tier	Within ZOI?	Progress to Stage 2?
66	17/02304/FUL	Ian Twinley	Internal alterations and change of use from single private dwelling to events venue.	0.00 (adjacent to or within PRA)	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	No – scale too small for a likelihood of significant cumulative effects
67	17/02271/OUT	Parker Strategic Land Ltd	Construction of up to 35 dwellings, open space and parkland with access from Coggeshall Road.	0.93	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
68	18/00947/OUT	Bellway Homes Limited	Construction of up to 58 dwellings including affordable homes, public space including local equipped area for play, sustainable drainage systems, landscaping including retention of Rickstones Road hedgerow on site and all associated development.	0.93	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
69	18/01346/FUL	Mr Ian Twinley	Internal alterations / refurbishment of a number of existing outbuildings to a bridal suite; demolition of existing dilapidate outbuildings and replacement with accommodation suites for guests; erection of 3 no. guest accommodation suites; proposed new function hall and ceremony hall (within walled garden); proposed new buildings providing ancillary accommodation for function room (on outside of walled garden).	0.00 (adjacent to or within PRA)	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
70	18/02010/FUL	Mr Steve Read	Demolition of existing dwelling and construction of 78 dwellings including access, landscaping, parking and associated works.	0.14	Submitted Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
71	18/01912/REM	Mr Chris Gatland	Construction of 57 dwellings and associated landscaping, access and parking.	0.14	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
72	18/01853/OUT	Mr Arran Gordon	Construction of 10 dwellings with associated parking, garaging and community footpath.	1.32	Refused Application	Tier 1	Landscape, biodiversity, population and health, water	No – application refused (to be reviewed again for potentially successful appeals)
73	19/00026/FUL	Mr Conan Farningham	Construction of 150 residential dwellings with associated infrastructure and landscaping.	1.33	Submitted Application	Tier 1	Landscape, biodiversity, population and health, water	Yes
74	18/02316/REM	Mrs Sarah Cornwell	Provision of access, appearance, landscaping, layout and scale for 58 dwellings, public open space, sustainable drainage systems, refuse collection, noise mitigation, broadband provision, electric car charging and landscaping including retention of the Rickstones Road hedgerow onsite and associated development.	0.93	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
75	18/02200/FUL	Pegasus Planning Group	Erection of three employment units (B1c/B2/B8 use) with access and parking.	0.13	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes

Development details							Stage 1	
ID	Application reference	Applicant or proponent	Brief description	Distance from project (km)	Application status	Tier	Within ZOI?	Progress to Stage 2?
76	19/01025/FUL	CALA Homes (North Home Counties) Ltd	Construction of up to 250 new dwellings with associated garden and parking provision, dedicated improved access from Coggeshall Road including the demolition of two existing residential properties (Kings Villas) to facilitate this access, new public open space, a Sustainable Urban Drainage System, and associated development.	0.81	Submitted Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
77	19/00679/REM	Parker Strategic Land Ltd	Construction of up to 250 new dwellings.	0.81	Submitted Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
78	19/01222/REM	Mr Giuseppe Cifaldi	Construction of 165 dwellings, new public open space, car parking and associated infrastructure works.	0.00 (adjacent to or within PRA)	Submitted Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
79	19/01803/FUL	Mrs Jennifer Carroll (Agent)	Demolition of existing farm building and 4 no. houses and erection of 50 no. dwellings with associated parking, landscaping, estate roads, public open-space, associated external works and access from Bury Lane.	0.00 (adjacent to or within PRA)	Submitted Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
80	19/01896/OUT	Meeson on behalf of Countryside Properties	Construction of up to 450 residential dwellings, commercial floorspace, residential care home and day nursery with all associated access, servicing, parking, drainage infrastructure, landscaping, open space and utilities infrastructure.	0.00 (adjacent to or within PRA)	Submitted Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
81	17/02227/FUL	Design MAD	Refurbishment of Albert Road Station entrance and new associated station building on eastern side of track, together with upgraded parking bays in the forecourt and improved cycle storage facilities.	0.60	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
82	18/00884/REM	Redrow Homes	Provision of 'appearance', 'landscaping', 'layout' and 'scale' for Phase 1B comprising 84 dwellings with associated landscaping, access and parking.	0.00 (adjacent to or within PRA)	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
83	19/00109/FUL	St Giles Development Ltd	Redevelopment of the site involving the erection of 2 x 3 bed, 5 x 4 bed and 6 x 5 bed dwelling houses (13 units) together with associated parking and landscaping.	0.55	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
84	20/000105/VAR	Foresight Group (Agent)	Variation of conditions regarding time limit and decommissioning requirements for solar park.	0.09	Submitted Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes

Development details							Stage 1	
ID	Application reference	Applicant or proponent	Brief description	Distance from project (km)	Application status	Tier	Within ZOI?	Progress to Stage 2?
85	20/00128/OUT	Mr. Simon Boulton	Construction of B1c (light industrial), B2 (general industry) and B8 (storage and distribution) uses, comprising a maximum gross internal floor space of 15,470 m^2, (166,518 square feet) with associated service yards, HGV and trailer parking, car parking provision, revised landscape provision and new service road with access onto Eastways.	0.00 (adjacent to or within PRA)	Submitted Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
86	19/00494/REM	Arla Dairy	Layout, scale, appearance and landscaping for residential development for up to 145 dwellings.	0.01	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
87	19/01980/FUL	The Club Company Ltd	Change of use of land to site 18 no. holiday caravans, extension to overflow carpark, relocation of playground, creation of two tennis courts and spa garden with ancillary building and associated hard and soft landscaping.	0.05	Submitted Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
88	20/00906/REM	Barratts Homes	Layout, scale, appearance and landscaping for residential development of 100 dwellings.	0.00 (adjacent to or within PRA)	Submitted Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
89	20/00386/OUT	Keens and Hunt Ltd	Demolition of garage and erection of a two-storey building comprising 10 x 2 bed Eco friendly motel rooms.	0.00 (adjacent to or within PRA)	Submitted Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
90	20/01434/FUL	Redrow Homes	Installation of Phases 3B & 4 infrastructure for the provision of secondary road network with associated footpaths, and necessary drainage infrastructure.	0.46	Submitted Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
91	HAT17H	Braintree District Council	Allocation for circa 50 dwellings.	0.00 (adjacent to or within PRA)	Adopted Allocation	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
92	Arla Dairy	Braintree District Council	Allocation for employment area, including business (BA1), general industrial (B2), storage and distribution (B8).	0.06	Adopted Allocation	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
93	WIS2H	Braintree District Council	Allocation for circa 94 new dwellings.	0.02	Adopted Allocation	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
94	WIS9H	Braintree District Council	Allocation for circa 213 new dwellings.	0.07	Adopted Allocation	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
95	WIS9E	Braintree District Council	Allocation for business uses (B1).	0.00 (adjacent to or within PRA)	Adopted Allocation	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes

Development details							Stage 1	
ID	Application reference	Applicant or proponent	Brief description	Distance from project (km)	Application status	Tier	Within ZOI?	Progress to Stage 2?
96	WIS9RW	Braintree District Council	Allocation for retail warehousing – up to a maximum of 2.287 ha.	0.00 (adjacent to or within PRA)	Adopted Allocation	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
97	WIS10H	Braintree District Council	Allocation for circa 20 new homes.	0.54	Adopted Allocation	Tier 3	Cultural heritage, landscape, biodiversity, population and health, water	Yes
98	WIW1H	Braintree District Council	Allocation for circa 40 new homes.	1.32	Adopted Allocation	Tier 3	Landscape, biodiversity, population and health, water	Yes
99	WIN7H	Braintree District Council	Allocation for circa 15 new homes.	0.51	Adopted Allocation	Tier 3	Cultural heritage, landscape, biodiversity, population and health, water	Yes
100	WCH27H	Braintree District Council	Allocation for circa 10 new homes.	0.37	Adopted Allocation	Tier 3	Cultural heritage, landscape, biodiversity, population and health, water	Yes
101	WCH22H	Braintree District Council	Allocation for circa 24 new homes.	0.48	Adopted Allocation	Tier 3	Cultural heritage, landscape, biodiversity, population and health, water	Yes
102	WCH21H	Braintree District Council	Allocation for circa 10 new homes.	0.82	Adopted Allocation	Tier 3	Cultural heritage, landscape, biodiversity, population and health, water	Yes
103	FEE4H	Braintree District Council	Allocation for circa 15 new homes.	0.04	Adopted Allocation	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
104	KEL2CH	Braintree District Council	Allocation for the extension of St Dominic's Care Home.	0.35	Adopted Allocation	Tier 3	Cultural heritage, landscape, biodiversity, population and health, water	Yes
105	RIV2H	Braintree District Council	Allocation for circa 300 new dwellings and associated community uses.	0.02	Adopted Allocation	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
106	WIS6H	Braintree District Council	Allocation for circa 600 new dwellings and associated community uses.	0.00 (adjacent to or within PRA)	Adopted Allocation	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
107	FEER230	Braintree District Council	Allocation for circa 30 new homes.	0.20	Proposed Allocation	Tier 3	Cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
108	KELV 332	Braintree District Council	Allocation for an specialist housing - St Dominic's Care Home, Kelvedon.	0.35	Proposed Allocation	Tier 3	Cultural heritage, landscape, biodiversity, population and health, water	Yes
109	RIVE 360 (RIV2H BTE/15/0799)	Braintree District Council	Strategic growth location - Land off Forest Road, Rivenhall.	0.02	Proposed Allocation	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
110	Site Ref: RIVE 362 Policy Ref: Policy LPP 2	Braintree District Council	Allocation for employment - extension to Eastways Industrial Estate, Witham (Rivenhall Parish).	0.00 (adjacent to or within PRA)	Proposed Allocation	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes

Development details							Stage 1	
ID	Application reference	Applicant or proponent	Brief description	Distance from project (km)	Application status	Tier	Within ZOI?	Progress to Stage 2?
111	WITN 425	Braintree District Council	Allocation for 10 or more new dwellings.	0.80	Proposed Allocation	Tier 3	Cultural heritage, landscape, biodiversity, population and health, water	Yes
112	WITN 426	Braintree District Council	Allocation for 10 or more new dwellings. Construction of 150 homes between 2017-2033.	1.33	Proposed Allocation	Tier 3	Landscape, biodiversity, population and health, water	Yes
113	WITN 427	Braintree District Council	Allocation for 10 or more new dwellings. Construction of 10 homes between 2017-2033.	1.30	Proposed Allocation	Tier 3	Landscape, biodiversity, population and health, water	Yes
114	WITN 613	Braintree District Council	Allocation for 10 or more new dwellings.	0.80	Proposed Allocation	Tier 3	Cultural heritage, landscape, biodiversity, population and health, water	Yes
115	Site Ref: WITN 429 Policy Ref: LPP 30	Braintree District Council	Allocated for mixed use development including retail, community uses, public house, pavilion, residential development and car parking.	0.76	Proposed Allocation	Tier 3	Cultural heritage, landscape, biodiversity, population and health, water	Yes
116	WITC 424	Braintree District Council	Allocation for 10 or more new dwellings. Construction of 61 dwellings.	0.67	Proposed Allocation	Tier 3	Cultural heritage, landscape, biodiversity, population and health, water	Yes
117	WITW 431	Braintree District Council	Allocation for 10 or more new dwellings. Construction of 20 homes between 2017-2033.	1.32	Proposed Allocation	Tier 3	Landscape, biodiversity, population and health, water	Yes
118	WITC 422	Braintree District Council	Allocation for 10 or more new dwellings.	0.54	Proposed Allocation	Tier 3	Cultural heritage, landscape, biodiversity, population and health, water	Yes
119	WIS9H(S)	Braintree District Council	Allocation for 10 or more new dwellings. Construction of 63 homes between 2017-2033.	0.07	Proposed Allocation	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
120	WITC 423	Braintree District Council	Strategic growth location.	0.00 (adjacent to or within PRA)	Proposed Allocation	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
121	Site Ref: HATF 315 & 316 Policy Ref: LPP 23	Braintree District Council	Strategic growth location for the construction of up to 450 new homes and a new stand-alone early years and childcare nursery.	0.00 (adjacent to or within PRA)	Proposed Allocation	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
122	Site Ref: WITC 421 Policy Ref: LPP 32	Braintree District Council	Allocation for 10 or more new dwellings. Construction of 40 dwellings.	0.14	Proposed Allocation	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
123	FEER232	Braintree District Council	Allocation for 30 or more new dwellings.	0.00 (adjacent to or within PRA)	Proposed Allocation	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
124	FEER233	Braintree District Council	Allocation for 750 or more new dwellings.	0.00 (adjacent to or within PRA)	Proposed Allocation	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
125	Site Ref: RIVE 363 Policy Ref: Policy LPP 2	Braintree District Council	Allocation for employment policy area - extension to Eastways Industrial Estate, Witham (Rivenhall Parish).	0.00 (adjacent to or within PRA)	Proposed Allocation	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes

Development details							Stage 1	
ID	**Application reference**	**Applicant or proponent**	**Brief description**	**Distance from project (km)**	**Application status**	**Tier**	**Within ZOI?**	**Progress to Stage 2?**
126	Comprehensive Redevelopment Area. Policy LPP 31	Braintree District Council	Allocation for the comprehensive redevelopment of the land between A12 and GEML, Hatfield Peverel.	0.00 (adjacent to or within PRA)	Proposed Allocation	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
127	KELV 332	Braintree District Council	Allocation for 250 or more new dwellings.	0.35	Proposed Allocation	Tier 3	Cultural heritage, landscape, biodiversity, population and health, water	Yes
128	N/A	Braintree District Council (Government's 'Restoring Your Railway fund')	Blackwater Rail Restoration.	0.00 (adjacent to or within PRA)	Early in bid process	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
Chelmsford City Council								
129	18/00293/EIASO	Countryside Zest (Beaulieu Park) LLP	EIA Screening Opinion for construction of the Radial Distributor Road (Phase 2B), including one new roundabout and one signal junction, one signal crossing, provision of cycle, pedestrian and bridleway crossings, landscaping and associated and ancillary development.	1.30	EIA Screening Request Sought	Tier 3	Landscape, biodiversity, population and health, water	Yes
130	16/01293/FUL	HIFML	Mixed use development (retail, business, general industrial and storage).	5.00	Approved Application	Tier 1	Population and health	Yes
131	17/01499/REM	Watch Tower Bible and Tract Society of Britain	Combined office building.	6.70	Approved Application	Tier 1	Population and health	Yes
132	16/01394/OUT	WH Marriage and Sons	Flour and feed mill.	3.40	Refused Application	Tier 1	Population and health	No – this application has been refused. Furthermore it is unlikely to have a significant influence on active travel
133	19/02123/OUT	Mr G Sharp, CCC Property	55 residential dwellings.	9.00	Submitted Application	Tier 1	Population and health	Yes
134	19/00384/OUT	Castle Homes SPV5 Ltd	92 residential dwellings.	9.00	Approved Application	Tier 1	Population and health	Yes
135	16/01630/MAT/3	Taylor Wimpey UK Ltd	Material amendment to permission 16/01630/MAT/1 (421 residential units and conversion of non-residential structure to 25 residential units).	5.00	Approved Application	Tier 1	Population and health	Yes
136	18/01326/FUL	Unknown. Agent is Mr Stuart Wilsher, Phase 2 Planning and Development	Mixed use scheme including 315 student residential units and retained buildings for leisure purposes.	3.00	Approved Application	Tier 1	Population and health	Yes
137	18/00840/FUL	Bellway Homes	Mixed use scheme including 203 residential units, 3 commercial units and relocation/installation of substations.	3.00	Approved Application	Tier 1	Population and health	Yes
138	18/00255/OUT	Bellway Homes Ltd and Trustees of the Fullbournes Trust	120 dwellings and land for expansion of Great Leighs Primary School.	7.00	Refused Application	Tier 1	Population and health	Yes
139	16/01630/FUL	Taylor Wimpey East London	421 residential dwellings.	2.50	Approved Application	Tier 1	Population and health	Yes

Development details							Stage 1	
ID	Application reference	Applicant or proponent	Brief description	Distance from project (km)	Application status	Tier	Within ZOI?	Progress to Stage 2?
140	20/00002/MAS	Countryside, Broadway Malyan, David Lock Associates, Essex County Council and Bellway	1,000 residential dwellings, 1000 m^2 of business and retail space a piece, primary school, neighbourhood centre, leisure facilities.	9.60	Submitted Application	Tier 1	Population and health	Yes
141	20/00071/FUL	Aquila EHS Ltd	Retail food store, retail/café units, general industry and storage/distribution units.	2.50	Submitted Application	Tier 1	Population and health	Yes
142	20/00071/OUT	Aquila EHS Ltd	Retail food store, retail/café units, general industry and storage/distribution units.	2.50	Submitted Application	Tier 1	Population and health	Yes
143	19/01665/REM	Watch Tower Bible and Tract Society of Britain	Extension of existing production facilities, erection of grounds maintenance building and energy centre.	6.00	Approved Application	Tier 1	Population and health	Yes (part of a comprehensive mixed use development scheme)
144	19/01618/FUL	Seven Capital (Chelmsford Limited)	231 residential dwellings (3 apartment blocks).	3.50	Submitted Application	Tier 1	Population and health	Yes
145	19/01488/REM	Watch Tower Bible and Tract Society of Britain	403 residential dwellings (9 residence blocks).	7.00	Approved Application	Tier 1	Population and health	Yes
146	19/00561/FUL	Cliffords Ltd	New leisure facilities as agreed under the fifth Deed of Variation to the Channels legal agreement (18/01251/MOD106).	3.00	Approved Application	Tier 1	Population and health	Yes
147	17/01612/REM	Watch Tower Bible and Tract Society of Britain	Four storey residence / healthcare building.	6.30	Approved Application	Tier 1	Population and health	Yes (part of a comprehensive mixed use development scheme)
148	16/01728/FUL	Sainsbury's Supermarkets Ltd	Removal of car park deck/reconfiguration of existing car park.	0.30	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, noise, population and health, water	Yes
149	17/00452/FUL	Ms Bridget Summer. Writtle University College	New stable building, horse therapy barn at Cow Watering Campus.	8.00	Approved Application	Tier 1	Population and health	No - whilst within the ZOI for population and health, the nature and scale of the development is not likely to influence cycling activity noticeably
150	16/01046/FUL	Mr J McGorry, The Royal Horticultural Society	Demolition of existing buildings and construction of new restaurant/activity barn.	8.40	Approved Application	Tier 1	Population and health	No - whilst within the ZOI for population and health, the nature and scale of the development is not likely to influence cycling activity noticeably
151	16/00961/FUL	Miss L Purkiss, King Edward VI Grammar School	New sports hall.	3.70	Approved Application	Tier 1	Population and health	No – whilst within the ZOI for population and health, the nature and scale of the development is not likely to influence cycling activity noticeably
152	18/01442/FUL	Mr M Carroll, Royal London Asset Management	New industrial/warehouse unit.	0.00 (adjacent to or within PRA)	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
153	16/00624/FUL	Mr J Revell, McDonald Highway Services	New building comprising workshops, offices and stores (total floor space 1440 m^2).	2.10	Approved Application	Tier 1	Population and health	No – whilst within the ZOI for population and health, the nature and scale of the development is not likely to influence cycling activity noticeably
154	19/00729/FUL	Mr Hall, New Hall School	Demolition of residential flats. Construction of new Northern Access Road.	0.44	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
155	18/00687/FUL	Mr Lee, Bloor Homes Ltd	Demolition of existing buildings, construction of internal road and associated infrastructure.	0.68	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes

Development details							Stage 1	
ID	Application reference	Applicant or proponent	Brief description	Distance from project (km)	Application status	Tier	Within ZOI?	Progress to Stage 2?
156	16/01973/FUL	Mr Biggadike, Inchcape Estates Ltd	Extension to existing car showroom and car parking area.	0.30	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, noise, population and health, water	Yes
157	16/00544/FUL	Jump Street Ltd	Change of use from storage/distribution to assembly/leisure (trampoline park).	0.84	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
158	16/00057/FUL	Mr Floyd, New Hall School Trust	New hockey/rugby pitch.	0.85	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
159	Strategic Growth Site 1b: Essex Police Headquarters and Sports Ground, New Court Road	Chelmsford City Council	250 residential dwellings, primary school, nursery and flexible workspace facilities.	1.64	Proposed Allocation	Tier 3	Landscape, biodiversity, population and health, water	Yes
160	Strategic Growth Site 1d: Former St Peter's College, Fox Crescent	Chelmsford City Council	185 residential dwellings, 2 special schools, small workspaces.	4.40	Proposed Allocation	Tier 3	Population and health	Yes
161	Existing Commitment EC4: East of Boreham	Chelmsford City Council	145 residential dwellings.	0.30	Proposed Allocation	Tier 3	Cultural heritage, landscape, biodiversity, noise, population and health, water	Yes
162	Strategic Growth Site 3a: East Chelmsford - Manor Farm	Chelmsford City Council	250 residential dwellings and country park.	1.22	Proposed Allocation	Tier 3	Landscape, biodiversity, population and health, water	Yes
163	Strategic Growth Site 3b: East of Chelmsford - Land North of Maldon Road	Chelmsford City Council	Office/business park (500 m^2) and childcare nursery.	0.92	Proposed Allocation	Tier 3	Cultural heritage, landscape, biodiversity, population and health, water	Yes
164	Strategic Growth Site 3c: East of Chelmsford - Land South of Maldon Road	Chelmsford City Council	100 residential dwellings.	1.39	Proposed Allocation	Tier 3	Landscape, biodiversity, population and health, water	Yes
165	Strategic Growth Site 6: North of Broomfield	Chelmsford City Council	450 residential dwellings, neighbourhood centre and childcare centre.	3.67	Proposed Allocation	Tier 3	Population and health	Yes
166	Site Allocation 1 - ASDA Car Park, Chelmer Village	Chelmsford City Council	Housing (number of dwellings unknown).	0.87	Adopted Allocation	Tier 3	Cultural heritage, landscape, biodiversity, population and health, water	Yes
167	Site Allocation 8 - Land south of Clements Close	Chelmsford City Council	Housing (number of dwellings unknown).	0.34	Adopted Allocation	Tier 3	Cultural heritage, landscape, biodiversity, population and health, water	Yes
168	Site Allocation 17 (CP22: North East Chelmsford)	Chelmsford City Council	Strategic employment site.	0.00 (adjacent to or within PRA)	Adopted Allocation	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes

Development details							Stage 1	
ID	Application reference	Applicant or proponent	Brief description	Distance from project (km)	Application status	Tier	Within ZOI?	Progress to Stage 2?
169	Strategic Growth Site 3d: East Chelmsford - Land North of Maldon Road	Chelmsford City Council	Around 50 residential dwellings.	1.17	Proposed Allocation	Tier 3	Landscape, biodiversity, population and health, water	Yes
170	Strategic Growth Site 1a - Chelmer Waterside	Chelmsford City Council	Six sites with total potential for 1,000 residential dwellings.	2.56	Adopted Allocation	Tier 3	Population and health	Yes
171	Strategic Growth Site 1b - Former St Peter's College Fox Crescent	Chelmsford City Council	Around 185 residential dwellings, two new special educational needs (SEND) schools.	4.40	Adopted Allocation	Tier 3	Population and health	Yes
172	Strategic Growth Site 1c - Former Royal Mail Premises, Victoria Road	Chelmsford City Council	Around 150 residential dwellings and childcare nursery.	2.96	Adopted Allocation	Tier 3	Population and health	Yes
173	Strategic Growth Site 1d - Riverside Ice and Leisure Land, Victoria Road	Chelmsford City Council	150 residential dwelling.	2.98	Adopted Allocation	Tier 3	Population and health	Yes
174	Strategic Growth Site 1e - Civic Centre Land, Fairfield Road	Chelmsford City Council	Around 100 residential dwellings.	3.72	Adopted Allocation	Tier 3	Population and health	Yes
175	Strategic Growth Site 1f - Eastwood House Car park, Glebe Road	Chelmsford City Council	Around 100 residential dwellings.	3.48	Adopted Allocation	Tier 3	Population and health	Yes
176	Growth Site Policy GR1 -1g Chelmsford Social Club and Private Car Park, Springfield Road	Chelmsford City Council	Around 100 residential dwellings.	2.88	Adopted Allocation	Tier 3	Population and health	Yes
177	Growth Site Policy 1h - Ashby House Car Parks, New Street	Chelmsford City Council	Around 100 residential dwellings.	2.98	Adopted Allocation	Tier 3	Population and health	Yes
178	Growth Site Policy 1i - Rectory Lane Car Park West	Chelmsford City Council	Allocation for circa 75 new homes. Main vehicle access will be from Broomfield Road/Elms Drive. Improved level pedestrian/cycle connection to two existing road crossing points to the south.	3.50	Adopted Allocation	Tier 3	Population and health	Yes
179	Growth Site Policy 1j - Car Park to the West of County Hotel, Rainsford Road	Chelmsford City Council	Allocation for circa 45 new homes, with main vehicle access from Rainsford Road.	3.91	Adopted Allocation	Tier 3	Population and health	No – under >50 dwelling threshold – unlikely to be of a scale to have a noticeable cumulative influence on cycling activity at this distance

Development details							Stage 1	
ID	Application reference	Applicant or proponent	Brief description	Distance from project (km)	Application status	Tier	Within ZOI?	Progress to Stage 2?
180	Growth Site Policy 1k - Former Chelmsford Electrical and Cr Wash, Brook Street	Chelmsford City Council	Allocation for circa 40 new homes, with the provision of a 3.5m widened cycle/footway along the New Street frontage.	3.09	Adopted Allocation	Tier 3	Population and health	No – under >50 dwelling threshold – unlikely to be of a scale to have a noticeable cumulative influence on cycling activity at this distance
181	Growth Site Policy 1l - BT Telephone Exchange, Cottage Place	Chelmsford City Council	Allocation for circa 30 new homes.	3.26	Adopted Allocation	Tier 3	Population and health	No – under >50 dwelling threshold – unlikely to be of a scale to have a noticeable cumulative influence on cycling activity at this distance
182	Growth Site Policy 1M – Rectory Lane Car Park East	Chelmsford City Council	Allocation for circa 25 new homes.	3.46	Adopted Allocation	Tier 3	Population and health	No – under >50 dwelling threshold – unlikely to be of a scale to have a noticeable cumulative influence on cycling activity at this distance
183	Growth Site Policy 1N – Waterhouse Lane Depot and Nursery	Chelmsford City Council	Allocation for circa 20 new homes.	4.52	Adopted Allocation	Tier 3	Population and health	No – under >50 dwelling threshold – unlikely to be of a scale to have a noticeable cumulative influence on cycling activity at this distance
184	Growth Site Policy 1O – Church Hall Site, Woodhall Road	Chelmsford City Council	Allocation for circa 19 new homes with main vehicle access from Woodland Road.	3.24	Adopted Allocation	Tier 3	Population and health	No - under >50 dwelling threshold – unlikely to be of a scale to have a noticeable cumulative influence on cycling activity at this distance
185	Growth Site Policy 1P - British Legion, New London Road	Chelmsford City Council	Allocation for circa 15 new homes.	4.05	Adopted Allocation	Tier 3	Population and health	No - under >50 dwelling threshold – unlikely to be of a scale to have a noticeable cumulative influence on cycling activity at this distance.
186	Growth Site Policy 1Q – Rear of 17 To 37 Beach's Drive	Chelmsford City Council	Allocation for circa 14 new homes with main vehicle access from Beach's Drive.	4.97	Adopted Allocation	Tier 3	Population and health	No - under >50 dwelling threshold – unlikely to be of a scale to have a noticeable cumulative influence on cycling activity at this distance
187	Growth Site Policy 1R - Garage Site, St Nazaire Road	Chelmsford City Council	Allocation for circa 12 new homes with main vehicle access from St Nazaire Road.	4.22	Adopted Allocation	Tier 3	Population and health	No - under >50 dwelling threshold – unlikely to be of a scale to have a noticeable cumulative influence on cycling activity at this distance
188	Growth Site Policy 1S – Garage Site and Land, Medway Close	Chelmsford City Council	Allocation for circa 10 new homes with improved main vehicle access from Medway Close.	5.20	Adopted Allocation	Tier 3	Population and health	No - under >50 dwelling threshold – unlikely to be of a scale to have a noticeable cumulative influence on cycling activity at this distance
189	Growth Site Policy 1T – Car Park R/O Bellamy Court, Broomfield Road	Chelmsford City Council	Allocation for circa 10 new homes with main vehicle access from Broomfield Road.	3.75	Adopted Allocation	Tier 3	Population and health	No - under >50 dwelling threshold – unlikely to be of a scale to have a noticeable cumulative influence on cycling activity at this distance
190	Growth Site Policy 1U – Rivermead, Bishop Hall Lane	Chelmsford City Council	Allocation for circa 80 new homes, with the potential for new bridges to Anglia Ruskin University and Springfield Hall Park connecting with the pedestrian and cycle network, and an improved pedestrian and cycle connection to Bishop Hall Lane.	3.08	Adopted Allocation	Tier 3	Population and health	Yes

Development details							Stage 1	
ID	Application reference	Applicant or proponent	Brief description	Distance from project (km)	Application status	Tier	Within ZOI?	Progress to Stage 2?
191	Growth Site Policy 1V – Railway Sidings, Brook Street	Chelmsford City Council	Intensification of business or industrial use. Improved pedestrian and cycle routes.	2.70	Adopted Allocation	Tier 3	Population and health	Yes (potential cumulative effect from new cycle routes)
192	Strategic Growth Site Policy 3A– East Chelmsford – Manor Farm	Chelmsford City Council	Allocation for circa 250 new homes, a new Country Park and new vehicular access road from Maldon Road into Sandford Mill.	1.22	Adopted Allocation	Tier 3	Landscape, biodiversity, population and health, water	Yes
193	Strategic Growth Site Policy 3B – East Chelmsford – Land North of Maldon Road (Employment)	Chelmsford City Council	Approximately 5,000m^2 (net) new use Class B1 floorspace, or other appropriate B use Classes. Stand-alone early years and childcare nursery.	0.91	Adopted Allocation	Tier 3	Cultural heritage, landscape, biodiversity, population and health, water	Yes
194	Strategic growth site policy 3C– East Chelmsford– Land south of Maldon Road	Chelmsford City Council	Allocation for circa 100 new homes.	1.39	Adopted Allocation	Tier 3	Landscape, biodiversity, population and health, water	Yes
195	Growth Site Policy 3D– East Chelmsford – Land North of Maldon Road (Residential)	Chelmsford City Council	Allocation for circa 50 new homes.	1.17	Adopted Allocation	Tier 3	Landscape, biodiversity, population and health, water	Yes
196	Growth Site Policy 4 – Land North of Galleywood Reservoir	Chelmsford City Council	Allocation for circa 13 new homes.	5.24	Adopted Allocation	Tier 3	Population and health	No – under >50 dwelling threshold – unlikely to be of a scale to have a noticeable cumulative influence on cycling activity at this distance
197	Growth Site Policy 5 - Land Surrounding Telephone Exchange, Ongar Road, Writtle	Chelmsford City Council	Allocation for circa 25 new homes.	6.58	Adopted Allocation	Tier 3	Population and health	No – under >50 dwelling threshold – unlikely to be of a scale to have a noticeable cumulative influence on cycling activity at this distance
198	Strategic Growth Site Policy 7B - Great Leighs - Land East of London Road	Chelmsford City Council	Allocation for circa 250 new specialist residential homes for elderly people.	7.31	Adopted Allocation	Tier 3	Population and health	Yes
199	Strategic Growth Site Policy 7C– Great Leighs– Land North and South of Banters Lane	Chelmsford City Council	Allocation for circa 100 new homes.	7.20	Adopted Allocation	Tier 3	Population and health	Yes
200	Strategic Growth Site Policy 7D - Great Leighs - Land East of Main Road	Chelmsford City Council	Allocation for circa 100 new homes.	7.17	Adopted Allocation	Tier 3	Population and health	Yes

Development details							Stage 1	
ID	Application reference	Applicant or proponent	Brief description	Distance from project (km)	Application status	Tier	Within ZOI?	Progress to Stage 2?
201	Strategic Growth Site Policy 8 – North of Broomfield	Chelmsford City Council	Allocation for circa 450, including a new stand-alone early years and childcare nursery located in the southern portion of the site.	3.67	Adopted Allocation	Tier 3	Population and health	Yes
202	Strategic Growth Site Policy 9 – East of Boreham	Chelmsford City Council	Allocation for circa 143 new homes, with vehicular access from Plantation Road and provision of pedestrian and cycle connections.	0.30	Adopted Allocation	Tier 3	Cultural heritage, landscape, biodiversity, noise, population and health, water	Yes
203	Travellers Site Policy Gt1 – Drakes Lane Gypsy and Traveller Site	Chelmsford City Council	Allocation for 10 permanent gypsy and traveller pitches with main vehicular access from Drakes Lane.	2.83	Adopted Allocation	Tier 3	Population and health	No – under 50 dwelling threshold – unlikely to be of a scale to have a noticeable cumulative influence on cycling activity at this distance
204	Growth Site Policy 11 – South of Bicknacre	Chelmsford City Council	Allocation for circa 35 new homes.	6.51	Adopted Allocation	Tier 3	Population and health	No – under 50 dwelling threshold – unlikely to be of a scale to have a noticeable cumulative influence on cycling activity at this distance
205	Growth Site Policy 12 - St Giles, Moor Hall Lane, Bicknacre	Chelmsford City Council	Allocation for circa 32 new units for specialist residential accommodation (SRA).	5.49	Adopted Allocation	Tier 3	Population and health	No – under 50 dwelling threshold – unlikely to be of a scale to have a noticeable cumulative influence on cycling activity at this distance
206	Strategic Growth Site Policy 13 – Danbury	Chelmsford City Council	Allocation for circa 100 new homes.	5.11	Adopted Allocation	Tier 3	Population and health	Yes
207	09/01314/EIA	Countryside Zest (Beaulieu Park) LLP	Outline application for mixed use development including dwellings (approximately 3,600), business park, retail, hotel, leisure, education & community etc.	0.00 (adjacent to or within PRA)	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes - Development under construction
208	10/00021/EIA	Countryside Zest (Beaulieu Park) LLP	Outline application with all matters reserved for new railway station and associated development.	0.00 (adjacent to or within PRA)	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes - Development in pre-construction
209	16/00312/EIASO	Mr Nick Bowen	Environmental Impact Assessment (EIA) Screening Opinion in respect of proposed Radial Distributor Road (RDR) Phase 3.	0.00 (adjacent to or within PRA)	EIA Screening Request Sought	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes - Development in pre-construction
210	15/01581/FUL	Mr David Hourd	New 400kV Gas-Insulated Substation.	0.00 (adjacent to or within PRA)	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
211	16/00911/FUL	Mr David Hourd	New 400kV Air-Insulated Substation.	0.00 (adjacent to or within PRA)	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
212	16/00713/EIASO	Pegasus Planning Group (agent name)	EIA Screening Opinion in respect of proposed construction of an AD plant.	0.00 (adjacent to or within PRA)	EIA Screening Request Sought	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
213	14/01552/OUT	Mr Ivor Beamon	Residential development of up to 145 residential dwellings.	0.30	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, noise, population and health, water	Yes

Development details							Stage 1	
ID	Application reference	Applicant or proponent	Brief description	Distance from project (km)	Application status	Tier	Within ZOI?	Progress to Stage 2?
214	13/00973/EIASO	Not available	EIA Screening Opinion in respect of a proposed Solar PV Project.	0.16	EIA Screening Request Sought	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
215	17/02165/OUT	Countryside Zest (Beaulieu Park) LLP	Alignment connecting the Radial Distributor Road (RDR) Phase 3 to the RDR Phase 2B Roundabout 5, to the Boreham Interchange at Roundabout 6. Including footpath/ cycleway, a steel framed bridge and the associated and ancillary development.	1.00	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
216	17/02039/REM	Countryside Zest (Beaulieu Park) LLP	Radial Distributor Road (Phase 2B), including one new roundabout and one signal junction, one signal crossing, provision of cycle, pedestrian and bridleway crossings, landscaping and associated and ancillary development.	0.00 (adjacent to or within PRA)	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
217	18/01378/REM	Countryside Zest (Beaulieu Park) LLP	Radial Distributor Road (Phase 2C), including schools access road, cycle/ pedestrian paths and associated infrastructure.	0.93	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
218	16/01471/REM	Countryside Zest (Beaulieu Park) LLP	Demolition of existing buildings and construction of 266 houses and 55 apartments, car parking, landscaping and associated and ancillary development (amended by 19/00590/MAT for the addition of 1 no. one-bed residential apartment).	1.32	Approved Application	Tier 1	Landscape, biodiversity, population and health, water	Yes
219	19/00586/REM	Countryside Zest (Beaulieu Park) LLP	Construction of 118 houses (Zones M, N & Q:) with associated infrastructure, servicing, landscaping and car parking.	1.35	Approved Application	Tier 1	Landscape, biodiversity, population and health, water	Yes
220	19/00581/REM	Countryside Zest (Beaulieu Park) LLP	Construction of 300 dwellings (Zones K and L) with associated infrastructure, servicing, landscaping and car parking spaces.	1.52	Application Approved	Tier 1	Landscape, biodiversity, population and health, water	Yes
221	19/01722/SCOPE	Countryside Zest (Beaulieu Park) LLP	EIA Scoping opinion to the proposed Development at Beaulieu Station Hub.	0.00 (adjacent to or within PRA)	EIA Scoping Opinion Sought	Tier 2	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
222	16/02194/REM	The Home Group	Construction of 240 dwellings, open space, hard and soft landscaping and associated highways and infrastructure works.	1.57	Application Approved	Tier 1	Landscape, biodiversity, population and health, water	Yes
223	19/01998/REM	Countryside Zest (Beaulieu Park) LLP	Construction of 111 dwellings (Zones O & P) with associated infrastructure, servicing, landscaping and car parking.	1.18	Approved Application	Tier 1	Landscape, biodiversity, population and health, water	Yes
224	20/00207/REM	Countryside Zest (Beaulieu Park) LLP	Development of a bridge connecting the Hanson Roundabout to the Generals Lane Roundabout, crossing over the A138 on-slip to the A12 and existing railway line.	0.00 (adjacent to or within PRA)	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes

Development details							Stage 1	
ID	Application reference	Applicant or proponent	Brief description	Distance from project (km)	Application status	Tier	Within ZOI?	Progress to Stage 2?
225	20/01148/AG	Mr. David Bolton	Construction of an agricultural general store.	0.00 (adjacent to or within PRA)	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
226	20/00840/SCOPE	Barton Willmore	Request for an EIA Scoping Opinion for: up to 205 dwellings (Parcels 3c and 3d); up to 8,500 m^2 of commercial use (3b), provision of a day care nursery (3b), and safeguarded land for Sandon Park and Ride.	0.00 (adjacent to or within PRA)	EIA Scoping Opinion Sought	Tier 2	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
227	17/00221/REM	Countryside Zest (Beaulieu Park) LLP	Construction of the Radial Distributor Road (Phase 2a), including two new roundabouts, provision of cycle and pedestrian crossings, substation, landscaping and associated and ancillary development.	0.00 (adjacent to or within PRA)	Application Approved	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
228	17/00310/EIASO	Countryside Zest (Beaulieu Park) LLP	Environmental Impact Assessment Screening Opinion for Zone E development comprising the construction of 193 houses, with associated infrastructure, servicing, landscaping and car parking.	0.00 (adjacent to or within PRA)	EIA Screening Request Sought	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
229	17/02039/REM	Countryside Zest (Beaulieu Park) LLP	Construction of the Radial Distributor Road (Phase 2B), including one new roundabout and one signal junction, one signal crossing, provision of cycle, pedestrian and bridleway crossings, landscaping and associated and ancillary development.	0.00 (adjacent to or within PRA)	Submitted Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
230	17/02165/OUT	Countryside Zest (Beaulieu Park) LLP	Construction of the alignment of the Radial Distributor Road (RDR) Phase 3 to connect the RDR Phase 2B Roundabout 5, to the Boreham Interchange at Roundabout 6. Including a footpath/cycleway, a steel framed bridge (maximum height of 14m) together with associated and ancillary development.	0.93	Submitted Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
231	17/02006/REM	Countryside Zest (Beaulieu Park) LLP	North-South Greenway, Beaulieu: creation of landscaped open space including, provision of primary and secondary cycleways, footpaths, a Neighbourhood Equipped Area for Play (NEAP), a Local Equipped Area for Play (LEAP) and an informal kickabout area for ball games and associated ancillary development.	1.30	Approved Application	Tier 1	Landscape, biodiversity, population and health, water	Yes
232	N/A	Essex Highways	Junction improvements to A1060/A114 Amy and Navy roundabout (flyover removal completed).	3.30	Future Planned Highway Authority Scheme	Tier 3	Population and health	Yes
233	N/A	Essex Highways	Chelmsford Growth Strategy (signage and technology improvements, Tindal Square/Market Road cycle lane, Writtle cycleway/Admiral Park bridge).	Variable - exact locations unknown	Future Planned Highway Authority Scheme	Tier 3	Population and health (other aspects to be considered once further details of scheme available)	Yes

Development details							Stage 1	
ID	Application reference	Applicant or proponent	Brief description	Distance from project (km)	Application status	Tier	Within ZOI?	Progress to Stage 2?
Colchester Borough Council								
234	182220	Mersea Homes and Hills Residential	420 residential units.	3.2	Submitted Application	Tier 1	Population and health	Yes
235	172935	Miss Jessica Ferguson	Retail unit and six unit retail terrace.	4.30	Approved Application	Tier 1	Population and health	No – application re-submitted at a later date (revised application reference 193163)
236	193163	Miss Jessica Ferguson	Retail unit and six unit retail terrace (re-submission of application reference 172935).	0.44	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
237	161578	Mr Archie Browning	Glamping site.	2.30	Approved Application	Tier 1	Population and health	No – whilst within the ZOI for population and health, the nature of the development means that no significant impacts on access are considered likely
238	182014	Mr Gladman	200 dwellings and land safeguarded for school expansion.	2.70	Refused Application	Tier 1	Population and health	No – application refused (to be reviewed again for potentially successful appeals)
239	180045	Mr Matthew Parsons	Demolish existing buildings and redevelop to create 262 residential dwellings.	7.64	Approved Application	Tier 1	Population and health	Yes
240	100502	HCA & North Essex Partnership	248 residential units.	8.19	Approved Application	Tier 1	Population and health	Yes
241	180940	Mr Ian Newman	Conversion of retained buildings to provide 20 residential units.	8.20	Approved Application	Tier 1	Population and health	No – under >50 dwelling threshold – unlikely to be of a scale to have a noticeable cumulative influence on cycling activity at this distance
242	152733	C/O Agent - Miss Sophie Jenkinson	Reserved matters application following outline approval (application reference 151401, 730 residential dwellings).	8.20	Approved Application	Tier 1	Population and health	Yes
243	152794	C/O Agent - Mrs Lauren Dooley	Highway improvements to facilitate redevelopment of Former Severalls Hospital.	8.20	Approved Application	Tier 1	Population and health	Yes
244	190665	Colchester Borough Council	Healthcare campus including 300 older people's homes, hospital, medical centre and care home.	9.20	Submitted Application	Tier 1	Population and health	Yes
245	200079	Colchester Borough Council	Pedestrian 'walk', renewable energy centre and heat distribution network.	9.20	Approved Application	Tier 1	Population and health	No – whilst within the ZOI for population and health, the nature of the development is not likely to generate noticeable cycling activity therefore it is not relevant
246	180438	Colchester Borough Council	Colchester Northern Gateway Sports Hub.	8.66	Approved Application	Tier 1	Population and health	Yes
247	160825	Turnstone Colchester Ltd	Restaurant/takeaway units, hotel, multiplex cinema and leisure units.	8.66	Approved Application	Tier 1	Population and health	Yes
248	201631	Turnstone Colchester Ltd	Site redevelopment to provide cinema, leisure units, hotel and restaurants/takeaways/public house.	8.66	Submitted Application	Tier 1	Population and health	Yes
249	121272	Countryside Annington (Col) Ltd	Mixed use development including 1,137 residential dwellings, residential care (120 beds), retail / commercial / community uses, primary school and early years childcare and new relief road.	7.79	Approved Application	Tier 1	Population and health	Yes
250	121949	Moritz LLG	Solar park (36.54 ha).	0.09	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes

Development details							Stage 1	
ID	Application reference	Applicant or proponent	Brief description	Distance from project (km)	Application status	Tier	Within ZOI?	Progress to Stage 2?
251	O/COL/01/0009	Mr Anthony Middlebrook	2,600 dwellings, mixed uses (retail, leisure, employment) and transport improvements.	5.60	Approved Application	Tier 1	Population and health	Yes (note while planning application was approved in 2002, planning conditions have been discharged in 2016 and scale of development is such that it may not be completed before Proposed Scheme)
252	160551	Mr Stephen Williams	Redevelopment of existing commercial units to 86 new residential dwellings.	9.90	Approved Application	Tier 1	Population and health	Yes
253	180873	Mr Davies	57 new residential properties.	1.80	Approved Application	Tier 1	Landscape, biodiversity, population and health, water	Yes
254	172438	Essex County Council	New 200 place school.	2.30	Submitted Application	Tier 1	Population and health	Yes
255	173252	Bearwell Construction Ltd	Redevelopment of existing school site to provide a 200 place SEND school.	2.30	Submitted Application	Tier 1	Population and health	Yes
256	152826	C/O Agent Mr Nick Wanstall	93 dwellings.	1.90	Approved Application	Tier 1	Landscape, biodiversity, population and health, water	Yes
257	172363	Mrs Natalie Webb	10 residential units.	1.03	Approved Application	Tier 1	Landscape, biodiversity, population and health, water	Yes
258	121041	O & H Properties Ltd	Resubmission of O/COL/02/0980 to extend the time limit for implementation.	1.30	Approved Application	Tier 1	Landscape, biodiversity, population and health, water	Yes
259	182570	Tollgate Partnership Ltd	External alterations to existing retail units, erection one new retail unit and new service access road.	1.10	Approved Application	Tier 1	Landscape, biodiversity, population and health, water	Yes
260	192209 & 191716	Essex County Council	Primary school for 420 pupils.	1.30	Application Approved	Tier 1	Landscape, biodiversity, population and health, water	Yes
261	181859	C/O Agent Mr Matthew Parsons	102 residential dwellings.	0.22	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
262	201065	C/O Agent Mr Ben Shaw	Two year temporary change of use of vacant land to install pop up cinema.	1.10	Submitted Application	Tier 1	Landscape, biodiversity, population and health, water	Yes
263	145494	C/O Agent Mr Michael Smith	358 new residential dwellings.	0.23	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
264	200995	Mr Michael Siggs	31 residential dwellings.	0.46	Submitted Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
265	200968	Michael Finlay	Repair/conversion of existing buildings to provide 36 residential units.	0.30	Submitted Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
266	201236	Ms S Harrison	49 residential dwellings.	0.55	Submitted Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
267	190699	Mr Taylor	Business park (3,009 m^2 of offices).	0.29	Submitted Application	Tier 1	Cultural heritage, landscape, biodiversity, noise, population and health, water	Yes
268	181137	Mosum Ltd	Internal and external alterations and extensions to existing hotel.	0.00 (adjacent to or within PRA)	Submitted Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes

Development details							Stage 1	
ID	Application reference	Applicant or proponent	Brief description	Distance from project (km)	Application status	Tier	Within ZOI?	Progress to Stage 2?
269	200388	Marks Tey Ltd.	Site redevelopment to provide new/replacement buildings for employment.	0.00 (adjacent to or within PRA)	Submitted Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
270	171933	Mr Gary Cleghorn	Demolition of existing buildings, new service road and erection of new office and canteen buildings.	5.90	Approved Application	Tier 1	Population and health	No – below 2000 m^2 floorspace threshold
271	172642	Mr N Percival	Extension/conversion or erection of 22 dwellings.	5.79	Approved Application	Tier 1	Population and health	No – below >50 dwelling threshold
272	130245	Wilkin and Sons Limited	126 dwellings, dentist surgery, new roundabout, allotments and amenity areas.	3.81	Approved Application	Tier 1	Population and health	Yes
273	190760	Mrs Amanda Otto	Conversion of redundant stables to office/pharmacy.	1.50	Approved Application	Tier 1	Landscape, biodiversity, population and health, water	Yes
274	171174	Schroders UK Property Fund	Two new retail units, alterations to vehicular access, car parking and improved pedestrian and cycle links.	5.94	Submitted Application	Tier 1	Population and health	Yes
275	152730	Inland Homes	Erection of 61 residential dwellings, conversion of former rectory building to provide 5 residential dwellings.	6.44	Approved Application	Tier 1	Population and health	Yes
276	190043	C/O Agent Michael Smith	119 residential dwellings in 5 apartment blocks.	6.44	Submitted Application	Tier 1	Population and health	Yes
277	190302	K De La Garza	80 residential dwellings, allotments, recreational hut and public open space.	8.50	Approved Application	Tier 1	Population and health	Yes
278	192271	Hopkins Homes Limited	41 residential dwellings.	6.20	Submitted Application	Tier 1	Population and health	No – below >50 dwelling threshold
279	190522	Bloor Homes (Eastern)	150 residential dwellings.	5.50	Approved Application	Tier 1	Population and health	Yes
280	173127	Gladman Developments Ltd	97 residential dwellings.	5.90	Approved Application	Tier 1	Population and health	Yes
281	193163	The Churchmanor Estates Company plc	Retail park comprising retail and restaurant units.	0.44	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
282	Policy SS4: Copford	Colchester Borough Council	70 residential dwellings.	0.21	Proposed Allocation	Tier 3	Cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
283	Policy SS4: Copford	Colchester Borough Council	50 residential dwellings.	0.21	Proposed Allocation	Tier 3	Cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
284	Policy WC2: Stanway	Colchester Borough Council	630 residential dwellings.	0.00 (adjacent to or within PRA)	Proposed Allocation	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
285	Policy WC2: Stanway	Colchester Borough Council	150 residential dwellings.	0.00 (adjacent to or within PRA)	Proposed Allocation	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes

Development details							Stage 1	
ID	Application reference	Applicant or proponent	Brief description	Distance from project (km)	Application status	Tier	Within ZOI?	Progress to Stage 2?
286	Policy WC2: Stanway	Colchester Borough Council	Up to 200 residential dwellings at land between Tollgate West and London Road (former Sainsbury's Site).	0.00 (adjacent to or within PRA)	Proposed Allocation	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
287	Site Ref: RIVE 364 Policy Ref: LPP 4	Braintree District Council	Special employment area for emergency services at Kelvedon Park.	0.00 (adjacent to or within PRA)	Proposed Allocation	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
288	Site Allocation 1 - Land north of Hospital Approach and south of Woodhouse Lane	Colchester Borough Council	Greenfield site allocated for 150-200 new residential dwellings	3.58	Proposed Allocation	Tier 3	Population and health	Yes
289	Site Allocation 4 - Land north of Copperfield Road	Colchester Borough Council	Network of small agricultural fields allocated for residential development (220-270 dwellings).	4.24	Adopted Allocation	Tier 3	Population and health	Yes
290	Site Allocation 17 (CP22: North East Chelmsford)	Colchester Borough Council	Strategic employment site.	0.00 (adjacent to or within PRA)	Adopted Allocation	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
291	Policy SS5: Eight Ash Green	Colchester Borough Council	150 dwellings (preferred site allocated by Neighbourhood Plan).	0.60	Adopted Allocation	Tier 3	Cultural heritage, landscape, biodiversity, population and health, water	Yes
292	Policy WC1: Stanway Strategic Economic Area	Colchester Borough Council	Land safeguarded for economic/employment uses.	0.45	Proposed Allocation	Tier 3	Cultural heritage, landscape, biodiversity, population and health, water	Yes
293	Site Allocation 2 - Land north of Copperfield Road	Colchester Borough Council	150-200 residential dwellings, relocation and expansion of Broomfield Primary School and associated community facilities.	3.01	Adopted Allocation	Tier 3	Population and health	Yes
294	Boxted Neighbourhood Plan	Colchester Borough Council	Provision of dwellings with minimum of 25% affordable housing.	3.01	Adopted Allocation	Tier 3	Population and health	Yes
295	Myland and Braiswick Neighbourhood Plan	Colchester Borough Council	Provision of houses, commercial, schools, mixed use and open space area as part of North Colchester Growth Area.	0.00 (adjacent to or within PRA)	Adopted Allocation	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
296	West Bergholt Neighbourhood Plan	Colchester Borough Council	120 dwellings divided between two sites.	1.17	Adopted Allocation	Tier 3	Landscape, biodiversity, population and health, water	Yes
297	Copford and Copford Green Allocation SS4	Colchester Borough Council	50 dwellings at Hall Road and 70 dwellings at Queensberry Avenue.	0.21	Proposed Allocation	Tier 3	Cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
298	Great Tey Allocation SS8	Colchester Borough Council	10 dwellings at Brook Road and 30 dwellings at Greenfield Drive.	2.77	Proposed Allocation	Tier 3	Population and health	Yes
299	Great Horkesley Allocation SS7	Colchester Borough Council	80 dwellings at Great Horkesley Manor and 13 dwellings at School Lane.	6.09	Proposed Allocation	Tier 3	Population and health	Yes
300	North Colchester - Other Allocations NC3	Colchester Borough Council	70 dwellings.	5.05	Proposed Allocation	Tier 3	Population and health	Yes

Development details							Stage 1	
ID	Application reference	Applicant or proponent	Brief description	Distance from project (km)	Application status	Tier	Within ZOI?	Progress to Stage 2?
301	Fordham Allocations SS6	Colchester Borough Council	20 dwellings.	4.15	Proposed Allocation	Tier 3	Population and health	Yes
302	90398	Mr N Moye	Construction of new headquarter office and a new nursery crescent building.	0.04	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
303	80194	Northumbrian Water Ltd	Construction of Wormingford Pumping Station.	0.00 (adjacent to or within PRA)	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
304	81203	Magri Builders Limited	32 residential dwellings.	0.01	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
305	131471	AGM Plc	Two industrial buildings.	0.31	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
306	81333	Tollgate Partnership Ltd	12 business units.	0.82	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
307	130789	Tollgate Partnership Ltd	Mixed use development (business incubators, restaurant and drive through coffee shop).	0.77	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
308	100993	Sainsbury's and Tollgate Partnership	Erection of new food store (replacement of existing store) and petrol station.	0.74	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
309	121040	O&H Properties	Mixed use development comprising business, residential and leisure uses.	0.99	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
310	171529	Gladman Developments	150 dwellings.	1.39	Approved Application	Tier 1	Landscape, biodiversity, population and health, water	Yes
311	101255	Mr Sean Cooke	Nursery building.	0.52	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
312	161380	Mr Stuart McAdam	176 residential dwellings.	0.17	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
313	110736	Mr J.I.S Mason	Retrospective application for new units for storage use and use of existing units for office/storage use.	0.34	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
314	150945	The Churchmanor Estates Company plc	One restaurant unit and two drive through restaurant/café units.	0.56	Refused Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	No – application refused (to be reviewed again for potential successful appeal)
315	151479	Pippa Cheetham	65 residential dwellings.	1.01	Approved Application	Tier 1	Landscape, biodiversity, population and health, water	Yes
316	172935	The Churchmanor Estates Company plc	Retail unit, retail terrace, two supermarkets and restaurant units.	0.45	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes

Development details							Stage 1	
ID	Application reference	Applicant or proponent	Brief description	Distance from project (km)	Application status	Tier	Within ZOI?	Progress to Stage 2?
317	145133	Push Energy Ltd & Mr J Strathern	Change of use of land from (1) agriculture to (2) mixed use for agriculture and use of the generation of renewable energy (solar).	0.00 (adjacent to or within PRA)	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
318	181846	Mrs Burwood and Go Homes Ltd	25 residential dwellings.	0.66	Refused Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	No – application refused (to be reviewed again for potential successful appeal)
319	190647	Marden Homes Ltd	150 residential dwellings.	1.40	Application Approved	Tier 1	Landscape, biodiversity, population and health, water	Yes
320	ESS/40/18/BTE	Brice Aggregates Limited	Removal of two conditions on ESS/10/18/BTE (mineral extraction and ancillary use).	0.00 (adjacent to or within PRA)	Submitted Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
321	192478	Mr Nigel Tedder (Agent)	20 residential dwellings.	0.66	Refused Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
322	172049	Mr Robert Eburne	100 residential dwellings.	1.62	Approved Application	Tier 1	Landscape, biodiversity, population and health, water	Yes
323	193134	Tollgate Partnership Ltd	Reserved matters application in accordance with permission 193133 (mixed use leisure and retail).	0.89	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
Essex County Council								
324	ESS/77/20/CHL	H R Philpot & Son	Sand and gravel quarry.	10.00 (adjacent to or within PRA)	Submitted Application	Tier 1	Population and health	No – whilst within the ZOI for population and health, the nature of the development is not likely to generate noticeable cycling activity therefore not relevant
325	ESS/01/18/CHL	A W and GW Day Ltd and Tarset Farms	Agricultural reservoir and associated irrigation pipeline.	4.40	Approved Application	Tier 1	Population and health	No – whilst within the ZOI for population and health, the nature of the development is not likely to generate noticeable cycling activity therefore not relevant
326	ESS/08/16/CHL	Mr Mike Courts	Restoration of quarry void to agricultural and nature conservation interest. Installation and operation of new inert waste recycling facility.	4.00	Approved Application	Tier 1	Population and health	No – whilst within the ZOI for population and health, the nature of the development is not likely to generate noticeable cycling activity therefore not relevant
327	ESS/16/15/CHL	Frank Lyons Plant Services	Sand and gravel extraction, relocation and existing processing plant and restoration to agriculture.	9.00	Approved Application	Tier 1	Population and health	No – whilst within the ZOI for population and health, the nature of the development is not likely to generate noticeable cycling activity therefore not relevant
328	ESS/65/12/CHL	Essex County Council	Sand and gravel extraction, retention of existing processing plant and restoration to agriculture and biodiversity.	0.17	EIA Scoping Opinion Sought	Tier 2	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
329	Policy P1/ Site A46	Essex County Council	Preferred site for sand and gravel extraction - Coleman's Farm, Witham.	0.00 (adjacent to or within PRA)	Adopted Allocation	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
330	Policy S9	Essex County Council	Safeguarding of the existing Coated Stone Plant (Asphalt) (Essex Regiment Way, North East Chelmsford).	2.47	Adopted Allocation	Tier 3	Population and health	No – whilst within the ZOI for population and health, the nature of the development is not likely to generate noticeable cycling activity therefore not relevant

Development details							Stage 1	
ID	Application reference	Applicant or proponent	Brief description	Distance from project (km)	Application status	Tier	Within ZOI?	Progress to Stage 2?
331	Policy S9	Essex County Council	Safeguarding of the existing Coated Stone Plant (Asphalt) (Bulls Lodge, North East Chelmsford).	2.47	Adopted Allocation	Tier 3	Population and health	No – this minerals allocation safeguards an existing facility which forms part of the baseline for assessment of environmental effects
332	Policy S5	Essex County Council	Safeguarding of Bulls Lodge Strategic Aggregate Recycling Facility.	0.00 (adjacent to or within PRA)	Adopted Allocation	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	No – this minerals allocation safeguards an existing facility which forms part of the baseline for assessment of environmental effects
333	Policy S9/ Site F1	Essex County Council	Safeguarding of the existing Chelmsford Rail Depot (used for both the import of limestone and the export of sand and gravel).	2.69	Adopted Allocation	Tier 3	Population and health	No – this minerals allocation safeguards an existing facility which forms part of the baseline for assessment of environmental effects
334	Policy S9/ Site F3	Essex County Council	Safeguarding of the existing Marks Tey Rail Siding (used for the export of sand and gravel).	0.00 (adjacent to or within PRA)	Adopted Allocation	Tier 3	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	No – this minerals allocation safeguards an existing facility which forms part of the baseline for assessment of environmental effects
335	W7	Essex County Council	Inert waste recycling at Sandon East, Chelmsford - 40,000tpa.	2.63	Adopted Allocation	Tier 3	Population and health	No – whilst within the ZOI for population and health, the nature of the development is not likely to generate noticeable cycling activity therefore not relevant
336	L(i)10R	Essex County Council	Inert waste recycling (75,000tpa) and inert landfill at Blackley Quarry, Gt Leighs, Chelmsford.	8.09	Adopted Allocation	Tier 3	Population and health	No – whilst within the ZOI for population and health, the nature of the development is not likely to generate noticeable cycling activity therefore not relevant
337	L(i)6	Essex County Council	Inert landfill at Sandon, Chelmsford.	2.36	Adopted Allocation	Tier 3	Population and health	No – whilst within the ZOI for population and health, the nature of the development is not likely to generate noticeable cycling activity therefore not relevant
338	ESS/39/14/BTE	Essex County Council	Extraction of sand and gravel.	0.00 (adjacent to or within PRA)	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
339	ESS/10/17/CHL	Eurovia Ltd	Continuation of inert waste recycling facility.	0.24	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
340	ESS/66/17/CHL/SO	Hanson Quarry Products Europe Limited	Continuation of development permitted by CHL/1019/87 (winning and working of sand and gravel).	0.00 (adjacent to or within PRA)	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
341	ESS/67/17/CHL/SO	Hanson Quarry Products Europe Limited	Continuation of development permitted by CHL/1890/87 (winning and working of sand and gravel, the erection of a processing plant and ready mix concrete and mortar plants, workshop and weighbridge and office.)	0.00 (adjacent to or within PRA)	EIA Scoping Opinion Sought	Tier 2	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes
342	ESS/10/18/BTE	Mr Oliver Brice, Colemans Farm Quarry	Removal of two conditions on ESS/39/14/BTE (extraction of sand and gravel) to enable rephasing of site, change in bund configuration and provision of visitor car parking.	0.00 (adjacent to or within PRA)	Approved Application	Tier 1	Air quality, cultural heritage, landscape, biodiversity, geology and soils, noise, population and health, water	Yes

Development details							Stage 1	
ID	Application reference	Applicant or proponent	Brief description	Distance from project (km)	Application status	Tier	Within ZOI?	Progress to Stage 2?
343	ESS/03/18/BTE/01/01	Blackwater Aggregates	Reserved matters application regarding condition 1 (commencement date) of ESS/03/18/BTE (sand and gravel extraction).	3.40	Approved Application	Tier 1	Population and health	No – whilst within the ZOI for population and health, the nature of the development is not likely to generate noticeable cycling activity therefore not relevant
344	CC/BTE/101/19	Essex County Council	New SEND school.	1.10	Approved Application	Tier 1	Landscape, biodiversity, population and health, water	Yes
345	ESS/08/20/COL/SPO	Tarmac UK	Proposed Southern Extension Colchester Zoo Expansion Enabling Works.	2.28	EIA Scoping Opinion Sought	Tier 2	Population and health	Yes
346	ESS/12/20/BTE	Blackwater Aggregates	Sand and gravel extraction, retention of existing processing plant and restoration to agriculture and biodiversity.	2.27	Submitted Application	Tier 1	Population and health	No – whilst within the ZOI for population and health, the nature of the development is not likely to generate noticeable cycling activity therefore not relevant
347	CCCHL/14/20/SPO	Essex County Council	Chelmsford North East Bypass (CNEB): A single carriageway road between Roundabout 4 of the Beaulieu Park Radial Distributor Road (RDR1) and a new roundabout on the A131 at Chatham Green plus dualling of the existing A131 between Chatham Green and Deres Bridge roundabout.	0.85	EIA Scoping Opinion Sought	Tier 2	Cultural heritage, landscape, biodiversity, population and health, water	Yes
348	CC/COL/35/19	Essex County Council	New primary school (420 pupils).	1.00	Approved Application	Tier 1	Cultural heritage, landscape, biodiversity, population and health, water	Yes
Maldon District Council								
349	20/00427/OUT	Blenheim Consultancy Services Ltd and CML Microsystems PLC	Erection of B1/B2 Business Park and 60 residential units.	4.00	Submitted Application	Tier 1	Population and health	Yes
350	20/00228/FUL	The National Trust	Realignment/closure of embankments and construction of freshwater pond.	9.30	Approved Application	Tier 1	Population and health	No – nature of development not likely to generate significant cumulative effects on population and health
351	19/00741/OUT	Countryside Properties & EC, MA & DC Watson & KL Watson-Knee	Residential development for 1,138 dwellings, residential care unit, primary school and early years childcare facility.	4.30	Approved Application	Tier 1	Population and health	Yes
352	15/01327/OUT	Mr Nick Mann - Dartmouth Park Estates Ltd.	Residential development (320 homes), employment development (2000 m^2) and new relief road to north of A414.	8.00	Submitted Application	Tier 1	Population and health	Yes
353	15/00885/FUL	Persimmon Homes	145 residential dwellings.	5.40	Approved Application	Tier 1	Population and health	Yes
354	14/01103/OUT	CEG Land Promotions Ltd & Landowners	1,000 dwellings, employment area of 3.4 ha, primary school and 2 x childcare facilities.	8.00	Approved Application	Tier 1	Population and health	Yes
355	19/01093/FUL	Crest Nicholson (Eastern)	Infrastructure works in support of Western Parcel of FUL/MAL/18/00071.	8.00	Approved Application	Tier 1	Population and health	(This is a further application related to 14/01103/OUT which is to be taken to Stage 2)
356	18/00494/FUL	Taylor Wimpey (East London)	Infrastructure works to facilitate future development.	8.00	Approved Application	Tier 1	Population and health	(This is a further application related to 14/01103/OUT which is to be taken to Stage 2)
357	16/01373/FUL	The Warren Estate	28 holiday lodges.	6.00	Approved Application	Tier 1	Population and health	No - development not likely to have significant cumulative effects on population and health due to short-term nature of holiday residencies
358	20/00519/FUL	Mr John Moran - The Warren Golf and Country Club	Tourism and leisure development, including 70 lodges and new golf academy.	5.50	Submitted Application	Tier 1	Population and health	No - development not likely to have significant cumulative effects on population and health due to short-term nature of holiday residencies

Development details							Stage 1	
ID	Application reference	Applicant or proponent	Brief description	Distance from project (km)	Application status	Tier	Within ZOI?	Progress to Stage 2?
359	18/00407/FUL	Aquila EHS Ltd	60 bedroom hotel.	7.00	Approved Application	Tier 1	Population and health	No - development not likely to have significant cumulative effects on population and health due to short-term nature of holiday residencies
360	APP/X1545/W/19/3230267 15/00419/OUT	Countryside Properties (UK) Ltd &EC, MA and DC Watson, KL Watson Knee	Mixed use development including 1,137 residential dwellings, residential care (120 beds), retail / commercial / community uses, primary school and early years childcare and new relief road as well as associated supporting infrastructure and landscaping.	3.40	Approved Application	Tier 1	Population and health	Yes
361	18/00071/FUL	Code- Development Partners	Variation of conditions on approved application (OUT/MAL/14/01103) for 1,000 dwellings, employment area (3.4 ha), local centre and primary school and early years childcare facilities.	6.52	Approved Application	Tier 1	Population and health	Yes
362	15/01327/OUT	Dartmouth Park Estates Ltd	320 dwellings, small scale employment (200 m^2) and new relief road.	6.2	Refused Application	Tier 1	Population and health	No – application refused (to be reviewed for potential appeals)
363	N/A	CGN and EDF Energy	Bradwell B new nuclear power station and associated infrastructure.	Unknown but indication that temporary infrastructure (Park and Ride facilities etc) to be constructed within 10km	Pre-Application Advice Sought	Tier 3	Population and health	Yes
Tendring District Council								
364	17/00859/OUT	Gladman Developments Ltd - Ivor Beamon	145 residential dwellings.	8.50	Application Under Appeal	Tier 1	Population and health	Yes
365	18/02118/FUL	Mr Jon Cooper - Evolve Business Centre (Colchester) Ltd	90 small commercial units and 4 commercial office blocks.	9.00	Approved Application	Tier 1	Population and health	Yes
366	19/01939/OUT	Mr S Williams - SRC Aggregates and Hills Building Group	Small business park development and storage.	9.30	Refused Application	Tier 1	Population and health	No – application refused (to be reviewed at later date to check for potential appeal)
367	20/00594/FUL	Flying Trade Group PLC	Food storage and distribution facility and distribution warehouse, associated offices, parking and logistics yard.	9.30	Submitted Application	Tier 1	Population and health	Yes
368	19/00944/EIASCR	Turley	116 residential dwellings.	8.30	EIA Screening Request Sought	Tier 3	Population and health	Yes
369	N/A	Tendring District Council	B1027/A133 Link Road.	10.00 (adjacent to or within PRA)	Future Planned Highway Authority Scheme	Tier 3	Population and health (to be confirmed once further details of the scheme are available)	No – nature and scale of development is not likely to have significant effect on active travel / travel demand or patterns