A12 Chelmsford to A120 widening scheme
TR010060

6.3 ENVIRONMENTAL STATEMENT

APPENDIX 14.2 WATER ENVIRONMENT REGULATIONS (WFD REGULATIONS) COMPLIANCE ASSESSMENT

APFP Regulation 5(2)(a)

Planning Act 2008

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

Volume 6

August 2022

Infrastructure Planning

Planning Act 2008

A12 Chelmsford to A120 widening scheme

Development Consent Order 202[ ]

ENVIRONMENTAL STATEMENT

APPENDIX 14.2 WATER ENVIRONMENT REGULATIONS (WFD REGULATIONS) COMPLIANCE ASSESSMENT

Regulation Reference	Regulation 5(2)(a)
Planning Inspectorate Scheme Reference	TR010060
Application Document Reference	TR010060/APP/6.3
Author	A12 Project Team & Highways England

Version	**Date**	**Status of Version**
Rev 1	August 2022	DCO Application

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1 Introduction

1.1 Purpose of the report

1.1.1 This compliance assessment has been prepared for the A12 Chelmsford to A120 Widening Scheme (hereafter referred to as the 'proposed scheme') following the legislation of the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (hereafter referred to as the WFD Regulations).

1.1.2 The purpose of this assessment is to determine the proposed scheme's compliance with the WFD Regulations.

1.1.3 Compliance with the provisions of the legislation needs to be taken into account in the planning of all new activities in the water environment. The Environment Agency, as competent authority in England, must exercise its relevant functions so as to secure compliance with the WFD Regulations (including determining any authorisation for an environmental permit or a licence to abstract or impound water), and so as best to secure the achievement of the following environmental objectives:

a) Measures would be put in place to prevent deterioration of the surface water status or groundwater status of a body of water (subject to the application of Regulations 18 and 19).

b) Measures would otherwise support the achievement of the environmental objectives set for a body of water (subject to the application of Regulations 16 to 19).

1.1.4 Regulations 16 to 19 set out the conditions relevant to extended deadlines for environmental objectives (Regulation 16), setting less stringent environmental objectives (Regulation 17), natural causes of change (Regulation 18) and modifications to physical characteristics of water bodies (Regulation 19).

1.2 Background

Preventing deterioration in ecological status or potential

1.2.1 All water bodies should meet good ecological status (GES), or if an artificial or heavily modified water body (A/HMWB), good ecological potential (GEP), within 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.

1.2.2 Any activity which has the potential to have an impact on ecology would need consideration in terms of whether it could cause deterioration in the status or potential of each individual water body quality element. It is, therefore, necessary to consider the possible changes associated with the proposed scheme.

1.2.3 Where there are sites protected under transposed and adopted regulations, WFD Regulations aim for compliance with any relevant standards or objectives for these sites, including nature conservation and water quality (these are known as linked protected areas).

1.2.4 For those water bodies that are not already in 'good' condition, specific mitigation measures have been set for each River Basin District to achieve the environmental objectives of the WFD Regulations. 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 would be delivered through the River Basin Management Plan (RBMP) which also identifies the different organisations responsible for their delivery.

1.3 The proposed scheme

1.3.1 The proposed scheme comprises improvements to the A12 between junction 19 (Boreham) at TL 7410 0940, and junction 25 (Marks Tey) at TL 9170 2380, a distance of approximately 24km, or 15 miles. Further information is provided in Chapter 2: The proposed scheme, of the Environmental Statement [TR010060/APP/6.1]. Table 1.1 provides a summary of construction and operation activities that are evaluated in this assessment.

Table 1.1 Construction and operation activities to be assessed.

Construction activities	Operation activities
• Highway structure (including embankments, cuttings, gantries, foundations, piling, other below-ground structures and crossings) • Outfall structure and drain confluences • Compounds and soil storage (including temporary construction drainage) • Haul roads and temporary roads • Channel realignments • Excavations required for attenuation ponds/borrow pits • Flood mitigation • Cadent gas pipeline diversion.	• Highway structure (including embankments, cuttings, gantries, foundations, piling, other below-ground structures and crossings) • Outfall structure and drain confluences • Drainage and routine runoff • Channel realignments • Flood mitigation • Cadent gas pipeline diversion.

2 Methodology

2.1 Assessment methodology

2.1.1 There are three stages to undertaking compliance, outlined below. These include screening and scoping stages followed by an impact assessment. The methodology for this is based on both Environment Agency (2016) Protecting and improving the water environment (internal guidance 488) and Advice Note 18: The Water Framework Directive (Planning Inspectorate, 2017).

Screening

2.1.2 Screening provides an initial overview of the proposed scheme, outlining the activities (as they are known in WFD Regulations) in the construction and operation phases. These are either screened in for further assessment or screened out.

Scoping

2.1.3 Scoping identifies the relevant RBMPs and designated water bodies within the study area. As part of this, the potential generic impacts are identified, in order to establish the risks from the proposed scheme activities to the water bodies and their quality elements, with a view to later scoping out those activities and water bodies that do not require further assessment.

2.1.4 A study area has been defined for the compliance assessment as a 500m buffer around all activities for the proposed scheme, capturing any designated water bodies within and immediately upstream or downstream of an activity.

Assessment of the proposed scheme

2.1.5 The assessment follows five steps for the designated water bodies and activities carried forward from the screening and scoping stages, including the following:

- Site-specific assessment of the proposed scheme against quality elements.
- Assessment of the proposed scheme against RBMP mitigation measures.
- Cumulative impact assessment with other developments planned on the designated water body.
- Assessment of the proposed scheme against status objectives of the relevant water bodies.
- Assessment of the proposed scheme against other linked legislation (protected areas).

2.2 Data collection

Desk-based study

2.2.1 A desk-based study has been carried out to inform this assessment, reviewing existing information for the study area to develop an initial baseline for the designated 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)
- Multi-Agency Geographic Information for Countryside (MAGIC) MAP (Natural England, 2020).

2.2.2 Regarding Groundwater Dependent Terrestrial Ecosystems (GWDTE), ecological datasets and information have also been obtained and assessed. This report should be read in conjunction with Section 5 of Appendix 14.4: Groundwater Assessment [TR010060/APP/6.3], which identifies, prioritises, and assesses the impacts of the proposed scheme on GWDTE located within or adjacent to the Order Limits.

3 Identification of designated water bodies

3.1.1 The proposed scheme is located within the Anglian RBD. Management within the RBD is supported by the RBMP.

3.1.2 Scoping has first identified the potentially impacted designated water bodies directly linked to the proposed scheme (within 500m); and secondly, water bodies upstream and downstream of those already identified. An assessment has been made to determine whether each of these water bodies would be scoped in for further assessment, or whether, due to the likelihood of there being limited impacts/lack of impact pathway (including distance), they can be scoped out.

3.1.3 Table 3.1 outlines the characteristics of each surface water body scoped in for further assessment, which are also shown in Figure 14.2.1. and Figure 14.2.2 (in Annex A of this appendix). These, and their water body reference IDs, are as follows:

- River Chelmer (downstream confluence with River Can) (GB105037033530)
- Boreham Tributary (GB105037033910)
- River Ter (GB105037033940)
- River Brain (GB105037041140)
- Domsey Brook (GB105037033870)
- River Blackwater (Combined Essex) (GB105037041160)
- Roman River (GB105037034150).

3.1.4 The River Blackwater (GB520503714000) and River Colne (GB520503713800) transitional and coastal water bodies have been scoped out of the assessment. The distance between these water bodies and the proposed scheme (in excess of 1km), makes it unlikely that impacts would be identified.

3.1.5 There is a single groundwater body known as the Essex Gravels (GB40503G000400), which is included in Table 3.2.

Table 3.1 Surface water body parameters (2019 data)

Designated water body name	Blackwater (Combined Essex)	Boreham Tributary	Brain	Chelmer (downstream confluence with Can)	Domsey Brook	Roman River	Ter
Water body ID	GB105037041160	GB105037033910	GB105037041140	GB105037033530	GB105037033870	GB105037034150	GB105037033940
National grid reference (as per Catchment Data Explorer)	TL7614124485	TL7541309223	TL7177325726	TL7859409063	TL8984119820	TL9350723073	TL7170117603
Length (km)	38.63	2.68	30.53	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 (2019 data)	Moderate	Moderate	Moderate	Poor	Moderate	Moderate	Moderate
Status objective (overall)	Moderate	Good	Moderate	Moderate	Good	Moderate	Moderate

Designated water body name	Blackwater (Combined Essex)	Boreham Tributary	Brain	Chelmer (downstream confluence with Can)	Domsey Brook	Roman River	Ter
Reasons for not achieving good status:	Physical modifications. Pollution (both point and diffuse sources). Flow (surface and groundwater abstractions).	No data to show.	Physical modifications. Pollution (both point and diffuse sources).	Physical modification. Flow (surface and groundwater abstractions). Pollution (point and diffuse sources).	No data to show.	Physical modifications. Pollution (point and diffuse sources). Flow (surface water abstraction).	Pollution (point and diffuse sources).
Protected area designation and relevant legislation	Nitrate Pollution Prevention Regulations 2015 Drinking Water Safeguard Zone The Urban Waste Water Treatment (England and Wales) (Amendment) Regulations 2003	Nitrate Pollution Prevention Regulations 2015	Nitrate Pollution Prevention Regulations 2015 The Urban Waste Water Treatment (England and Wales) (Amendment) Regulations 2003	Nitrate Pollution Prevention Regulations 2015 The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 Drinking Water Safeguard zone Drinking Water Protected Area The Urban Waste Water Treatment (England and Wales) (Amendment) Regulations 2003	Nitrate Pollution Prevention Regulations 2015	Nitrate Pollution Prevention Regulations 2015	Nitrate Pollution Prevention Regulations 2015

Designated water body name	Blackwater (Combined Essex)	Boreham Tributary	Brain	Chelmer (downstream confluence with Can)	Domsey Brook	Roman River	Ter
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	Good	Poor	Good	Moderate	Moderate
Physico-chemical quality elements	Moderate	Good	Moderate	Moderate	Good	Moderate	Moderate
Chemical status	Fail	Fail	Fail	Fail	Fail	Fail	Fail

Table 3.2 Groundwater water body parameters

Element	Essex Gravels
ID	GB40503G000400
Area (km^2)	1,275
Overall water body classification	Poor
Quantitative status	Good
Quantitative saline intrusion	Good
Quantitative water balance	Good
Quantitative GWDTE test	Good
Quantitative dependent surface water body status	Good
Chemical status	Poor
Chemical drinking water protected area	Good
General chemical test	Poor (agriculture and rural land management - poor livestock management, poor nutrient management)
Chemical GWDTEs test	Good
Chemical dependent surface water body status	Good
Chemical saline intrusion	Good

4 Screening

4.1 Screening of activities

4.1.1 The main construction and operational activities of the proposed scheme are presented in Table 4.1. This table acts as a screening assessment for whether further assessment of a particular activity is required (Section 6 of this appendix), given the likely generic impacts.

4.1.2 The following activities have been screened out of the assessment for all WFD Regulations water bodies**:**

- Excavations of attenuation ponds and borrow pits: Screened out for surface water bodies due to the distance of hydrological pathways between the activity and the nearest designated water body.
- Cadent gas pipeline diversions: Screened out as pipelines would cross main rivers via trenchless crossings. Therefore, no significant impacts are anticipated on surface water bodies. Furthermore, the activity is also screened out of groundwater bodies as impacts would be insignificant on a groundwater body scale.

Table 4.1 Screening of the proposed scheme activities

Water body	Screened in construction activities	Screened in operational activities
WFD Regulations surface water bodies		
Chelmer (downstream confluence with Can)	• Outfall structure and drain confluences	• Drainage • Outfall structure and drain confluences
Boreham Tributary	• Outfall structure and drain confluences • Haul roads and temporary roads • Compounds and soil storage	• Drainage • Outfall structure and drain confluence
Ter	• Outfall structure and drain confluences • Compounds and soil storage	• Drainage • Outfall structure and drain confluence
Brain	• Highway structure • Outfall structure and drain confluences • Haul roads and temporary roads • Compounds and soil storage	• Highway structure • Drainage • Outfall structure and drain confluence

Water body	Screened in construction activities	Screened in operational activities
Blackwater (Combined Essex)	• Highway structure • Outfall structure and drain confluences • Realignment • Compounds and soil storage • Haul roads and temporary roads • Flood mitigation	• Highway structure • Drainage • Outfall structure and drain confluence • Realignment
Domsey Brook	• Highway structure • Outfall structure and drain confluences • Realignment • Compounds and soil storage • Haul roads and temporary roads	• Highway structure • Drainage • Outfall structure and drain confluence • Realignment
Roman River	• Highway structure • Outfall structure and drain confluences • Realignment • Compounds and soil storage • Haul roads and temporary roads	• Highway structure • Drainage • Outfall structure and drain confluence • Realignment
WFD Regulations groundwater bodies		
Essex Gravels	• Compounds • Haul roads and temporary roads • Highway structure • Excavations required for attenuation ponds/drainage infrastructure and borrow pits • Dewatering	• Drainage (including highway structure)

5 Scoping

5.1 Scoping of water body elements

5.1.1 Table 5.1 summarises the scoped-in water body elements taken forward into the WFD Regulations assessment for the relevant water bodies. These are scoped 'in' due to changes in number of species, potential loss of habitat, and/or displacement of species. For example, effects of change to water quality, effects of changes in sediment availability and geomorphic process, and physico-chemical elements, etc.

5.1.2 Table 5.2 considers the groundwater elements to be taken forward as part of the assessment. There may be changes to GWDTEs, water balance, and water quality (both qualitative and quantitative). These changes have been identified and assessed in Section 6.1 of this appendix, as part of the WFD Regulations site-specific assessment. Ammonia and phosphate have been scoped out of the assessment as changes to discharged wastewater and agricultural runoff are deemed unlikely as a result of the proposed scheme.

Table 5.1 Scoped-in WFD Regulations surface water body elements

Element	Description of element
Biology	Fish: Composition, abundance and age of structure of fish fauna, presence of sensitive species.
	Invertebrates: Composition and abundance of benthic invertebrate fauna.
	Freshwater aquatic plants (macrophytes) and diatoms (phytobenthos) – Composition and abundance of aquatic flora.
Hydromorphology (i.e. hydrological regime and morphology)	Quantity and dynamics of water flow.
	Connection to groundwater bodies
	River continuity
	River depth and width variation
	Structure and substrate of the riverbed
	Structure of the riparian zone
Physico-chemical elements	Acid neutralising capacity
	Dissolved oxygen (DO)
	pH
	Temperature

Element	Description of element
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

Table 5.2 Scoped in WFD Regulations groundwater body elements

Element	Scoped in or out
Quantitative status quality elements	
GWDTEs (non-designated)	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 would be no saline intrusion.
Water balance	In
Surface water	In
Chemical status quality elements	
Drinking water protected area	In
GWDTEs (non-designated)	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 would be no saline intrusion.
Surface water	In
General quality	In

6 Assessment of the proposed scheme

6.1 Site-specific assessment against quality elements

6.1.1 This section provides a comprehensive site-specific assessment of the scoped-in proposed scheme activities and their potential impacts on the quality elements at water body scale (see Tables 6.1, 6.2, 6.3 and 6.4).

6.1.2 Impacts are assessed in terms of risk of deterioration to elements following embedded and standard mitigation (see Chapter 14: Road drainage and the water environment, of the Environmental Statement [TR010060/APP/6.1] for more details) using the following:

- Red (x) – Negative change. Negative changes are defined as a noticeable change in the quality element but may not be extensive or significant on a designated water body scale. These changes highlight a need for mitigation to limit deterioration of the water body (both locally and on a water body scale). A negative change could be one that is of a localised nature and would not lead to deterioration in quality element status. However, because the precautionary principle is used, these are further detailed in the WFD Regulations impact assessment if it is concluded that any activity on any element could impact on a water body scale, or locally. The specific impacts tables (Tables 6.1, 6.2, 6.3 and 6.4) detail whether a risk of deterioration has been identified.

- Blue (-) – Negligible change. This presents a low risk of change of status with localised impacts anticipated (impacts managed by best practice measures). Mitigation may not be necessary as the impacts are small scale, and only slightly noticeable.

- Green (✓) – Positive change. Potential improvement in status.

- Grey – No change from the existing situation.

6.1.3 Tables 6.1 to 6.4 include a section on additional ways to reduce impacts. These are suggestions listed as a possible way to control impacts other than those listed as mitigation in the first iteration Environmental Management Plan (EMP) [TR10060/APP/6.5]. The last column of Tables 6.1 to 6.4 outlines whether there is a risk of deterioration when all impacts and aspects of mitigation are considered. Impacts and risk are outlined for each water quality and supporting element. Importantly, if there is a risk of an element status change, this could lead to water body deterioration, and therefore non-compliance is a risk.

Table 6.1 Construction impacts on screened-in WFD Regulations surface water body quality and supporting elements

Key to change	Negligible change	Negative change	Positive change	No change

Activity	Quality element	Potential impact(s) (following embedded and standard mitigation)	Relevant designated water body and magnitude of impact	Additional ways to reduce impacts or enhance quality element, including mitigation	Risk of quality element deterioration
Haul roads and temporary roads	Macrophytes and phytobenthos (combined)	It is anticipated that a temporary bailey bridge would be constructed both upstream and downstream of Brain Bridge; a bailey bridge would also be constructed upstream of Domsey Bridge. These have been assumed to comprise foundations set back from the banks. Therefore, no impacts are associated with the crossings themselves. However, fine sediment arising from enabling works such as vegetation clearance and topsoil stripping could smother habitats located along the local channel bed. These impacts are likely to be limited to the duration of the enabling works phase. Application of measures within sediment management plans would result in no significant impacts to the water bodies.	Brain (-)	No additional mitigation required.	No risk of deterioration to quality elements.
			Domsey Brook (-)		
		Macrophytes are extensively present along the bed and channel margins adjacent to where haul roads are proposed. There is therefore a risk of sediment entering the water body, potentially smothering species. Any smothering of macrophyte habitats would be highly localised to the haul roads and negligible on a water body scale. Application of measures within sediment management plans would result in no significant impacts to the water bodies.	Blackwater (Combined Essex) (-)		
		The shaded length of the Roman River and Boreham Brook, where haul roads are proposed, has reduced light levels within the water body and therefore macrophytes are unlikely to be present. Application of measures within sediment management plans would result in no significant impacts to the macrophytes and phytobenthos in this location.	Roman River (-)		
			Boreham Brook		
	Benthic invertebrates	Fine sediment and pollutants that enter the watercourse could lead to a reduction in the population of benthic invertebrates found along the water bodies. Fine sediment could smother and therefore reduce spawning habitats and dispersal. However, with sediment and pollution management measures in place, as found in the first iteration EMP [TR10060/APP/6.5], the quantity of sediment and pollution would be negligible. Therefore, any changes to the quality element would be negligible on a water body scale.	All screened-in water bodies (-).		
	Fish	Fine sediment and pollutants that enter the watercourse, as well as noise from construction activities could lead to a reduction in fish population, through fatalities; reduce spawning habitats as a result of fine sediment smothering these areas (redds); and interruption to fish passage. However, with sediment and pollution management measures in place, as per the EMP, the quantity of sediment and pollution would be negligible. Therefore, any changes to the quality element would be negligible on a water body scale.			
	Quantity and dynamics of water flow	It is anticipated that a bailey bridge would be constructed both upstream and downstream of Brain Bridge and upstream of Domsey Brook bridge. Foundations (comprising pads) for the bridge abutments are assumed to be set back from the banks. Therefore, it is	Brain (-)		

Key to change	Negligible change	Negative change	Positive change	No change

Activity	Quality element	Potential impact(s) (following embedded and standard mitigation)	Relevant designated water body and magnitude of impact	Additional ways to reduce impacts or enhance quality element, including mitigation	Risk of quality element deterioration
Haul roads and temporary roads		unlikely the flow regime or hydraulics of the water body would be impacted by the crossing. The presence of the haul road could however alter surface water flow paths and local flow dynamics depending on where they drain into the water body. Furthermore, haul roads could provide a localised obstruction to flood flows, if such an event was to occur. This would alter flow dynamics on flood flows and potentially lead to increased flows where they are constrained. Impacts would be negligible on a water body scale though, given the extent of works.	Domsey Brook (-)		
		The presence of the haul roads could lead to changes in surface water pathways and lead to localised changes in flow dynamics depending on where they drain into the water body. Furthermore, haul roads could provide a localised obstruction to flood flows, if such an event was to occur. This would alter flow dynamics on flood flows and potentially lead to increased flows where they are constrained. Impacts would be negligible on a water body scale, given the extent of works.	Blackwater (Combined Essex) (-)		
			Boreham Brook		
			Roman River (-)		
	Connection to groundwater bodies	No changes are anticipated on the connectivity between surface and groundwater bodies, as haul roads are superficial and unlikely to penetrate aquifers.	All screened-in water bodies (-)		
	River continuity	Localised impacts to lateral connectivity with the floodplain are anticipated at the site of the crossing. However, this would be local to the abutments and haul road and unlikely to be significant on a water body scale.	Brain (-)		
			Domsey Brook (-)		
		A haul road is anticipated adjacent the right-hand bank top of Boreham Brook, upstream of the existing A12. This would likely lead to a temporary disconnect between surface water flow paths that drain into the water body. However, such impacts are likely to be localised to the haul road and recover following the completion of the construction phase. Therefore, no significant impacts are anticipated on a water body scale.	Boreham Brook		
		At Ashman's Bridge, two haul roads are likely to cause localised disruption to the lateral connectivity between the River Blackwater and its left-hand flood plain. This could lead to alterations in the location of flows re-entering the water body, but it would be local to the haul road and not significant on a water body scale.	Blackwater (Combined Essex) (-)		
		At the Roman River culvert, a haul road has been proposed which is likely to be in close proximity to the Roman River water body. Here, localised disruption in the lateral connectivity between the watercourse and the haul road are anticipated, leading to localised changes in surface waters entering the water body. However, such impacts would be local to the haul road and not significant on a water body scale.	Roman River (-)		
	River depth and width variations	Localised alterations could take place where fine sediment has settled on the bed. However, with the extent of works and the adherence to a sediment management plan, these impacts are likely to be negligible.	All screened-in water bodies (-)		
	Structure and substrate of the riverbed	Enabling works could lead to fine sediment release along the location of the haul roads. However, given the extent of haul roads, their alignment relative to the water bodies and following the use of a sediment management plan, impacts are unlikely to extend beyond construction areas and would lead to negligible impacts on the water bodies.			

Key to change	Negligible change	Negative change	Positive change	No change

Activity	Quality element	Potential impact(s) (following embedded and standard mitigation)	Relevant designated water body and magnitude of impact	Additional ways to reduce impacts or enhance quality element, including mitigation	Risk of quality element deterioration
Haul roads and temporary roads	Structure of the riparian zone	The construction of the haul road (vegetation clearance and topsoil stripping) would take place in the riparian zone. The removal of the vegetation would disrupt local communities in vegetation. Sediment compaction for the haul road and crossing could limit infiltration capacity and prevent the re-establishment of vegetation following construction. Therefore, negative impacts are anticipated but given the localised extent, these impacts are unlikely to be significant on a water body scale.	All screened-in water bodies (x)	Limit the amount of riparian vegetation clearance to that found specifically along the footprint of the haul road.	Despite the negative change to the quality element, the localised nature of the change would not be extensive enough to risk deterioration in status.
	Dissolved oxygen	The quantity of sediment entering the watercourse during the construction and use of haul roads and temporary crossing would be negligible if standard mitigation is adhered to. Dissolved oxygen levels are only likely to become deleterious where water levels are low, flow speeds are low/still and fine sediment input is high. As a result of measures within the first iteration EMP [TR10060/APP/6.5], this is unlikely. Through the use of a sediment management plan and pollution management plan, found in the EMP, any potential change to dissolved oxygen would be mitigated.	All screened-in water bodies (-).	No additional mitigation required.	No risk of deterioration to quality elements.
	pH	pH could change due to sediment washing into the water body via runoff, bypassing the sediment management measures and entering the watercourse. However, this would depend on sediment pH levels relative to that of the receiving water. The sediment management plan and pollution management plan, located in the EMP, would reduce the sediment entering the watercourse to quantities that would be negligible on a water body scale.			
	Temperature	The addition of temporary crossings would likely reduce water temperatures local to the crossing through shading. However, temperatures would not change on a water body scale.	Brain (-)		
			Domsey Brook (-)		
		Any impacts would have the potential to cause sediment build up and shallower/stagnant water, limiting flow and causing temperature change (locally). However, no change is anticipated due to the lack of temporary crossings, and given the negligible quantities of fine sediment capable of entering the water bodies, following the sediment management plan.	Blackwater (Combined Essex)		
			Boreham Brook		
			Roman River		
Haul roads and temporary roads	Specific pollutants	Polluting substances, sediment-bound pollutants and hydrocarbons from fuel and other materials (including cementitious materials being conveyed to site) could drain into the adjacent watercourses as vehicles use or construct the haul roads. This could take place within the catchment of any designated water body. However, in accordance with a pollution management plan, (see the EMP for details), quantities of such substances (in construction runoff) would likely be mitigated before discharge to the wider environment. As a result, the overall impact on a water body scale, is anticipated to be negligible.	All screened-in water bodies (-)		

Key to change	Negligible change	Negative change	Positive change	No change

Activity	Quality element	Potential impact(s) (following embedded and standard mitigation)	Relevant designated water body and magnitude of impact	Additional ways to reduce impacts or enhance quality element, including mitigation	Risk of quality element deterioration
	Protected Areas	Potential negligible increases in fine sediment could impact the River Blackwater nitrate vulnerable zone and the Rivers Blackwater and Brain nitrate sensitive area, depending on the quality of local sediments entering the watercourse. However, given the extent of the works, it is unlikely that such impacts would obstruct the objectives of the legislation which protects them.	Brain (-) Domsey Brook (-) Blackwater (Combined Essex) (-)		
		The extent of the works and quantities of fine sediment and pollutants being released, following the implementation of the EMP and pollution management plan, would be unlikely to cause a change in the level of nitrates present. Therefore, no impacts are anticipated.	Roman River		
		No protected areas are present within this water body. Therefore, no impacts are anticipated.	Boreham Brook		
Highway structure	Macrophytes and phytobenthos (combined)	The combination of in-channel works (including sheet piling) both upstream and downstream of Brain Bridge during its expansion could lead to destabilisation of the local bed and bank material and release fine sediment into the channel. Here, sediment could smother macrophyte habitats present along the watercourse. In-channel works could further disturb communities by compacting the bed and leading to localised reduction in macrophytes in the construction area. However, once construction is complete, macrophytes are likely to recolonise the disturbed areas. Therefore, impacts would be negligible.	Brain (-)		
		In-channel and bankside work associated with sheet piling, piling and construction of the abutments and piers at Ashman's Bridge and the new and/or extended culvert crossings could lead to disruption of localised macrophytes along the bed. There could also be fine sediment smothering of macrophytic communities present downstream of Ashman's Bridge and those culvert crossings. Impacts are likely to remain local to the construction area, while the reduced presence of macrophytes and phytobenthos would be limited to the construction phase with recolonisation of the channel likely to occur once construction is complete. Therefore, impacts would be negligible on a water body scale.	Blackwater (Combined Essex) (-)		
		The extension of Domsey Bridge and the construction of the new Domsey East culvert would involve in-channel and bankside working. Disturbance of bank material and the release of fine sediment could smother local macrophytic communities, if present. The watercourse is turbid, with fine sediment present along it. This prevents opportunities for macrophytes to colonise the channel, with the exception of isolated pockets along the watercourse. Therefore, any impacts would likely be negligible on a water body scale.	Domsey Brook (-)		
Highway structure		The length of the watercourse where the extension of Roman River culvert is largely shaded from sunlight, so macrophytes are unlikely to colonise the reach within the construction area. Therefore, any changes arising from in-channel and bankside working for the portal culvert here would be negligible.	Roman River (-)		

Key to change	Negligible change	Negative change	Positive change	No change

Activity	Quality element	Potential impact(s) (following embedded and standard mitigation)	Relevant designated water body and magnitude of impact	Additional ways to reduce impacts or enhance quality element, including mitigation	Risk of quality element deterioration
	Benthic invertebrates	The combination of in-channel and bankside works (including sheet piling) and piling at Brain Bridge, Ashman's Bridge and new culvert crossings could disturb invertebrate communities and disrupt dispersal pathways along the Rivers Brain, Blackwater and tributaries of the latter. Furthermore, fine sediment could also smother invertebrate habitats present along the watercourses. However, the extent of works would only lead to localised impacts to invertebrate communities and would be negligible on a water body scale.	Brain (-) Blackwater (Combined Essex) (-)		
		The combination of in-channel and bankside works at Domsey Bridge and Domsey Brook East culvert could disturb invertebrate communities and disrupt dispersal pathways along Domsey Brook. Furthermore, fine sediment could also smother invertebrate habitats present along the watercourse. However, the extent of works would only lead to localised impacts to invertebrate communities and would be negligible on a water body scale.	Domsey Brook (-)		
		Fine sediment released by in-channel and bankside works associated with the Roman River Culvert extension could smother invertebrate communities and disturb dispersal pathways. Such impacts are likely to remain localised to the construction area and would be negligible on a water body scale.	Roman River (-)		
	Fish	In-channel and bankside working associated with the expansion of Brain bridge and Ashman bridge, Domsey Bridge and the construction of Domsey East Culvert could lead to disturbance of local bed and banks, bed substrate compaction and fine sediment release. These impacts could see localised smothering and disturbance of spawning habitats and disturb migratory routes for local fish species. Furthermore, vibrations associated with piling could lead to fish fatalities as it can damage swim bladders. Similar impacts are anticipated along tributaries of the River Blackwater, where new culvert crossings are proposed for the new offline highway structure. Overpumping at Rivenhall Brook, a tributary of the River Blackwater, could lead to fish becoming trapped in the hydro-pump or preventing any migration upstream. However, such impacts are unlikely to pose a risk on a water body scale. Fluming at Brain Bridge and the sheet piling at Ashman's Bridge would likely increase water velocities at the crossing due to channel confinement. This could lead to further issues with fish passage as it could exacerbate fatigue in migratory fish attempting to swim upstream. Similar issues could arise with the pipe proposed to convey flows through Domsey Bridge. Moreover, the darkened structure of the pipe could discourage fish species from entering it due to its uninviting appearance. Fish could therefore become trapped and unwilling to migrate further upstream. However, given the localised nature of the changes, such activities would be unlikely to be significant on a water body scale.	Brain (x) Blackwater (Combined Essex) (x) Domsey Brook (x)	Avoid construction works during migratory periods. Move fish away from construction area, if practicable.	No risk of deterioration if mitigation measures followed.

Key to change	Negligible change	Negative change	Positive change	No change

Activity	Quality element	Potential impact(s) (following embedded and standard mitigation)	Relevant designated water body and magnitude of impact	Additional ways to reduce impacts or enhance quality element, including mitigation	Risk of quality element deterioration
Highway structure		Bankside and in-channel working associated with the construction of the culvert extension could lead to fine sediment smothering spawning habitats. However, mitigation measures involving the avoidance of construction in the watercourse during the migration and spawning season would likely mitigate such impacts. If followed, impacts would be negligible on a water body scale. Fluming of the watercourse along the crossing could impinge flows and lead to increased water velocities. This could lead to conditions unsuitable for migratory fish species as it could exacerbate fatigue. Furthermore, localised ponding of flows at the inlet could also impact migratory species as fine sediment could settle there and impact local water quality. However, this would likely remain local to the crossing and if mitigation measures are followed, such impacts would be unlikely to be significant on a water body scale.	Roman River (x)		No risk of deterioration if mitigation measures followed.
	Quantity and dynamics of water flow	The River Brain would be flumed as works take place on Brain Bridge. Here, sheet piling would be used to convey flows and realign them from the centre of the channel to either the left or right bank depending on the bridge modification phase where it would guide flow along the left- or right-hand side of the bridge. Furthermore, the trackways underneath the bridge would be removed to enable fluming to occur. Such activities would likely alter local flow dynamics as flow is deflected and constrained within the channel. Such confinement would likely increase local flows above the sill, while the sheet piling would facilitate secondary flow paths and increase local flow turbulence. However, such impacts are likely to remain local to the construction activities and be negligible on a water body scale.	Brain (-)	No additional mitigation required.	No risk of deterioration to quality elements.
		Sheet piling used along both banks to segregate the main modification works and piling matting could lead to localised confinement of flows. Here, water velocities would increase as a result of the confinement, while the abrupt change in between sheet piling and natural channel material could lead to localised eddying. However, impacts are likely to remain local to the sheet piling and negligible on a water body scale. Bankside and in-channel working for the proposed culverts would likely alter local flow dynamics of tributaries to the River Blackwater. Here, flow is largely ephemeral, largely depending on surface water drainage. However, Rivenhall Brook is perennial, therefore, temporary overpumping is proposed to convey flows. This would likely lead to localised and temporary changes in flow dynamics at the watercourse. However, this would be negligible on a water body scale.	Blackwater (Combined Essex) (-)		
		Flow beneath Domsey Bridge would be flumed during construction works. This would accommodate flows but confinement could lead to localised increases in water velocities leading to eddying at the inlet and outlet of the flume as flow resistance abruptly changes. Impacts here are likely to remain local to the bridge and be negligible on a water body scale.	Domsey Brook (-)		

Key to change	Negligible change	Negative change	Positive change	No change

Activity	Quality element	Potential impact(s) (following embedded and standard mitigation)	Relevant designated water body and magnitude of impact	Additional ways to reduce impacts or enhance quality element, including mitigation	Risk of quality element deterioration
Highway structure		Bankside and in-channel working for the proposed culvert extensions would likely alter local flow dynamics. Here, proposed fluming could lead to flow confinement, which would result in localised increases in water velocities and eddying at the outlet as flow resistance abruptly changes. Ponding of flows could also take place at the inlet as the culvert is temporarily reduced in capacity. However, such impacts would remain local to the culvert and negligible on a water body scale.	Roman River (-)		
	Connection to groundwater bodies	Piling from the modifications to Brain Bridge, Ashman's Bridge and Domsey Bridge could disturb local links between the water bodies and groundwater flow paths. Piling could directly impede baseflow entering the water bodies via the hyporheic zone. Impacts would however remain local to the working extent and negligible on a water body scale.	Brain (-)		
			Blackwater (Combined Essex) (-)		
			Domsey Brook (-)		
		Disturbance to the connection between the surface water bodies and groundwater aquifers would take place as the culvert structure is placed along the water body. This could lead to changes or complete obstruction of any groundwater paths draining into the water body as baseflow. However, impacts would be local to the works and negligible on the water body scale.	Roman River (-)		
	River continuity	Piling along the bankside of the channel could disrupt the lateral connectivity along the River Brain. However, given existing conditions where lateral connectivity is already restricted, impacts are unlikely to cause any significant changes to the designated water quality element.	Brain (-)		
		Stitching of the abutments and foundations to extend Ashman's Bridge would take place where lateral connectivity is already limited, with no presence of a floodplain. Furthermore, due to a lack of in-channel works, impacts on the continuity of flows and sediment would also be limited. Therefore, construction works would have no impact on the continuity of the water body. Where new culverts are proposed, including Rivenhall Brook, in-channel and bankside works could lead to changes in the river continuity as sediment conveyance is inhibited. At Rivenhall Brook, such conveyance would be further inhibited by the temporary hydro-pump which would convey flows across the new highway structure for a short period. Such impacts would be local to construction areas, while the duration of the works would lead to negligible changes on a water body scale.	Blackwater (Combined Essex) (-)		
Highway structure		Fluming could lead to changes in flow dynamics. The purpose of these is to allow flow to continue upstream to prevent fish passage from being completely obstructed. However, the alterations in flow dynamics, similar to those commonly observed at undersized culverts would lead to flows ponding upstream. This would lead to sediment deposition as flows reduce in energy available to transport sediment, thereby reducing sediment from being supplied downstream. However, both watercourses have already been significantly impacted by the presence of culverts and historical realignments that have impeded sediment conveyance, evidenced by the silted beds present along them. Therefore, impacts are unlikely to alter significantly as a result of fluming.	Domsey Brook (-)		
			Roman River (-)		

Key to change	Negligible change	Negative change	Positive change	No change

Activity	Quality element	Potential impact(s) (following embedded and standard mitigation)	Relevant designated water body and magnitude of impact	Additional ways to reduce impacts or enhance quality element, including mitigation	Risk of quality element deterioration
	River depth and width variations	Bankside and in-channel works could lead to disturbance of bed and bank material. The alterations in flow hydraulics (i.e., increased turbulence) could exacerbate scour along the local bed and banks. However, channel conditions local to the proposed construction works present limited scour and erosion, and are largely observed to be aggrading. Such scour and erosion could be exacerbated by the clearance of vegetation along the riparian corridor. These impacts are likely to cease following construction, as the sill present at Brain Bridge would not be modified, while cleared vegetation would eventually recolonise the banks. Therefore, flow and hydromorphological processes would return to pre-construction conditions.	Brain (-)		
		Bankside works during sheet piling, piling and the extension of Ashman's Bridge could lead to localised scour of the bed and banks of the River Blackwater. This would arise from the disturbance of natural material and clearance of vegetation along the banks. Furthermore, the presence of sheet piling on both banks could facilitate bed scour as flows become locally constrained. However, impacts are likely to remain local to the construction working area and unlikely to continue following the completion of the construction works. Therefore, impacts are likely to be negligible. Where culverts are proposed to allow tributaries of the River Blackwater to pass beneath the new offline highway structure, similar impacts are anticipated. Here, bankside and in-channel working would lead to scour of the banks as bank material is disturbed. Furthermore, overpumping at Rivenhall Brook, a main tributary of the River Blackwater, would also lead to scour of the bed and banks. Such impacts are likely to be temporary and with standard mitigation through the use of an EMP, such impacts would likely be negligible on a water body scale.	Blackwater (Combined Essex) (-)		
Highway structure		The extension of the Roman River culvert and Domsey Bridge could lead to the impacts associated with in-channel and bankside works as well as fluming of the watercourse. Bankside working could lead to localised bank scour, where construction is taking place, or immediately downstream. In-channel working could compact the bed substrate and reduce sediment availability downstream. However, as the watercourse here appears to lack sufficient energy to mobilise most sediment sizes, it is unlikely this effect would become an issue. Furthermore, fluming of the watercourse could also increase the potential for scour as flows are confined increasing their water velocities. These impacts are likely to remain localised at the construction area and remain negligible on a water body scale.	Domsey Brook (-) Roman River (-)		
	Structure and substrate of the riverbed	In-channel works could lead to the compaction of the bed material at Brain Bridge which could reduce sediment availability to the downstream reaches, which, without suspended sediment would be unrestricted by flow resistance and could lead to increased flow velocities and scour downstream. However, the River Brain consists of reduced velocities, where aggradation is prevalent downstream. Furthermore, the sill acting as the foundation for Brain Bridge and its abutments generally prohibits sediment transportation here. Therefore, conditions would be unlikely to change significantly due to construction activities.	Brain (-)		

Key to change	Negligible change	Negative change	Positive change	No change

Activity	Quality element	Potential impact(s) (following embedded and standard mitigation)	Relevant designated water body and magnitude of impact	Additional ways to reduce impacts or enhance quality element, including mitigation	Risk of quality element deterioration
		Bankside working (including the installation of sheet piles along both banks) and the presence of sheet piling could lead to fine sediment release, as a result of bed and bank scour. Consequently, fine sediment could smother bed substrate material downstream. However, as the channel substrate is observed as largely comprising fine sediment combined with low, unenergetic flow, such impacts are likely to be negligible on a water body scale. In-channel works at the site of proposed culverts along the tributaries of the River Blackwater for the new offline structure would also lead to bed substrate compaction. However, most of the tributaries are insignificant from a hydromorphological perspective, acting primarily as drainage channels for agriculture.	Blackwater (Combined Essex) (-)		
		In-channel and bankside working, as well as fluming, could lead to fine sediment release which could smother downstream bed substrate material. Moreover, in-channel working could also compact local bed substrate material reducing the quantity of sediment available for entrainment. However, the watercourse along the A12 lacks sufficient energy to entrain most sediment sizes; silt deposits form along most of the channel. Therefore, impacts are unlikely to alter the composition and structure of the channel bed.	Domsey Brook Roman River		
Highway structure	Structure of the riparian zone	Enabling works to accommodate the construction of the highway structure would likely lead to riparian vegetation being lost. Furthermore, bankside works could compact soils and reduce the likelihood of vegetative re-establishment. Therefore, permanent impacts are anticipated but would not be significant on a water body scale.	All screened-in water bodies (x)	No additional mitigation required.	No risk to the water quality element, despite the negative impacts. Impacts are anticipated to be localised and would likely cease following construction.
	Dissolved oxygen	The quantity of sediment entering the watercourse during the construction phase of the highways structure is likely to be negligible. However, dissolved oxygen levels can be deleterious where water levels are low, flow speeds are low/still and fine sediment input is high. Through the use of a sediment management plan and pollution management plan, found in the EMP, any potential change to dissolved oxygen as a result would be mitigated.	All screened-in water bodies (-)		No risk of deterioration to quality elements.
	pH	The sediment management plan within the EMP would reduce the quantity of sediment entering the watercourse to quantities that would be negligible on a water body scale. pH could change if sediments bypass the sediment management measures and enter the watercourse. However, this would depend on the pH levels of sediments entering the channel relative to the receiving water's pH.			
	Temperature	No change is likely to any screened-in water bodies as a result of this activity.			

Key to change	Negligible change	Negative change	Positive change	No change

Activity	Quality element	Potential impact(s) (following embedded and standard mitigation)	Relevant designated water body and magnitude of impact	Additional ways to reduce impacts or enhance quality element, including mitigation	Risk of quality element deterioration
	Specific pollutants	Polluting substances, sediment-bound pollutants and hydrocarbons from fuel and cementitious material being conveyed to site could drain into the adjacent watercourses as vehicles use or construct the haul roads. This could take place within the catchment of any designated water body. However, in accordance with a pollution management plan, as per the EMP, quantities of such substances (in construction runoff) would likely be mitigated before discharge to the wider environment. As a result, the overall impact on a water body scale is anticipated to be negligible.			
Highway structure	Protected areas	Potential negligible increases in fine sediment could impact the River Blackwater nitrate vulnerable zone and the Rivers Blackwater and Brain nitrate sensitive area, depending on the quality of local sediments entering the watercourse. However, given the extent of the works, it is unlikely that such impacts would obstruct the objectives of the legislation which protects them.	Brain (-)		
			Blackwater (Combined Essex) (-)		
			Domsey Brook (-)		
		Potential negligible increases in fine sediment could impact the Roman River nitrate vulnerable zone depending on the quality of local sediments entering the watercourse. However, given the extent of the works, it is unlikely that such impacts would obstruct the objectives of the legislation which protects these areas.	Roman River (-)		
Outfall structures and drain confluences	Macrophytes and phytobenthos (combined)	Construction of the outfalls would largely take place offline to the water bodies with impacts occurring once the outfall is connected to the water bodies through excavation of the bed and banks. Consequently, the abundance and composition of aquatic flora may be affected by disturbance to both bed and bank during outfall construction, increased sedimentation of coarse habitats and reduction in water clarity and localised changes in flow. These may act independently or cumulatively to change the distribution and functioning of aquatic communities. Changes are considered to be limited to the activity and highly localised and therefore impacts are considered to be a negligible risk at the water body scale. Application of measures within sediment management plans would result in no significant impacts to the water bodies.	All screened-in water bodies (-)		
	Benthic invertebrates	The composition and abundance of invertebrate communities along each water body would likely be impacted by the excavation of bed and banks material following construction of the outfalls. specialised habitats (woody debris, for example), the creation of dispersal barriers, reduction in water clarity and smothering of habitats by fine sediment would be potential consequences of this. These impacts may act independently or cumulatively in changing the distribution and functioning of invertebrate communities. Application of measures within sediment management plans would result in no significant impacts to the water bodies.			

Key to change	Negligible change	Negative change	Positive change	No change

Activity	Quality element	Potential impact(s) (following embedded and standard mitigation)	Relevant designated water body and magnitude of impact	Additional ways to reduce impacts or enhance quality element, including mitigation	Risk of quality element deterioration
	Fish	Fish communities, both in abundance and composition along each water body could be impacted by the excavation of bed and bank material following the construction of the outfalls. This would lead to the localised disruption of specialised or coarse sediment habitats used for spawning. Additionally, the creation of migratory and acoustic barriers, reduction in water quality and changes in flow dynamics could impact the distribution and functioning of fish communities as a result of the activity. However, as the activity has been proposed to take place offline from the watercourse, such impacts are unlikely to take place or be significant on a water body scale.			
Outfall structures and drain confluences	Quantity and dynamics of water flow	Excavation of bank material could lead to localised changes in flow dynamics. These impacts would arise from enabling works (removal of riparian and emergent vegetation) where localised changes in flow turbulence would take place. However, impacts would be highly localised to the construction activity and would be negligible on a water body scale.			
	Connection to groundwater bodies	Impacts to the connectivity between the channel and local aquifers would be local to the area of construction. This would be the case if dewatering or sheet piling is used to construct the outfall structure offline from the channel, as baseflow would be impeded. Impacts would be negligible in terms of water body scale.			
	River continuity	Construction activities would likely cause local disruption between the water bodies and their floodplains, potentially causing some highly localised issues with sediment conveyance as flow dynamics alter through excavations. The impacts would be short-term with regard to the extent of the construction.			
	River depth and width variations	Construction activities (including vegetation clearance) would leave the banks bare and prone to destabilisation, where they would be exposed to fluvial processes, potentially leading to additional changes in local channel width and depth. However, impacts would be temporary and local to the construction area, thus negligible on a water body scale.			
	Structure and substrate of the riverbed	The increased likelihood of fine sediment being accidentally released into the watercourse during construction activities would likely result in the smothering of local bed substrate material. This could lead to localised homogeneity in the bed substrate and decreased coarse to fine sediment ratios along each water body. These impacts would be negligible on a water body scale.			No risk of deterioration to quality elements.
	Structure of the riparian zone	Vegetation clearance and soil compaction during the construction activities would likely impact the surface water infiltration capacity of the riparian soils and cause localised long-term impacts to riparian vegetation re-establishment. Therefore, impacts would be negligible on a water body scale.			
	Dissolved oxygen	The quantity of sediment entering the watercourse during the construction phase of the outfall structure and confluences would be negligible. Through the use of a sediment management plan and pollution management plan, found in the EMP, any potential change to dissolved oxygen would be mitigated. Dissolved oxygen levels are only likely to become deleterious where water levels are low, flow speeds are low/still and fine sediment input is high. As a result of the EMP, this is unlikely.			

Key to change	Negligible change	Negative change	Positive change	No change

Activity	Quality element	Potential impact(s) (following embedded and standard mitigation)	Relevant designated water body and magnitude of impact	Additional ways to reduce impacts or enhance quality element, including mitigation	Risk of quality element deterioration
	pH	The quantity of sediment and pollutants entering the watercourse during excavation of the outfall would be negligible. Furthermore, the levels of fine sediment would be diluted further downstream of the construction working areas and would not impact pH along each designated water body at a water body scale.			
	Temperature	No impacts are anticipated given the number of trees and other vegetation being removed as a result of the outfall structures and drain confluences.	All screened-in water bodies		
Outfall structures and drain confluences	Specific pollutants	If any sediment bound pollutants are accidently released during as the outfall is connected to the water bodies, this could lead to localised increases in pollutants and a reduction in water quality. Furthermore, spillages of oil from plant vehicles used to excavate the banks could introduce hydrocarbons into the water bodies. However, through the use of both pollution and sediment management plans in the EMP, such events are likely to be rare and negligible on a water body scale.	All screened-in water bodies (-)		
	Protected Areas	Fine sediment arising from excavations could lead to highly localised impacts to the River Chelmer nitrate vulnerable zone and the Chelmer nitrate and eutrophic sensitive areas. These would be negligible on a water body scale. No impacts are anticipated on other designations.	Chelmer (downstream confluence with Can) (-)		
			Boreham Tributary (-)		
			Ter (-)		
		Fine sediment arising from excavations could lead to highly localised impacts to the River Blackwater nitrate vulnerable zone and the Rivers Blackwater and Brain nitrate and eutrophic sensitive areas. These would be negligible on a water body scale. No impacts are anticipated on other designations.	Brain (-)		
			Blackwater (Combined Essex) (-)		
		Fine sediment arising from excavations could lead to highly localised impacts to the River Blackwater nitrate vulnerable zone. These would be negligible on a water body scale. No impacts are anticipated on other designations.	Domsey Brook (-)		
		Fine sediment arising from excavations could lead to highly localised impacts to the Roman River nitrate vulnerable zone. These would be negligible on a water body scale. No impacts are anticipated on other designations.	Roman River (-)		
Channel realignments	Macrophytes and phytobenthos (combined)	The disturbance of natural material from excavations to tie the realigned channel into the online watercourse at Domsey Bridge could lead to fine sediment smothering communities present downstream. However, impacts are likely to be limited to the construction phase and mitigated via the sediment management plan found in the EMP. For Domsey Brook East, connecting the realignment to the online watercourse could also lead to fine sediment smothering any macrophyte or phytobenthos communities present downstream. However, sediment management plans, as per the EMP, would work to mitigate such impacts. Impacts from the two realignments are anticipated to be negligible on a water body scale.	Domsey Brook (-)		

Key to change	Negligible change	Negative change	Positive change	No change

Activity	Quality element	Potential impact(s) (following embedded and standard mitigation)	Relevant designated water body and magnitude of impact	Additional ways to reduce impacts or enhance quality element, including mitigation	Risk of quality element deterioration
Channel realignments		Fine sediment released as a result of the Rivenhall Brook realignment could reach the designated water body via a hydrological pathway, and smother macrophyte habitats present along the channel. However, such fine sediment would likely be mitigated through sediment management plans, as per the EMP. Any quantities that bypass measures described in the management plan would likely be negligible and remain local to the realignment. Therefore, no impacts are anticipated on the water body.	Blackwater (Combined Essex)		
		The shaded length of the Roman River, where works are proposed, would reduce light penetration required for extensive colonisation of macrophytes along the bed. Fine sediment that may bypass sediment management measures found in the first iteration EMP [TR10060/APP/6.5] would be unlikely to cause significant impacts to the macrophytes or phytobenthos communities, if present along the reach.	Roman River (-)		
	Benthic invertebrates	Fine sediment and pollutants that enter the watercourse could lead to a reduction in the population of sensitive benthic invertebrates found along the water bodies and reduce spawning habitats and dispersal pathways as result of fine sediment smothering. However, with sediment and pollution management measures in place, as per the first iteration EMP [TR10060/APP/6.5], the quantity of sediment and pollution would negligible. Therefore, any changes to the quality element would be negligible on a water body scale.	Brain (-)		
			Roman River (-)		
		Fine sediment released as a result of the Rivenhall Brook realignment could reach the designated water body via a hydrological pathway and smother invertebrate habitats present along the channel as well as disrupt dispersal pathways. However, such fine sediment would likely be mitigated through sediment management plans, as per the first iteration EMP [TR10060/APP/6.5]. Any quantities that bypass sediment management measures described in the management plan would likely be negligible and remain local to the realignment. Therefore, no impacts are anticipated on the water body.	Blackwater (Combined Essex)		
	Fish	Fine sediment and pollutants that enter the watercourse could lead to a reduction in fish population, through fatalities, and reduce spawning habitats (redds) as result of fine sediment smothering. However, with sediment and pollution management measures in place, as per the first iteration EMP [TR10060/APP/6.5], the quantity of sediment and pollution would be negligible on a water body scale.	Brain (-)		
			Roman River (-)		
		Fine sediment released as a result of the Rivenhall Brook realignment could reach the designated water body via a hydrological pathway and smother spawning habitats. However, such fine sediment would likely be mitigated through sediment management plans, as per the first iteration EMP [TR10060/APP/6.5]. Any quantities that bypass sediment management measures described in the management plan would likely be negligible and remain local to the realignment. Therefore, no impacts are anticipated on the designated water body.	Blackwater (Combined Essex)		

Key to change	Negligible change	Negative change	Positive change	No change

Activity	Quality element	Potential impact(s) (following embedded and standard mitigation)	Relevant designated water body and magnitude of impact	Additional ways to reduce impacts or enhance quality element, including mitigation	Risk of quality element deterioration
Channel realignments	Quantity and dynamics of water flow	Excavations of the realignment would likely remain offline to the watercourse with flow dynamics only disturbed once the realignment is connected to the online watercourse. Here, localised changes in flow dynamics could lead to temporary pockets of eddying flow which would cease once excavations are complete. Therefore, impacts would be negligible on a water body scale.	Domsey Brook (-)		No risk of deterioration to quality elements.
			Roman River (-)		
		Given the distance between the realignment of Rivenhall Brook and the designated water body, no impacts are anticipated.	Blackwater (Combined Essex)		
	Connection to groundwater bodies	No changes are anticipated on the connectivity between surface and groundwater bodies.	Brain		
			Blackwater (Combined Essex)		
			Roman River		
	River continuity	Localised impacts to lateral connectivity with the floodplain are anticipated at the site of the crossing. Furthermore, there would likely be loss of floodplain as the new channel is excavated, further limiting the connectivity of floodplain sediment and flow from the channel. However, this would remain local to the realignments and unlikely to be significant on a water body scale.	Domsey Brook (-)		
			Roman River (-)		
		No impacts are anticipated given the realignment would take place along a non-designated water body.	Blackwater (Combined Essex)		
	River depth and width variations	The majority of works would take place offline with the majority of impacts taking place as the realignments are tied-in to the online watercourse. Here, excavations could lead to localised eddying and bed and bank disturbance. These could result in localised scour of the bed and banks while excavations take place. Such impacts would however remain localised and negligible on a water body scale.	Domsey Brook (-)		
			Roman River (-)		
		The distance between the Rivenhall Brook realignments and the designated water body would be significant enough that impacts to this water quality element would be unlikely to occur.	Blackwater (Combined Essex)		
	Structure and substrate of the riverbed	The majority of works are likely to occur offline from the water body with impacts largely occurring as the realignment is tied-in to the online watercourse. Localised eddying of flows could lead to small pockets of scour at the tie-in locations while disturbances to bed material from extraction could facilitate the entrainment of bed sediments. Sediments are likely to smother localised bed substrate but such impacts would be negligible on a designated water body scale.	Domsey Brook (-)		
			Roman River (-)		
		The distance between the Rivenhall Brook realignments and the designated water body would be significant enough that impacts to this water quality element would be unlikely to occur.	Blackwater (Combined Essex)		

Key to change	Negligible change	Negative change	Positive change	No change

Activity	Quality element	Potential impact(s) (following embedded and standard mitigation)	Relevant designated water body and magnitude of impact	Additional ways to reduce impacts or enhance quality element, including mitigation	Risk of quality element deterioration
Channel realignments	Structure of the riparian zone	Where the realignments tie-in to the water bodies, riparian vegetation clearance is anticipated. Such clearance and compaction of soils along the cleared riparian corridor could lead to permanent yet localised impacts to the composition, abundance and re-establishment of vegetation here. Furthermore, the excavation of the realigned channels would also impact local riparian features, such as the floodplain. Despite noticeably negative changes to the water quality element, such impacts would not be significant on a water body scale, given the extent of works.	Domsey Brook (x)	Limit the amount of riparian vegetation clearance to that found specifically along the footprint of the haul road.	Despite the negative change to the quality element, the localised nature of the change would not be extensive enough to risk deterioration in status.
			Roman River (x)		
		Impacts are unlikely to propagate downstream from the realignments on Rivenhall Brook to the Blackwater, and therefore no change to the water body would occur as a result.	Blackwater (Combined Essex)	No additional mitigation required.	No risk of deterioration to quality elements.
	Dissolved oxygen	The quantity of sediment entering the watercourse during the construction phase of the realignment would be negligible. Dissolved oxygen levels are only likely to become deleterious where water levels are low, flow speeds are low/still and fine sediment input is high. As a result of the measures in the first iteration EMP [TR10060/APP/6.5], this is unlikely. Additionally, through the use of the sediment management plan and pollution management plan within the EMP, any potential change to dissolved oxygen would be prevented.	Brain (-)		
			Domsey Brook (-)		
		Impacts are unlikely to propagate downstream from the realignments on Rivenhall Brook to the Blackwater, and therefore no change to the water body would occur as a result.	Blackwater (Combined Essex)		
	pH	pH could change if sediments enter the channel from works via runoff, however, this would depend on the pH of sediments entering the channel relative to the receiving water's pH. The sediment management plan and pollution management plan within the first iteration EMP [TR10060/APP/6.5], would reduce the quantity of sediment entering the watercourse to quantities that would be negligible on a water body scale.	Domsey Brook (-)		
			Roman River (-)		
		Impacts are unlikely to propagate downstream from the realignments on Rivenhall Brook to the Blackwater, and therefore no change to the water body would occur as a result	Blackwater (Combined Essex)		
	Temperature	No impacts are anticipated on water temperature as a result of the realignments	Domsey Brook		
			Blackwater (Combined Essex)		
			Roman River		
Channel realignments	Specific pollutants	Polluting substances, sediment-bound pollutants and hydrocarbons from fuel and cement being conveyed to site could drain into the adjacent watercourses from vehicles and plant. This could take place within the catchment of any designated water body. However, in accordance with a pollution management plan, as per the first iteration EMP [TR10060/APP/6.5], quantities of such substances (in construction runoff) would likely be mitigated before discharge to the wider environment. As a result, the overall impact on a water body scale is anticipated to be negligible.	Domsey Brook (-)		
			Blackwater (Combined Essex) (-)		
			Roman River (-)		

Key to change	Negligible change	Negative change	Positive change	No change

Activity	Quality element	Potential impact(s) (following embedded and standard mitigation)	Relevant designated water body and magnitude of impact	Additional ways to reduce impacts or enhance quality element, including mitigation	Risk of quality element deterioration
	Protected Areas	Potential negligible increases in fine sediment could impact the River Blackwater nitrate vulnerable zone and the Rivers Blackwater and Brain nitrate sensitive area, depending on the quality of local sediments entering the watercourse. However, given the extent of the works, impacts would be negligible on a water body scale. No impacts are anticipated on other designations.	Domsey Brook (-) Blackwater (Combined Essex) (-)		
		Potential negligible increases in fine sediment could impact the Roman River nitrate vulnerable zone depending on the quality of local sediments entering the watercourse. However, given the extent of the works, impacts would be negligible on a water body scale. No impacts are anticipated on other designations.	Roman River (-)		
Flood mitigation areas	Macrophytes and phytobenthos (combined) Benthic invertebrates Fish	Excavations of flood compensation areas along a non-designated water body (Ordinary Watercourse 21) could lead to a loss of any macrophyte habitats present along the watercourse. This could however lead to indirect impacts to the designated water body where fine sediment could be released and deposited at the confluence. As a result, it could smother any macrophytes or invertebrate communities. Furthermore, such sediment could impact any fish spawning or migratory habitats. Nevertheless, with sediment management plans in place, such impacts are unlikely to occur as the quantity of released fine sediment would be negligible and, given such quantities, unlikely to reach the designated water body.	Blackwater (Combined Essex) (-)		
	Quantity and dynamics of water flow Connection to groundwater bodies River continuity	The distance between the flood compensation along Ordinary Watercourse 21 and the designated water body would be significant enough that impacts to this water quality element would be unlikely to occur. Dewatering as a result of the works is likely to affect local flow regimes and dynamics at Ordinary Watercourse 21, however this would remain negligible on a water body scale.			
	River depth and width variations	Excavations of flood compensation areas along a non-designated water body (Ordinary Watercourse 21) could lead to indirect impacts to the designated water body where fine sediment could be released and deposited at the confluence. Fine sediment would likely settle and aggrade the local bed substrate along Ordinary Watercourse 21. However, with sediment management plans in place, such impacts are unlikely to occur as the quantity of released fine sediment would be negligible and, given such quantities, unlikely to reach the designated water body.			
Flood mitigation areas	Structure and substrate of the riverbed				
	Structure of the riparian zone	The distance between the flood compensation along Ordinary Watercourse 21 and the designated water body would be significant enough that impacts to this water quality element would be unlikely to occur.			

Key to change	Negligible change	Negative change	Positive change	No change

Activity	Quality element	Potential impact(s) (following embedded and standard mitigation)	Relevant designated water body and magnitude of impact	Additional ways to reduce impacts or enhance quality element, including mitigation	Risk of quality element deterioration
	Dissolved oxygen	Dissolved oxygen levels are only likely to become deleterious where water levels are low, flow speeds are low/still and fine sediment input is high. As a result of the measures in the first iteration EMP [TR10060/APP/6.5], this is unlikely. The quantity of sediment entering the watercourse during the construction phase of the flood mitigation area would be negligible. Through the use of the sediment management plan and pollution management plan within the first iteration EMP [TR10060/APP/6.5], any potential change to dissolved oxygen would be mitigated.			
	pH	The quantity of sediment and pollutants entering the watercourse during the excavation of the outfall would be negligible. Furthermore, the levels of fine sediment would be diluted further downstream of the construction working areas and would not impact pH along the water body. Through use of the sediment management plan and pollution management plan within the first iteration EMP [TR10060/APP/6.5], any impacts would be mitigated.			
	Temperature	The distance between the flood compensation along Ordinary Watercourse 21 and the designated water body would be large enough that impacts to this water quality element would be unlikely to occur.			
	Specific pollutants	Any historical legacy of contaminants in the soil, coupled with excavation and machinery could lead to localised increases in pollutants, if present. Furthermore, spillages of oil from plant vehicles used to excavate the banks could introduce hydrocarbons into the water bodies. However, through the use of both pollution and sediment management plans in the first iteration EMP [TR10060/APP/6.5], such events are likely to be rare and negligible on a water body scale.			
	Protected Areas	Fine sediment arising from excavations could lead to highly localised impacts to the River Blackwater nitrate vulnerable zone and the Rivers Blackwater and Brain nitrate and eutrophic sensitive areas. These would be negligible on a water body scale. No impacts are anticipated on other designations.			
Compounds and soil storage (including temporary construction drainage)	Macrophytes and phytobenthos (combined)	Surface runoff, fine sediment and associated silt-laden runoff would likely be conveyed via the construction drainage network and mitigated for via the sediment management and pollution management plans, as per the first iteration EMP [TR10060/APP/6.5]. Therefore, any sediment or pollutants which bypass the management measures would be negligible in quantity and likely diluted as they reach the water bodies.	All screened-in water bodies		
	Benthic invertebrates				
	Fish				
	Quantity and dynamics of water flow	It is anticipated that the construction drainage would be discharged at existing greenfield runoff rates. Therefore, impacts would involve negligible and highly localised changes in flow dynamics at the outfall structures.			
	Connection to groundwater bodies	Compounds would not require any penetration of local aquifers therefore no impacts are anticipated as a result of the activity. Temporary construction drainage is assumed to be to a surface water body.			

Key to change	Negligible change	Negative change	Positive change	No change

Activity	Quality element	Potential impact(s) (following embedded and standard mitigation)	Relevant designated water body and magnitude of impact	Additional ways to reduce impacts or enhance quality element, including mitigation	Risk of quality element deterioration
	River continuity	Impacts would be highly localised to the lateral connectivity of the water bodies, depending on the location of the temporary construction outfalls, if any are constructed and operated. Therefore, impacts would be negligible on a water body scale.	All screened-in water bodies (-)		
	River depth and width variations	Surface runoff, fine sediment and associated silt-laden runoff would likely be conveyed via the construction drainage network and mitigated for via the sediment management plan, as per the EMP. Therefore, any sediments which bypass the management measures would be negligible in quantity and unlikely to make any significant changes to the water bodies. Furthermore, with temporary construction drainage anticipated to match existing greenfield runoff rates, any scour would remain highly localised to the location of the construction outfalls and cease once construction has completed. Therefore, impacts would be negligible on a water body scale.			
	Structure and substrate of the riverbed	Surface runoff, fine sediment and associated silt-laden runoff would likely be conveyed via the construction drainage network and mitigated for via the sediment management plan, as per the first iteration EMP [TR10060/APP/6.5]. Therefore, any sediment bypassing the management measures would be negligible in quantity and be unlikely to make any significant changes to the bed of each water body.			
	Structure of the riparian zone	The distance between the compounds and the water bodies would be significant enough that impacts to this water quality element would be unlikely to occur.	All screened-in water bodies		
Compounds and soil storage (including temporary construction drainage)	Dissolved oxygen	The quantity of sediment entering the watercourse from the compounds would be negligible. However, dissolved oxygen levels are only likely to become deleterious where water levels are low, flow speeds are low/still and fine sediment input from proposed works is high. As a result of the measures in the first iteration EMP [TR10060/APP/6.5], this is unlikely. Through the use of the sediment management plan and pollution management plan within the first iteration EMP [TR10060/APP/6.5], any potential change to dissolved oxygen would be prevented.			
	pH	Sediment could enter the channel if the riverbank was surcharged. However, the quantity of sediment and pollutants entering the water bodies would be negligible. Furthermore, the levels of fine sediment would be diluted further downstream of the construction working areas and would not impact pH along the designated water body. Through the use of a sediment management plan and pollution management plan in the first iteration EMP [TR10060/APP/6.5], any impacts would be mitigated.			
	Temperature	No impacts are anticipated to water temperature as a result of the compounds and soil storage areas.			
	Specific pollutants	Polluting substances, sediment-bound pollutants and hydrocarbons from fuel and cementitious material could drain into the adjacent watercourses from site compounds. This could take place within the catchment of any designated water body. However, in accordance with a pollution management plan, as per the first iteration EMP [TR10060/APP/6.5], quantities of such substances (in construction runoff) would likely be mitigated before discharge to the wider environment. As a result, the overall impact on a water body scale is anticipated to be negligible.			

Key to change	Negligible change	Negative change	Positive change	No change

Activity	Quality element	Potential impact(s) (following embedded and standard mitigation)	Relevant designated water body and magnitude of impact	Additional ways to reduce impacts or enhance quality element, including mitigation	Risk of quality element deterioration
	Protected Areas	Fine sediment arising from excavations could lead to highly localised impacts to the River Chelmer nitrate vulnerable zone and the Chelmer nitrate and eutrophic sensitive area. These would be negligible on a water body scale. No impacts are anticipated on other designations.	Boreham Brook Ter		
		Fine sediment arising from excavations could lead to highly localised impacts to the River Blackwater nitrate vulnerable zone and the Rivers Blackwater and Brain nitrate and eutrophic sensitive areas. These would be negligible on a water body scale. No impacts are anticipated on other designations.	Brain Blackwater (Combined Essex) Domsey Brook		
		Fine sediment arising from excavations could lead to highly localised impacts to the River Blackwater nitrate vulnerable zone. These would be negligible on a designated water body scale. No impacts are anticipated on other designations.	Roman River		
All activities and their impacts to Invasive Non-Native Species (management)	Biological quality elements	All activities have the potential to disturb, spread or promote Invasive Non-Native Species (INNS), particularly where the water bodies are currently vulnerable to their predominance. INNS have the potential to impact aquatic flora and fauna populations through reduction in habitat diversity/complexity and competition with native species. Several invasive species which could impact biological quality elements have been recorded along the screened-in water bodies, as listed below: • River Chelmer (downstream of confluence with River Can) – Japanese knotweed, Himalayan balsam (*Impatiens glandulifera*), floating pennywort (*Hydrocotyle ranunculoides*), Turkish crayfish (*Pontastacus leptodactylus*) • Boreham Brook, River Ter and Domsey Brook – American mink (*Neovison vison*) • River Brain – Himalayan balsam, Japanese knotweed (*Fallopia japonica*), floating pennywort • River Blackwater (combined Essex) – floating pennywort, water fern (*Azolla filiculoides),* Japanese knotweed, Himalayan balsam, signal crayfish (*Pacifastacus leniusculus*), Chinese mitten crab (*Eriocheir sinensis*), giant hogweed and American mink • Roman River – Himalayan balsam, Japanese knotweed and American mink Such species could cause detriment to water quality elements, however, with mitigation in place any spread would be controlled, and impacts would not be significant on a water body scale.	All screened-in Water bodies. (x)	An Invasive Species Management Plan (ISMP) would be included within the EMP. Control measures, such as the adherence to the Environment Agency's 'Clean, check, dry' guidelines would be mandatory. Limiting in-channel works would further reduce the risk of INNS transfer. Where INNS are identified, they would be reported to Defra.	No risk of deterioration to water quality elements, if mitigation is followed.
	Hydromorphological supporting elements	INNS known along the water bodies (Himalayan balsam, Japanese knotweed, giant hogweed) would likely replace the indigenous riparian vegetation along the banks. As they are generally seasonal in nature, INNS would die during summer 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.	Chelmer (downstream confluence with Can) (x) Brain (x) Blackwater (combined Essex) (x)		

Key to change	Negligible change	Negative change	Positive change	No change

Activity	Quality element	Potential impact(s) (following embedded and standard mitigation)	Relevant designated water body and magnitude of impact	Additional ways to reduce impacts or enhance quality element, including mitigation	Risk of quality element deterioration
All activities and their impacts to Invasive Non-Native Species (INNS) (management)		An Ecological Clerk of Works (ECoW) would be responsible for identification of INNS and implementation of the ISMP to prevent spread through the study area as a result of the proposed scheme. With these controls in place, the impact of INNS would not be significant on a water body scale, despite their noticeably negative impacts on WFD water bodies.	Roman River (x)		
		No impacts are anticipated on hydromorphological supporting elements as a result of INNS recorded along the water bodies.	Boreham Tributaries	No additional mitigation required	No risk of deterioration of water quality element
			Ter		
			Domsey Brook		
	Physico-chemical quality elements	If disturbed, the presence of floating pennywort could reduce photosynthesis opportunities for native macrophytes by shading the watercourse. Furthermore, during periods of die-back, the rotting plant material would increase nutrients along the channel and reduce dissolved oxygen levels. Furthermore, Himalayan balsam and giant hogweed would also leave banks exposed to erosion during winter. This could lead to localised increases in fine sediment along each water body. However, with an ISMP in place, INNS would be controlled and their impact would not be significant on a water body scale.	Chelmer (downstream confluence with Can) (x)	An ISMP would be included within the Environment Management Plan. Control measures, such as the adherence to the Environment Agency's 'Clean, check, dry' guidelines would be mandatory. Limiting in-channel works would further reduce the risk of INNS transfer. Where INNS are identified, they would be reported to Defra.	No risk of deterioration to water quality elements, if mitigation is followed.
			Brain (x)		
			Blackwater (combined Essex) (x)		
			Roman River (x)		
	Specific pollutants	No impacts anticipated on quality element as a result of the proposed scheme.	All screened-in water bodies.	No mitigation required	No risk of deterioration of water quality element
	Protected areas	No impacts anticipated on protected areas as a result of the proposed scheme.			

Table 6.2 Operation impacts on screened-in WFD Regulations surface water body quality and supporting elements

Key to change	Negligible change	Negative change	Positive change	No change		
Activity	**Quality element**	**Potential impact(s) (following embedded and standard mitigation)**	**Relevant water body and magnitude of impact**	**Additional ways to reduce impact on, or enhance the water quality element**	**Risk of quality element deterioration**
Drainage (including routine runoff)	Macrophytes and phytobenthos (combined)	Localised changes in water quality could alter short-term macrophyte composition and distribution as sediment is released via outfalls directly to the water bodies or tributaries. It is anticipated that such impacts would remain local to the outfall structure and drainage ditch confluences as pollutants are diluted downstream. Therefore, impacts would be negligible on a water body scale. Changes associated with flow dynamics would also remain local to the outfall structure and drainage ditch confluences. Here, flows would be attenuated to match existing flow rates, therefore scour associated with the new input of flow would be negligible.	All screened-in water bodies (-)	No additional mitigation required.	No risk of deterioration to quality elements.
	Benthic invertebrates	Localised changes in water quality and flow dynamics could alter invertebrate communities and dispersal pathways as flow is introduced to the water body via the outfall structure. Here, scour could lead to losses in invertebrate habitats, while fine sediment and potential pollutants attached to them could indirectly influence invertebrate populations at the outfall structures. Impacts from flow dynamics would likely remain highly localised to the outfall structure, while pollutants would likely be diluted further downstream. Therefore, impacts would be negligible on a water body scale.	All screened-in water bodies (-)		
Drainage (including routine runoff)	Fish	Localised changes in water quality and flow dynamics could alter fish communities and habitats as flow is introduced to the water bodies via the outfall structure and drainage channel confluences. Here, scour could lead to losses in functional and/or spawning habitats, while potential increases in copper arising from tributaries and/or outfall structures could cause fatalities in fish populations. Impacts associated with flow dynamics would likely remain local to the outfall structures and drainage channel confluences. Furthermore, pollutants would likely be diluted further downstream, while mitigation measures would reduce the likelihood of significant effects on a water body scale. Therefore, impacts would be negligible on a water body scale.	All screened-in water bodies (-)		
	Quantity and dynamics of water flow	As flow would either match existing flows (online alignment), greenfield runoff rates (offline alignment) or a combination of the two (online/offline combined) impacts to flow regimes would be unlikely to change. As the new outfalls would create a new input of flow, they could lead to some highly localised changed to flow turbulence as and when flow is drained into the watercourse. However, impacts would be negligible on a water body scale.	All screened-in water bodies (-)		
	Connection to groundwater bodies	No impacts are anticipated to quality elements. No infiltration is proposed in Appendix 14.6: Surface Water Drainage Strategy, of the Environmental Statement [TR10060/APP/6.3].	All screened-in water bodies		
Drainage (including routine runoff)	River continuity	No impacts are anticipated to quality element given standard mitigation applied to outfall structure.			
	River depth and width variations	The highly localised change in flow dynamics as flow is introduced to water bodies at the new locations could lead to scour local to the outfall structure. Impacts are likely to be negligible on a water body scale.	All screened-in water bodies (-)		

Key to change	Negligible change	Negative change	Positive change	No change

Activity	Quality element	Potential impact(s) (following embedded and standard mitigation)	Relevant water body and magnitude of impact	Additional ways to reduce impact on, or enhance the water quality element	Risk of quality element deterioration
	Structure and substrate of the riverbed	Fine sediment conveyed via the drainage ditches and outfalls would likely be negligible in quantity, given the presence of retention ponds, attenuation ponds, filter drains and other mitigation measures. Any fine sediment which bypasses these measures would likely remain local to the drainage ditch confluences, tributary confluences and outfall structures. Therefore, impacts to the bed substrate would likely be negligible on a water body scale.	All screened-in water bodies (-)		
	Structure of the riparian zone	No impacts are anticipated on quality element.	All screened-in water bodies		
	Dissolved oxygen	Fine sediment conveyed via the drainage channels and outfalls could lead to localised changes in oxygen levels. Furthermore, with the localised changes in flow dynamics and water depths at the site of the outfall structures and drainage confluences, dissolved oxygen levels could improve. However, with mitigation measures in place to filter flows of pollutants and fines, such changes would be highly localised to the drainage ditch confluences and outfall structures before returning to existing levels downstream. Therefore, impacts would be negligible on a water body scale.	All screened-in water bodies (-)		
	pH	Fine sediment conveyed via the drainage channels and outfalls could lead to localised changes in pH, depending on soil and superficial geological conditions. However, with mitigation measures in place to filter flows of pollutants and fines, such changes would be highly localised to the drainage ditch confluences and outfall structures before returning to existing levels downstream. Therefore, impacts would be negligible on a water body scale.			
	Temperature	No impacts anticipated on quality element.	All screened-in water bodies		
Drainage (including routine runoff)	Specific pollutants	Discharges of road runoff drainage could lead to exceedances in Environmental Quality Standards (EQS) for the screened-in water bodies due to increases in copper and zinc prior to control measures. These would arise from existing outfalls and potentially new outfalls and could lead to fish and invertebrate fatalities. However, water quality assessments have been undertaken, based on embedded mitigation measures included in the proposed drainage design, and no environmentally significant effects have been identified upon the water bodies. The proposed drainage design includes sustainable drainage system features such as retention ponds, filter drains and swales, all of which offer water quality treatment to road runoff drainage before it is discharged to the wider water environment. Similarly, the risk of specific pollutants entering surrounding watercourses due to an accidental spillage has been assessed and no environmentally significant effects have been identified. As such, impacts from drainage discharges during operation are anticipated to be negligible on a water body scale.	All screened-in water bodies (-)		

Key to change	Negligible change	Negative change	Positive change	No change

Activity	Quality element	Potential impact(s) (following embedded and standard mitigation)	Relevant water body and magnitude of impact	Additional ways to reduce impact on, or enhance the water quality element	Risk of quality element deterioration
	Protected Areas	Fine sediment arising from excavations could lead to highly localised impacts to the River Chelmer nitrate vulnerable zone and the Chelmer nitrate and eutrophic sensitive area. These would be negligible on a water body scale. No impacts are anticipated on other designations.	Chelmer (downstream confluence with Can) (-)		
			Boreham Tributary (-)		
			Ter (-)		
		Fine sediment discharged via drainage could lead to highly localised impacts to the River Blackwater nitrate vulnerable zone and the Rivers Blackwater and Brain nitrate and eutrophic sensitive areas. These would be negligible on a water body scale. No impacts are anticipated on other designations.	Brain (-)		
			Blackwater (Combined Essex) (-)		
		Fine sediment and pollutants via drainage could lead to highly localised impacts to the River Blackwater nitrate vulnerable zone. These would be negligible on a water body scale. No impacts are anticipated on other designations.	Domsey Brook (-)		
Drainage (including routine runoff)		Fine sediment and pollutants via drainage could lead to highly localised impacts to the Roman River nitrate vulnerable zone. These would be negligible on a water body scale. No impacts are anticipated on other designations.	Roman River (-)		
Outfall structure and drainage ditch confluences	Macrophytes and phytobenthos (combined)	Short-term scour of the natural banks local to the outfall structure could lead to losses of macrophyte communities, while fine sediment entrained by such scour could smother local communities downstream. Such impacts would be highly localised to the outfall structures and drainage ditch confluences and would be negligible on a water body scale.	All screened-in water bodies (-)		No risk of deterioration to quality elements.
	Benthic invertebrates	Short-term scour of the natural banks local to the outfall structure as well as fine sediment released by such scour could lead to losses of invertebrate populations and habitats. Such impacts would be highly localised to the outfall structures and drainage ditch confluences, and would therefore be negligible on a water body scale.			
	Fish	Short-term scour of the natural banks local to the outfall structure as well as fine sediment released by such scour could lead to losses of fish habitats. Such impacts would be highly localised to the outfall structures and drainage ditch confluences, and would therefore be negligible on a water body scale.			
	Quantity and dynamics of water flow	The outfall structure, which has been proposed to be set back from the banks could lead to localised changes in flow dynamics, where changes in secondary flow paths could take place as a result of the structures being located on or near to channel bends. However, impacts would remain highly localised to the outfall structure and would therefore be negligible on a water body scale.	Chelmer (downstream confluence with Can) (-)		Low risk of deterioration to quality elements
			Boreham Tributary (-)		
			Ter (-)		
			Blackwater (Combined Essex) (-)		
			Domsey Brook (-)		
			Roman River (-)		

Key to change	Negligible change	Negative change	Positive change	No change

Activity	Quality element	Potential impact(s) (following embedded and standard mitigation)	Relevant water body and magnitude of impact	Additional ways to reduce impact on, or enhance the water quality element	Risk of quality element deterioration
		Highly localised and short-term scour could take place at the location of the outfall structures and drainage ditch confluences. However, given the proposed setting back of the structures and placement along a straight reach, impacts would be negligible on a water body scale.	Brain (-)	No additional mitigation required	No risk of deterioration to quality elements.
	Connection to groundwater bodies	The presence of drainage ditch confluences and outfall structures could lead to localised disruption to the connectivity between the water bodies and local aquifers. Impacts would be negligible on a water body scale.	All screened-in water bodies (-)		
	River continuity	The presence of drainage ditch confluences and outfall structures could lead to localised disruption to the lateral connectivity between the water bodies and local floodplains. Impacts would be negligible on a water body scale.	All screened-in water bodies (-)		
Outfall structure and drainage ditch confluences	River depth and width variations	Where outfall structures are located at or near to bends in the water bodies, scour could occur along the local banks. Furthermore, it could initiate channel instabilities which could result in further scour upstream and downstream of the outfalls. These impacts would remain localised relative to the scale of the designated water bodies but could be prolonged. Therefore, the mitigation suggested could limit the extent of scour and channel instability. Impacts would therefore be insignificant on a water body scale.	All screened-in water bodies (x)	Install bank protection upstream and downstream of outfall. A monitoring programme would be carried out to assess the performance of bank protection.	No risk of deterioration to quality element, if mitigation measures followed.
	Structure and substrate of the riverbed	As the water bodies adjust to the presence of the outfall structure and drainage ditch confluences, scour could release fine sediment. This could then smother local bed substrate material. However, impacts would likely be acute and remain highly localised, and therefore negligible on a water body scale.	All screened-in water bodies (-)	No additional mitigation required	No risk of deterioration to quality elements.
	Structure of the riparian zone	The presence of the outfall structure and drainage ditch confluences would permanently disrupt the existing vegetated riparian zone. Despite impacts being noticeable, they would remain local to the outfall structures and confluences, and not significant on a water body scale.	All screened-in water bodies (x)		
	Dissolved oxygen	Fine sediment released as the water bodies adjust to the presence of the outfall structures and drainage ditch confluences would alter local oxygen levels within the water bodies. Impacts would however be short-term and local to the structures and confluences, with dissolved oxygen levels returning to existing conditions further downstream. Therefore, the anticipated changes would be negligible on a water body scale.	All screened-in water bodies (-)		
	pH	Fine sediment released as the water bodies adjust to the presence of the outfall structures and drainage ditch confluences would alter pH levels. This depends on soil and conditions of local superficial geology. However, impacts would be short-term and local to the structures and confluences, with dissolved oxygen levels returning to existing conditions further downstream. Therefore, impacts would be negligible on a water body scale.	All screened-in water bodies (-)		
	Temperature	No impacts are anticipated on quality element.	All screened-in water bodies		

Key to change	Negligible change	Negative change	Positive change	No change

Activity	**Quality element**	**Potential impact(s) (following embedded and standard mitigation)**	**Relevant water body and magnitude of impact**	**Additional ways to reduce impact on, or enhance the water quality element**	**Risk of quality element deterioration**
Outfall structure and drainage ditch confluences	Specific pollutants	Localised impacts could take place as bank material is scoured during the initial operation of the outfall structures and drainage ditches. This would only occur if pollutants (likely copper and polycyclic aromatic hydrocarbons (PAHs)) are present within the sediment. However, such impacts are likely to remain highly localised and would occur over a short-term period. Therefore, impacts would be negligible on a water body scale.	All screened-in water bodies (-)		
	Protected Areas	Fine sediment arising from excavations could lead to highly localised impacts to the River Chelmer nitrate vulnerable zone and the Chelmer nitrate and eutrophic sensitive area. These would be negligible on a water body scale. No impacts are anticipated on other designations.	Chelmer (downstream confluence with Can) (-)		
			Boreham Tributary (-)		
			Ter (-)		
		Fine sediment discharged via drainage could lead to highly localised impacts to the River Blackwater nitrate vulnerable zone and the Rivers Blackwater and Brain Nitrate and eutrophic sensitive areas. These would be negligible on a water body scale. No impacts are anticipated on other designations.	Brain (-)		
			Blackwater (Combined Essex) (-)		
		Fine sediment arising from excavations could lead to highly localised impacts to the River Blackwater nitrate vulnerable zone. These would be negligible on a water body scale. No impacts are anticipated on other designations.	Domsey Brook (-)		
		Fine sediment arising from excavations could lead to highly localised impacts to the Roman River nitrate vulnerable zone. These would be negligible on a water body scale. No impacts are anticipated on other designations.	Roman River (-)		
Highway structure	Macrophytes and phytobenthos (combined)	Scour protection proposed along Brain Bridge would likely prevent any significant changes in fine sediment at the highway structures which could impact macrophyte communities, if present. Therefore, any impacts would be negligible on a water body scale.	Brain (-)		
		Scour protection proposed along Ashman's Bridge would likely prevent any significant changes in fine sediment at the highway structures which could impact macrophyte communities, if present. Therefore, any impacts would be negligible on a water body scale. The presence of new culvert crossings along the offline structure and junction could lead to prolonged shading of tributaries to the River Blackwater. This would notably include Rivenhall Brook, which would pass through a box culvert and limit any opportunity of macrophytes to grow along the culverted channel. Impacts would remain local to the culvert and negligible on a water body scale.	Blackwater (Combined Essex) (-)		
		The extensions to Brain Bridge, Ashman's Bridge, Domsey Bridge and Roman River culvert, as well as the proposed Domsey East Culvert would likely lead to loss of macrophyte communities by increasing the level of shading along the water bodies. Impacts would however remain highly localised to the structures and negligible on a water body scale.	Domsey Brook (-)		
Highway structure		No impacts are anticipated as a result of the Roman River Culvert extension, given the existing level of shading to the water body at the site of the extension.	Roman River		

Key to change	Negligible change	Negative change	Positive change	No change

Activity	Quality element	Potential impact(s) (following embedded and standard mitigation)	Relevant water body and magnitude of impact	Additional ways to reduce impact on, or enhance the water quality element	Risk of quality element deterioration
	Benthic invertebrates	Scour protection proposed along Brain Bridge would likely prevent any significant changes in fine sediment at the highway structures which could impact invertebrate communities and habitats, if present. Therefore, any impacts would be negligible on a water body scale.	Brain (-)		
		Scour protection proposed along Ashman's Bridge would likely prevent any significant changes in fine sediment at the highway structures which could impact invertebrate communities and habitats, if present. Therefore, any impacts would be negligible on a water body scale. The presence of new culverts along the offline structure would lead to the displacement of benthic invertebrate communities along tributaries of the River Blackwater. Notably, Rivenhall Brook, which would be crossed by a box culvert, could see a local reduction in invertebrate community arising from the presence of such structure. Furthermore, scour from the watercourse adjusting to the presence could lead to further loss of localised habitat. However, given the localised extent of effects, impacts would be negligible on a water body scale.	Blackwater (Combined Essex) (-)		
		Following construction, scour could take place as the watercourses adjust to the presence of the extensions to Domsey Bridge and Roman River Culvert. Furthermore, adjustment is likely to take place along the channel adjacent to the proposed Domsey East Culvert. This could lead to a loss of invertebrate communities and habitats due to scour and the release of fine sediment smothering them. Impacts would however be short-term and highly localised to the crossings with communities potentially restoring once the channel has adjusted. Therefore, despite noticeably negative changes, impacts would not be significant on a water body scale.	Domsey Bridge (x) Roman River (x)		No risk of deterioration, given the localised scale of the impact.
	Fish	Scour protection proposed along Brain Bridge would likely prevent any significant changes in fine sediment at the highway structures which could impact fish communities and habitats, if present. Therefore, any impacts would be negligible on a water body scale.	Brain (-)		No risk of deterioration to quality elements.
		Scour protection proposed along Ashman's Bridge would likely prevent any significant changes in fine sediment at the highway structures which could impact fish communities and habitats, if present. Therefore, any impacts would be negligible on a water body scale. Further impacts come from the presence of culverts proposed to allow tributaries of the River Blackwater to pass beneath the new offline structure and junctions. These changes include Rivenhall Brook, which would be culverted by a box culvert for a prolonged distance of the newly realigned channel. This would likely act as a barrier to any migratory species which use this watercourse. However, on a water body scale these impacts would remain local to the culverts and would therefore not be significant on a water body scale.	Blackwater (Combined Essex) (x)		No risk of deterioration, given the localised scale of the impact.
Highway structure		The extension of Roman River Culvert, Domsey Bridge and the construction of the proposed Domsey East Culvert could lead to further obstacles for migratory fish species. However, the installation of baffles along both Domsey Bridge and Roman River Culvert, while applying gravels to the bed of Domsey East Culvert, could allow flow turbulence the channel to facilitate fish passage, thereby mitigating the effects of the crossings.	Domsey Brook (-) Roman River (-)		No risk of deterioration to quality elements.

Key to change	Negligible change	Negative change	Positive change	No change

Activity	Quality element	Potential impact(s) (following embedded and standard mitigation)	Relevant water body and magnitude of impact	Additional ways to reduce impact on, or enhance the water quality element	Risk of quality element deterioration
	Quantity and dynamics of water flow	The initial operation of Brain Bridge could lead to localised changes in flow dynamics along both banks of the water body. The extension of the abutments means eddying of flows already present would move to the new tie-in point. Such impacts would remain similar to conditions currently present, with eddying remaining highly localised and likely ceasing in magnitude as the channel adjusts to the extensions.	Brain (-)		
		The initial operation of Ashman's Bridge could lead to localised changes in flow dynamics along the banks of the water body, River Blackwater. The extension of the abutments means eddying of flows already present would move to the new tie-in point. Such impacts would remain similar to conditions currently present, with eddying remaining highly localised and likely ceasing in magnitude as the channel adjusts to the extensions. New culverts which would allow the tributaries of the River Blackwater to pass beneath the new offline structure and junctions would lead to localised changes in flow dynamics as the banks and cross-section are replaced by the culvert. This would lead to abrupt changes in flow dynamics as eddying flows form at the outlet. However, such impacts would be localised and unlikely to lead to change to the water quality element. As such, impacts would be unlikely to pose a significant risk on a water body scale.	Blackwater (Combined Essex) (x)		No risk of deterioration, given the localised scale of the impact.
		Following the initial operation of the Domsey Bridge extension and proposed Domsey East Culvert, flow dynamics are likely to change. The large extension to Domsey Bridge would elongate the over-widened nature of the channel with flow becoming increasingly placid. A localised increase in water velocities could occur at Domsey East Culvert. Furthermore, potential ponding could take place upstream of Domsey East with eddying of flows at the outlet. Impacts would remain highly localised to the crossings and not significant on a water body scale. Moreover, with enhancements described, impacts would further reduce in magnitude.	Domsey Brook (x)	Install baffles along the bed of Domsey Bridge.	
		The extension of Roman River would be unlikely to alter flow conditions significantly, given the short extension and limited change in the cross-section of the culvert. Any changes would be the location of eddying in the water body at the outlet, as it has been moved downstream. Impacts would be negligible on a water body scale, while the enhancements described would further alleviate the channel from such changes.	Roman River (-)	Install baffles along the bed of the existing and extended culvert. This would be approached at detailed design.	No risk of deterioration to quality elements.
	Connection to groundwater bodies	Impacts would remain highly localised to the crossing structures and negligible on a water body scale.	All screened-in water bodies (-)	No additional mitigation required	
Highway structure	River continuity	Brain Bridge already experiences an issue with continuity of sediment, given the quantity of fine sediment accumulating at the inlet. However, the extension to the bridge would lead to no changes to conditions here as the sill which causes such problems would remain unmodified. The lack of floodplain at the site of the bridge extension would also lead to limited disruption to the lateral connectivity between the water body and its floodplain. Therefore, impacts would be negligible on a water body scale.	Brain (-)		

Key to change	Negligible change	Negative change	Positive change	No change

Activity	Quality element	Potential impact(s) (following embedded and standard mitigation)	Relevant water body and magnitude of impact	Additional ways to reduce impact on, or enhance the water quality element	Risk of quality element deterioration
		The lack of floodplain at the site of the Ashman's Bridge extension would lead to very limited and localised impacts on lateral connectivity between the water body and its floodplain. The presence of new culverts along the tributaries of the River Blackwater could lead to localised disturbance to sediment conveyance with a notable example found at Rivenhall Brook. However, given embedded and standard mitigation, including the submergence of the culvert inlet and augmenting gravels along the culvert bed, such impacts would carry a low risk of deterioration and are unlikely to be significant on a water body scale.	Blackwater (Combined Essex) (x)		Low risk of deterioration.
		The extension of Domsey Bridge and the proposed Domsey East Culvert would likely lead to localised disruptions in sediment conveyance, if designed inappropriately. The channel at Domsey Bridge is already over-wide as fine sediment is seen accumulating at the inlet. However, impacts would be localised to Domsey Bridge and negligible on a water body scale, particularly with enhancements in place and an appropriately designed channel realignment immediately upstream of the bridge. If designed inappropriately, the Domsey East culvert could also lead to localised disruption to sediment conveyance. However, with standard mitigation in place, including the inclusion of gravels along the bed of the culvert, such impacts are unlikely to be extensive. Therefore, impacts would be negligible on a water body scale.	Domsey Brook (-)	Install baffles along the bed of Domsey Bridge.	No risk of deterioration to quality elements.
		The extension to Roman River would be unlikely to cause significant changes to existing conditions. The channel here is held up already by its historical realignment and reduction in gradient, as well as the presence of the culvert. Therefore, impacts would be negligible on a water body scale. Furthermore, by applying the enhancements described, sediment conveyance could improve.	Roman River (-)	Install baffles along the bed of Roman River Culvert. This would be approached at detailed design.	
	River depth and width variations	At the inlet and outlet of Brain Bridge, it is likely that highly localised instances of scour could take place where the extended abutments tie-in with the natural bank material. However, with the proposed scour protection at the bridge, it is unlikely such scour would be extensive or a long-term process.	Brain (-)	No additional mitigation required	
Highway structure		The extension to Ashman's Bridge would include scour protection to prevent any operational impacts associated with bed and bank scour. Therefore, any impacts associated with scour would be negligible on a water body scale. The presence of new culverts would lead to localised changes in river width and depth. Scour associated with the channel adjustment is anticipated. For most of the tributaries, such scour would be limited to periods of bankfull or higher flows, given their being drainage channels. However, Rivenhall Brook would likely experience scour once the culvert is operational. Such impacts would likely be short-term, ceasing soon after the culvert becomes operational. Moreover, fine sediment aggradation could take place at the inlet, however given the standard mitigation measures, such accretion would be minimal and local to the inlet. Therefore, impacts would be unlikely to be significant on a water body scale, leading to a low risk of deterioration.	Blackwater (Combined Essex) (x)	Consider mitigation measures for realignment.	Low risk of deterioration.

Key to change	Negligible change	Negative change	Positive change	No change

Activity	Quality element	Potential impact(s) (following embedded and standard mitigation)	Relevant water body and magnitude of impact	Additional ways to reduce impact on, or enhance the water quality element	Risk of quality element deterioration
		Where Domsey Bridge has been extended, its overwide nature would continue to influence processes at the inlet, where siltation was observed. However, impacts would be negligible on a water body scale. Furthermore, the realignment could improve conditions upstream, if designed appropriately. The proposed Domsey East Culvert could lead to localised scour of the bed and banks as the channel adjusts to its presence. Impacts are likely to be short-term, ceasing soon after the culvert becomes operational. Moreover, fine sediment aggradation could take place at the inlet, however given standard mitigation measures, such accretion would be minimal and highly localised to the inlet, and negligible on a water body scale.	Domsey Brook (-)	Install baffles along the bed of Domsey Bridge. This would be approached at detailed design.	No risk of deterioration to quality elements.
		The extension of the Roman River Culvert could lead to localised scour of the bed and banks as it adjusts to the presence of the extension, given the largely homogenous bed substrate material present along this reach of the water body. However, scour would remain local to the culvert and negligible on a water body scale.	Roman River (-)	No additional mitigation required	
	Structure and substrate of the riverbed	No significant changes are anticipated as a result of the extension to Brain Bridge or Roman River Culvert. All water bodies were observed as having silt beds, therefore fine sediment supplied by localised scour would not cause any significant changes to them.	Brain (-)		
			Roman River (-)		
		No significant changes are anticipated as a result of the extension to Ashman's Bridge. All water bodies were observed as having silt beds, therefore fine sediment supplied by localised scour would not cause any significant changes to them. Where new culverts have been proposed for the new offline structure, including that which carries the structure across Rivenhall Brook, much of the existing natural bed substrate material would be lost. However, with standard mitigation measures in place, which include installing gravels along the bed, such impacts are likely to lead to a low risk of deterioration to the water quality element.	Blackwater (Combined Essex) (x)		Low risk of deterioration to the water quality element.
Highway structure		The extension of Domsey Bridge and the proposed Domsey East Culvert would lead to prolonged replacement of the natural bed material along the water body. The loss of such bed material would be local to the extensions, while standard mitigation measures for Domsey East Culvert would mitigate impacts arising from the increase in artificial structures along the channel. This would lead to a low risk of deterioration.	Domsey Brook (x)	Install baffles along the bed of Domsey Bridge. This would be approached at detailed design.	
	Structure of the riparian zone	The extension of Brain Bridge, Ashman's Bridge, Domsey Bridge and the Roman River Culvert, as well as the proposed Domsey East Culvert would all lead to the permanent loss of the riparian zone along their respective water bodies. Despite the loss, such impacts would remain highly localised to the structures and not extend further upstream and downstream. Therefore, impacts would be negligible on a water body scale.	All screened-in water bodies (-)	No additional mitigation required.	No risk of deterioration to quality elements.
	Dissolved oxygen	Scour protection proposed at Brain Bridge and Ashman's Bridge would prevent any significant scour along the channel. Any fine sediment released as a result of scour would be negligible and unlikely to cause significant changes in dissolved oxygen levels on a water body scale.	Brain		
			Blackwater (combined Essex)		

Key to change	Negligible change	Negative change	Positive change	No change

Activity	Quality element	Potential impact(s) (following embedded and standard mitigation)	Relevant water body and magnitude of impact	Additional ways to reduce impact on, or enhance the water quality element	Risk of quality element deterioration
		Fine sediment arising from localised and short-term scour at all watercourse crossings could lead to highly localised and short-term reductions in dissolved oxygen levels. Such changes could lead to localised limitations to fish attempting to migrate upstream as well as movement by fish and invertebrate communities. These impacts are likely to remain short-term and occur during the initial operation of the structures. Furthermore, levels are likely to return to existing conditions downstream as fine sediment is diluted downstream along the water bodies. Therefore, impacts would be negligible on a water body scale.	Domsey Brook (-)		
			Roman River (-)		
	pH	Fine sediment arising from localised and short-term scour at all watercourse crossings could lead to highly localised and short-term changes to pH, depending on soil and geological conditions at each crossing. These impacts are likely to remain short-term and occur after the structure becomes operational. Furthermore, such levels are likely to return to existing conditions downstream as fine sediment is diluted along the water bodies. Therefore, impacts would be negligible on a water body scale.	All screened-in water bodies (-)		
	Temperature	The extensions to each crossing and the proposed Domsey East Culvert would lead to permanent reductions in water temperature caused by increased shading. However, such reductions would remain local to the structures, returning to existing temperatures downstream. Therefore, impacts would be negligible on a water body scale.			
	Specific pollutants	Localised impacts could take place as bank material is scoured during the initial operation of the outfall structures and drainage ditches. This would only occur if pollutants (likely copper and PAHs) are present within the sediment. However, such impacts are likely to remain highly localised and would occur over a short-term period. Therefore, impacts would be negligible on a water body scale.			
Highway structure	Protected Areas	Fine sediment arising from excavations could lead to highly localised impacts to the River Chelmer nitrate vulnerable zone and the Chelmer nitrate and eutrophic sensitive areas. These would be negligible on a water body scale. No impacts are anticipated on other designations.	Chelmer (downstream confluence with Can) (-)		
			Boreham Tributary (-)		
			Ter (-)		
		Fine sediment discharged via drainage could lead to highly localised impacts to the River Blackwater nitrate vulnerable zone and the Rivers Blackwater and Brain nitrate and eutrophic sensitive areas. These would be negligible on a water body scale. No impacts are anticipated on other designations.	Brain (-)		
			Blackwater (Combined Essex) (-)		
		Fine sediment arising from excavations could lead to highly localised impacts to the River Blackwater nitrate vulnerable zone. These would be negligible on a water body scale. No impacts are anticipated on other designations.	Domsey Brook (-)		
		Fine sediment arising from excavations could lead to highly localised impacts to the Roman River nitrate vulnerable zone. These would be negligible on a water body scale. No impacts are anticipated on other designations.	Roman River (-)		

Key to change	Negligible change	Negative change	Positive change	No change

Activity	Quality element	Potential impact(s) (following embedded and standard mitigation)	Relevant water body and magnitude of impact	Additional ways to reduce impact on, or enhance the water quality element	Risk of quality element deterioration
Channel realignments	Macrophytes and phytobenthos (combined)	The alignment of the new channel relative to the existing alignment means the watercourse here would be less shaded, thereby providing more opportunities for macrophytes to become established along the watercourse. The positive change would be noticeable, however not significant on a water body scale.	Domsey Brook (✓)		
		With the extensive shading along the existing channel and the presence of dense deciduous woodland along the proposed realignment, no changes are anticipated on macrophyte communities given the limited opportunities for growth. It is unlikely that macrophytes are present along the reach adjacent to the A12, given the coverage of shade present there. Therefore, impacts would not be significant enough to pose a risk of deterioration on a water body scale.	Roman River (-)		
	Benthic invertebrates	The realignments could improve the likelihood of invertebrate communities colonising the bed substrate. Such changes could improve the quantity and complexity of species present along the realigned channels. This would generally occur if the enhancements, as described, are taken into account. Short-term adverse impacts could involve fine sediment smothering any existing invertebrate communities downstream; however, this would remain local to the tie-in location, short-term and mitigated over the long term by the enhancements to the channel. Therefore, impacts would be negligible on a water body scale.	All screened-in water bodies (-)	Augment coarse gravels along the bed. Recreate pool-riffle sequences.	
Channel realignments	Fish	The increased length of the realignments would mitigate the impacts to fish habitats resulting from the modifications and construction of watercourse crossings as well as the construction activities associated with the realignments themselves. Any short-term impacts, such as fine sediment smothering coarse habitats and spawning areas, would be local to the structures. Furthermore, if enhancements including the augmentation of gravels and replication of pool-riffle channels take place, this could improve fish habitat availability along the realignments. The positive change would be noticeable, however not significant on a water body scale.	All screened-in water bodies (✓)	Augment coarse gravels along the bed. Recreate pool-riffle sequences.	
	Quantity and dynamics of water flow	The gently sinuous nature of the realignments would be a betterment relative to existing conditions which present a straightened channel with little to no variability in flow dynamics. A gently sinuous channel would provide opportunity for secondary flow paths' increase in magnitude, and create potential for variations in flow dynamics. Furthermore, enhancements, including gravel augmentation and pool-riffle sequences would further improve flow conditions along the water bodies. Changes would likely be noticeably positive; however, they would remain insignificant on a water body scale.		Augment coarse gravels along the bed. Recreate pool-riffle sequences.	
	Connection to groundwater bodies	If superficial aquifers are present, the gently sinuous planform of the realignments could lead to slight improvements in the structure of the hyporheic zone. This would contribute to localised improvements in groundwater connectivity. Impacts would likely be noticeably positive; however, they would remain insignificant on a water body scale.		No additional mitigation required	
	River continuity	The realignment of both Domsey Brook and Roman River would move the watercourses away from the highway structure, therefore, reducing the restriction on the channel. This could improve lateral connectivity with their floodplains and allow for the potential of some localised lateral adjustment. The watercourses are however lacking in energy, with Domsey Brook presenting an over-wide cross-section at Domsey Bridge, and Roman River being over-long and over-wide as it flows along the A12. The realignments would be unlikely to change such issues with continuity but through the described enhancements as well as the		Excavate a two-stage channel with narrow low-flow channel at Domsey Brook. Excavate a one-stage channel with a low-flow channel of	

Key to change	Negligible change	Negative change	Positive change	No change

Activity	Quality element	Potential impact(s) (following embedded and standard mitigation)	Relevant water body and magnitude of impact	Additional ways to reduce impact on, or enhance the water quality element	Risk of quality element deterioration
		gentle sinuosity, increased sediment conveyance could take place. Impacts would likely be noticeably positive; however, they would remain insignificant on a water body scale.		varying widths along Roman River. Augment gravels along the beds of both watercourse realignments. Replicate pool-riffle sequences along the realignments.	
	River depth and width variations	Scour is likely to take place as the realignments are tied-in to the retained watercourse. Such scour would likely remain local to the tie-in location and remain a short-term impact ceasing as the water bodies adjust to their new alignment. The gently sinuous nature of the realignments would however, lead to positive changes to channel width and depth as natural processes would be encouraged. This would lead to a sequence of river widths and depths reflective of a natural environment. Impacts would likely be noticeably positive; however, they would remain insignificant on a water body scale.		Augment coarse gravels along the bed. Recreate pool-riffle sequences.	
Channel realignments	Structure and substrate of the riverbed	If enhancements are considered, this could improve substrate conditions along the realignments and provide a betterment to the quality element. Both watercourses were observed as having beds comprising silt and some fine gravels, although the ratio favours silt. The described enhancements would work to improve the ratio in favour of gravels and coarser sediment, potentially leading to self-regulating channels with complex bed substrate composition and distribution. Impacts would likely be noticeably positive; however, they would remain insignificant on a water body scale.	All screened-in water bodies (✓)		
	Structure of the riparian zone	The realignments would move the current watercourse away from the highway's structure and improve the riparian zone along the channel. This would facilitate colonisation of vegetation and create opportunities for varied riparian habitats. Impacts would likely be noticeably positive; however, they would remain insignificant on a water body scale.		No additional mitigation required	
	Dissolved oxygen	Short-term impacts would include fine sediment causing negligible reductions in dissolved oxygen as the water bodies adjust to their new alignments. These impacts would be local to the tie-in locations and cease once the water bodies have adjusted. The increased lengths and potential enhancements along the water bodies could improve dissolved oxygen levels by leading to more varied flow dynamics which can entrain and move fine sediment downstream, thereby increasing the capacity for oxygen within the water. Impacts would likely be noticeably positive; however, they would remain insignificant on a water body scale.		Augment coarse gravels along the bed. Recreate pool-riffle sequences.	
	pH	Short-term impacts would include fine sediment causing negligible changes in pH as the water bodies adjust to their new alignments. These impacts would be dependent on local geology and would remain local to the tie-in locations, ceasing once the water bodies have adjusted. Therefore, any impacts would be negligible on a water body scale.	All screened-in water bodies (-)	No additional mitigation required	

Key to change	Negligible change	Negative change	Positive change	No change		
Activity	**Quality element**	**Potential impact(s) (following embedded and standard mitigation)**		**Relevant water body and magnitude of impact**	**Additional ways to reduce impact on, or enhance the water quality element**	**Risk of quality element deterioration**
	Temperature	No impacts are anticipated on water temperatures along the water bodies.		All screened-in water bodies		
	Specific pollutants	Localised impacts could take place as bank material is scoured during the initial operation of the outfall structures and drainage ditches. This would only occur if pollutants (likely copper and PAHs) are present within the sediment. However, such impacts are likely to remain highly localised and would occur over a short-term period. Therefore, any impacts would be negligible on a water body scale.		All screened-in water bodies (-)		
	Protected areas	Fine sediment arising from excavations could lead to highly localised impacts to the River Blackwater nitrate vulnerable zone. These would be negligible on a water body scale. No impacts are anticipated on other designations.		Domsey Brook (-)		
Channel realignments		Fine sediment arising from excavations could lead to highly localised impacts to the Roman River nitrate vulnerable zone. These would be negligible on a water body scale. No impacts are anticipated on other designations.		Roman River (-)		

Table 6.3 Construction impacts on screened-in WFD Regulations groundwater body quality and supporting elements

Key to change	Negligible change	Negative change	Positive change	No change

Activity	**Quality element**	**Potential impact(s)**	**Relevant designated water body (colour-coded based on key)**	**Additional ways to reduce impact on, or enhance the water quality element**	**Risk of quality element deterioration**
Compounds	GWDTEs (non-designated) (quantitative)	Removal of vegetation and shallow soils has the potential to alter recharge characteristics which could locally affect shallow groundwater flows to the GWDTE. Marshy Grassland 1 lies adjacent to proposed compound areas which could alter flows to the GWDTEs from the west and east. This is however expected to be a negligible disruption. Given that the GWDTE sites are not designated, impacts would not result in a deterioration of the quantitative element status.	Essex Gravels (-)	No additional mitigation required.	No risk of deterioration to water quality element.
	Water balance	No dewatering required for site compounds, therefore limited potential for change to water balance.	Essex Gravels		
	Surface water	No dewatering impacts are expected for compounds; therefore no impacts to baseflows to surface waters are predicted.	Essex Gravels		
	Drinking water protected area	Impacts on drinking water protected areas from these activities are unlikely to cause deterioration in water quality such that additional treatment is required. Adherence to industry good practice during construction would significantly reduce changes to groundwater quality and quantity. However, given the distance of the groundwater abstractions from the compound areas and their locations outside the Order Limits, there would be no change in chemical status.	Essex Gravels		
	GWDTEs (non-designated) (quality)	Changes to groundwater quality due to mobilisation of suspended solids and associated solutes, leaks and spills of fuels and chemicals from compound areas could reduce the quality. No GWDTEs lie within the footprint of the potential compound areas so no direct impacts are predicted. However, Marshy Grassland 1 lies immediately downgradient of a compound area, therefore groundwater quality at the site could be impacted by the proposed scheme. Adherence to industry good practice during construction would significantly reduce changes to groundwater quality and given the GWDTE sites are not designated, there would be no change in quality status.	Essex Gravels (-)		
	Surface water	No significant excavation is required for the compound areas; therefore no impacts to baseflow quality to surface waters are predicted.	Essex Gravels		
	General quality	Adherence to industry good practice during construction would significantly reduce changes to groundwater quality, therefore at a groundwater body scale there would be limited to no change in quality status.	Essex Gravels (-)		

Key to change	Negligible change	Negative change	Positive change	No change

Activity	**Quality element**	**Potential impact(s)**	**Relevant designated water body (colour-coded based on key)**	**Additional ways to reduce impact on, or enhance the water quality element**	**Risk of quality element deterioration**
Haul roads	GWDTEs (quantitative)	The nearest haul road to a GWDTE is located less than 2m south of Wet Woodland 8. However, this is located on the opposite side of Domsey Brook. Therefore, negligible impacts to groundwater flows and levels are predicted as a result of compaction. All other haul roads are located at sufficient distance from the GWDTEs that no impacts are predicted as a result. Given that the GWDTE sites are not designated, impacts would not result in a deterioration of the quantitative element status.	Essex Gravels (-)		
	Water balance	No excavations are required for the haul roads, therefore there is no potential for change to water balance.	Essex Gravels		
	Surface water	No excavations are required for the haul roads, therefore no impacts to baseflows to surface waters are predicted.	Essex Gravels		
	Drinking water protected area	No groundwater abstractions are located near the haul roads, therefore no impacts are predicted to abstractions by their construction and use.	Essex Gravels		
	GWDTEs (quality)	The nearest haul road is located on the opposite bank from Wet Woodland 8. There are several best-practice mitigation measures which would be incorporated into the EMP for pollution prevention including managing silt pollution (for suspended solids transport). These measures would reduce the likelihood of contaminating groundwater at the GWDTE and would result in negligible impacts. The rest of the GWDTEs are not predicted to be impacted as a result of the haul roads and given that Wet Woodland 8 is not designated, impacts would not result in a deterioration of quantitative element status.	Essex Gravels (-)		
	Surface water	No significant excavation is required for the compound areas; therefore, no impacts to baseflow quality of surface waters are predicted.	Essex Gravels		
Haul roads	General quality	There are several best-practice mitigation measures which would be incorporated into the EMP for pollution prevention, including managing silt pollution (for suspended solids transport). These measures would reduce the likelihood of contaminating groundwater. Adherence to industry good practice during construction would significantly reduce changes to groundwater quality, therefore at a groundwater body scale there would be limited to no change in quality status.	Essex Gravels (-)		

Key to change	Negligible change	Negative change	Positive change	No change

Activity	**Quality element**	**Potential impact(s)**	**Relevant designated water body (colour-coded based on key)**	**Additional ways to reduce impact on, or enhance the water quality element**	**Risk of quality element deterioration**
Highway structure (includes associated earthworks and piling)	GWDTEs (quantitative)	Some of the road cuttings / widenings would require dewatering. GWDTEs identified within the radius of influence for dewatering of cuttings include Wet Woodland 1 and Marshy Grassland 1, and Riverview Meadows Local Wildlife Site. In these areas, groundwater levels are predicted to decrease as a result of dewatering. However, given the distance of these sites from the cutting, impacts with a slight significance of effect are predicted at all affected locations. Areas of Wet Woodland 1 and Wet Woodland 7 lie within the Order Limits and therefore could be directly impacted by compaction activities relating to the proposed scheme which could disrupt shallow groundwater flows within the site, resulting in a moderate to slight significance of effect. Given that the GWDTE sites are not designated, impacts would not result in a deterioration of the quantitative element status.	Essex Gravels (-)		
	Water balance	Dewatering is expected to be required in multiple cuttings/widenings along the proposed scheme. However, considering the scale of the superficial aquifers across and beyond the study area, the proposed works would be expected to be effectively minor. As part of the standard measures, environmental permits to support dewatering activities would be obtained. As a result, any changes to the water balance would be negligible at a groundwater body scale.	Essex Gravels (-)		
	Surface water	The dewatering assessment (Appendix 14.4: Groundwater Assessment, Section 3 [TR010060/APP/6.3]) has indicated that negligible impacts are predicted to surface water features across the proposed scheme as a result of dewatering of cuttings. Therefore, this would not result in a deterioration of the qualitative element status.	Essex Gravels (-)		
Highway structure (includes associated earthworks and piling)	Drinking water protected area	Groundwater abstractions LGA-17 and PGA-7 have been identified as being potentially impacted by dewatering of cuttings. In addition, seven licensed groundwater abstractions (LGA-2, LGA-3, LGA-5, LGA-17, LGA-24, LGA-27 and LGA-33) and two private unlicensed abstractions ((PGA-2 and PGA-5) could potentially be impacted from a water quality perspective. Other groundwater abstractions have been identified within road cuttings / widenings zones of influence. However, as detailed in Appendix 14.4: Groundwater Assessment, of the Environmental Statement [TR010060/APP/6.3], only slight or negligible impacts are expected, because of the distances. Changes to flows and levels within the groundwater body as a result of dewatering would be localised, therefore in the context of the entire groundwater body, the status would not be affected.	Essex Gravels (-)	Additional mitigation is being implemented for individual groundwater abstraction receptors, as detailed in Chapter 14: Road drainage and the water environment, of the Environmental Statement [TR010060/APP/6.1]. No additional mitigation measures are required at the scale of groundwater body.	

Key to change	Negligible change	Negative change	Positive change	No change

Activity	**Quality element**	**Potential impact(s)**	**Relevant designated water body (colour-coded based on key)**	**Additional ways to reduce impact on, or enhance the water quality element**	**Risk of quality element deterioration**
	GWDTEs (quality)	Changes to groundwater quality are possible due to the mobilisation of suspended solids and associated solutes, leaks and spills of fuels and chemicals from construction areas. There is the potential for groundwater to be intercepted during excavation which could create a preferential pathway for any contaminants into the ground and hence the aquifer. Given the distance of the GWDTE from the cuttings, negligible impacts are predicted. Marshy Grassland 1 and Wet Woodland 7 lie partially within the Order Limits, and therefore could be directly impacted by the proposed scheme. Adherence to industry good practice during construction would significantly reduce changes to groundwater quality and given the GWDTE sites are not designated, there would be no change in quality status.	Essex Gravels (-)	No additional mitigation required.	
	Surface water	Appendix 14.4: Groundwater Assessment, of the Environmental Statement [TR010060/APP/6.3] has shown that along many road cuttings/ widenings expected to intercept groundwater, there could be water quality issues with EQS exceedances. This could lead to water quality discharge issues. However, as part of standard mitigation measures, any groundwater of poor quality intercepted during construction, which cannot be treated adequately to appropriate quality standards, would be tanked and disposed of offsite at an appropriate licensed location. As a result, any residual impact would be negligible.	Essex Gravels (-)		
Highway structure (includes associated earthworks and piling)	General quality	Piling has the potential to create temporary pathways for poor quality perched groundwater to migrate into aquifer units or confined deeper horizons. Piling techniques can also introduce sediments or contaminated soils to an aquifer body as material is pushed down by the piling technique. However, with a Piling Risk Assessment as a standard mitigation measure, residual impacts are expected to be negligible. At groundwater body scale and with the implementation of standard good practice any changes to the groundwater quality would be expected to be localised and negligible.	Essex Gravels (-)		
Excavations required for attenuation ponds/drainage infrastructure and borrow pits	GWDTEs (non-designated) (quantitative)	Construction of attenuation ponds, including any associated dewatering, could affect groundwater flows to, and levels in, a GWDTE. Wet Woodland 7, Wet Woodland 8 and Brockwell Meadows Local Nature Reserve have been identified within the radius of influence for such dewatering activities, therefore groundwater flows and levels within these sites could be locally altered. Because of the distances and the drawdown effects expected at Wet Woodland 8 and Brockwell Meadows Local Nature Reserve, impacts are predicted to be minor. Temporary changes on groundwater flows could however be of moderate magnitude at Wet Woodland 7. Given that the GWDTE sites are not designated, impacts would not result in a deterioration of the quantitative element status.	Essex Gravels (-)	Additional mitigation is being implemented for Wet Woodland 7, as detailed in Appendix 14.6: Surface Drainage Strategy, of the Environmental Statement, [TR010060/APP/6.3]. This involves continued monitoring in existing boreholes complemented by an NVC to refine baseline habitat at the site.	

Key to change	Negligible change	Negative change	Positive change	No change

Activity	**Quality element**	**Potential impact(s)**	**Relevant designated water body (colour-coded based on key)**	**Additional ways to reduce impact on, or enhance the water quality element**	**Risk of quality element deterioration**
				A Water Balance Compensation strategy would also be required (see Appendix 14.6: Surface Drainage Strategy, of the Environmental Statement, [TR010060/APP/6.3]).	
	Water balance	Dewatering of the borrow pits and attenuation ponds would be temporary during construction. Considering the scale of the superficial aquifers across and beyond the study area, the proposed works would be expected to have a minor adverse magnitude of impact on the aquifers. As part of the standard measures, environmental permits to support dewatering activities would be obtained. As a result, any changes to the water balance would be negligible at a groundwater body scale.	Essex Gravels (-)	No additional mitigation required.	
	Surface water	The dewatering assessment has indicated that negligible impacts are predicted to surface water features across the proposed scheme as a result of dewatering for attenuation ponds and borrow pit construction. Therefore, this would not result in a deterioration of the qualitative element status.	Essex Gravels (-)		
Excavations required for attenuation ponds/drainage infrastructure and borrow pits	Drinking water protected area	There are six groundwater abstractions which lie within the dewatering zone of influence for Borrow Pit J. Four of these abstractions have been assigned a default Source Protection Zone 1 of 50m and Source Protection Zone 2 of 250m given their use for domestic and/or agricultural purposes. Given the distance of these abstractions from the borrow pit impacts, the result of dewatering has been assessed as negligible. No groundwater abstractions lie within the dewatering zone of influence for attenuation ponds. No impacts on groundwater abstractions water quality are expected as a result of constructing attenuation ponds and borrow pits.	Essex Gravels		
	GWDTEs (non-designated) (quality)	Where a borrow pit is directly adjacent to a GWDTE (Wet Woodland 7) there is potential for an increase in suspended solid concentrations in the underlying groundwater. However, with the implementation of standard good practice, any changes to the groundwater quality would be expected to be localised and negligible. In addition, the GWDTE is not designated, impacts would not result in a deterioration of the qualitative element status.	Essex Gravels		

Key to change	Negligible change	Negative change	Positive change	No change

Activity	**Quality element**	**Potential impact(s)**	**Relevant designated water body (colour-coded based on key)**	**Additional ways to reduce impact on, or enhance the water quality element**	**Risk of quality element deterioration**
	Surface water	Appendix 14.1: Water Quality Assessment Report, of the Environmental Statement [TR010060/APP/6.3] has shown that in places there may be water quality issues with EQS exceedances in the groundwater intercepted at excavation sites. This could lead to water quality discharge issues. However, as part of standard mitigation measures, any groundwater of poor quality intercepted during construction and which cannot be treated adequately to appropriate quality standards would be tanked and disposed offsite at an appropriate licensed location. As a result, any residual impact would be negligible.	Essex Gravels		
	General quality	At groundwater body scale and with the implementation of standard good practices, any changes to the groundwater quality would be expected to be localised and negligible.	Essex Gravels		
Retaining walls and associated sheet piles	GWDTEs (non-designated) (quantitative)	There are no proposed retaining walls located within the vicinity of any GWDTE. Therefore, no impacts to groundwater flows and levels are predicted as a result of these structures. Given that the GWDTE sites are not designated, impacts would not result in a deterioration of the quantitative element status.	Essex Gravels	Implement any dewatering practices so as to limit the impact on GWDTEs.	
Retaining walls and associated sheet piles	Water balance	In some areas, retaining walls could cause localised groundwater impediment on the upgradient side. However, given the size of the retaining walls when considered at a groundwater body scale, this would equilibrate at catchment scale.	Essex Gravels	No additional mitigation required.	
	Surface water	No dewatering impacts are expected for retaining walls and sheet piling; therefore no impacts on baseflows to surface waters are predicted.	Essex Gravels		
	Drinking water protected area	No water quality impairment is expected as a result of retaining walls and associated sheet piles.	Essex Gravels		
	GWDTEs (non-designated) (quality)	No water quality impairment is expected as a result of retaining walls and associated sheet piles.	Essex Gravels		
	Surface water	No water quality impairment is expected as a result of retaining walls and associated sheet piles.	Essex Gravels		
	General quality	No water quality impairment is expected as a result of retaining walls and associated sheet piles.	Essex Gravels		

Table 6.4 Operation impacts on screened-in WFD Regulations groundwater body quality and supporting elements

Key to change	Negligible change	Negative change	Positive change	No change

Activity	**Quality element**	**Potential impact(s)**	**Relevant designated water body (colour-coded based on key)**	**Additional ways to reduce impact on, or enhance the water quality element**	**Risk of quality element deterioration**
Drainage (including highway structure)	GWDTEs (quantitative)	Ongoing dewatering to maintain groundwater levels below the road level in road cuttings/widenings may alter groundwater flow paths such that groundwater discharge rates to, or levels within, a GWDTE may be affected. Therefore, long-term changes to groundwater levels and flows are predicted in Wet Woodland 1, Marshy Grassland 1 and Riverview Meadows Local Wildlife Site. Given the distance of these sites from the cutting, impacts with a slight significance of effect are predicted. Given that the GWDTE sites are not designated, impacts would not result in a deterioration of the quantitative element status.	Essex Gravels (-)	No additional mitigation required.	No risk of deterioration to water quality element.
	Water balance	Ongoing dewatering is required to maintain groundwater levels below the road level in cuttings. However, dewatering is not expected to require large quantities of water to be abstracted and would be localised. As a result, any changes to the water balance would be negligible at a groundwater body scale.	Essex Gravels (-)		
	Surface water	The dewatering assessment (Appendix 14.4: Groundwater Assessment, Section 3 [TR010060/APP/6.3]) has indicated that negligible impacts are predicted to surface water features across the proposed scheme as a result of dewatering. Therefore, no significant changes of baseflow contribution are predicted from the drainage of the proposed scheme, and this would not result in a deterioration of status.	Essex Gravels		
	Drinking water protected area	Changes to flows and levels within the groundwater body as a result of drainage features would be localised. The routine runoff analysis (Appendix 14.1: Water Quality Assessment Report, of the Environmental Statement [TR010060/APP/6.3]) has shown that risks to groundwater quality are very low. Therefore, in the context of the entire groundwater body, the status would not be affected.	Essex Gravels		
	GWDTEs (qualitative)	Given the distances of the GWDTEs from the cutting locations, no changes in groundwater quality are predicted. Given that the GWDTE sites are not designated, impacts would not result in a deterioration of the qualitative element status.	Essex Gravels		
Drainage (including highway structure)	Surface water	Poor groundwater quality could continue to be mobilised towards the drainage system as a result of road cuttings and widenings, which could result in a significant impact on the receiving surface water receptors.	Essex Gravels (x)	Detailed water quality assessment would be undertaken to determine whether intercepted groundwater can be mixed with road runoff or whether it needs to be kept separate. These considerations would be incorporated into a detailed Road Drainage Strategy.	With implementation of additional mitigation measures, no deterioration is expected.

Key to change	Negligible change	Negative change	Positive change	No change

Activity	**Quality element**	**Potential impact(s)**	**Relevant designated water body (colour-coded based on key)**	**Additional ways to reduce impact on, or enhance the water quality element**	**Risk of quality element deterioration**
	General quality	No discharges to ground are proposed as part of the proposed scheme and the runoff water quality assessment (Appendix 14.1: Water Quality Assessment Report, of the Environmental Statement [TR010060/APP/6.3]) has indicated that risks of groundwater quality deterioration are very low, and would not impact the quality status of the WFD Regulations groundwater body.	Essex Gravels	No additional mitigation required.	No risk of deterioration to water quality element.

6.2 Review of RBMP-specific mitigation measures

6.2.1 Within each RBMP, there is a list of mitigation measures or environmental improvements specifically for artificial or heavily modified water bodies (A/HMWBs), which have been identified for implementation as part of the RBMP cycle. Part of the compliance assessment is to consider these specific mitigation measures and assess whether the proposed scheme can contribute to them or could obstruct any of them from being delivered.

6.2.2 The River Chelmer (downstream confluence with the Can), River Brain, Domsey Brook, River Blackwater and Roman River surface water bodies covered by this assessment are designated as A/HMWBs. The specific mitigation measures identified for these water bodies are presented in Table 6.5 together with an indication as to whether they are already in place.

Table 6.5 Effect of the proposed scheme on A/HMWB mitigation measures

Specific mitigation measure	In place/Not in place	Impacted by proposed scheme?	Justification
Remove or soften hard bank	Not in place	Yes	The proposed scheme would introduce hard banks through culverting.
Preserve or restore habitats		No	The proposed scheme would not prevent the implementation of these mitigation measures.
In-channel morphological diversity			
Bank rehabilitation			
Avoid the need to dredge	In place		
Dredging disposal strategy			
Reduce impact of dredging			
Reduce sediment resuspension			
Retime dredging or disposal			
Sediment management (dredging)			
Dredge disposal site selection			
Manage disturbance (dredging)			
Selective vegetation control			
Vegetation control techniques			

Specific mitigation measure	In place/Not in place	Impacted by proposed scheme?	Justification
Vegetation control timing			
Invasive species techniques			
Sediment management strategy			
Reduction or removal of woody debris removal			
Modify vessel design	Not in place		
Vessel management	In place		
Boats in central track			
Invasive species awareness			
Boat wash awareness			

6.3 Cumulative assessment with other developments

6.3.1 Future planned developments (approved and pending planning decisions) have been screened to determine whether there would likely be any cumulative effects when considered in conjunction with the proposed scheme. In total, 49 additional developments have been assessed with 13 found to be within 1km of the proposed scheme and therefore potentially leading to cumulative impacts on screened-in surface water and groundwater bodies. Chapter 16: Cumulative effects assessment, of the Environmental Statement ([TR010060/APP/6.1]) provides further detail regarding the scoping of additional developments.

6.3.2 The potential cumulative impacts of the 13 additional developments on WFD Regulations quality elements are summarised in Table 6.6.

Table 6.6 Cumulative Assessment

Additional developments	Planning application reference	Distance from proposed scheme (km)	Potential cumulative impact on WFD Regulations quality elements
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.	CC/CHL/14/20/SPO	0.85	Potential construction and operation impact to biological, water quality and hydromorphological quality elements of both Boreham Tributary and River Ter surface water bodies. Additional impacts to take place on Essex Gravels. Given the extent of the crossings and or outfalls draining into the surface water bodies and the size of the groundwater body, cumulative impacts on a water body scale are unlikely.
Outline application for mixed use development including dwellings (approximately 3,600), business park, retail, hotel, leisure, education and community etc. Also includes pumping station, foul water sewer route, Radial Distributor Road, and railway station.	09/01314/EIA	0	Potential for cumulative impacts on Boreham Tributary, including water quality aspects from road, rail and residential drainage. Control measures including sustainable drainage systems, environmental permitting for foul water drainage and a Construction Environmental Management Plan, are all proposed in the Environmental Impact Assessment. These measures would lead to no likely impacts on surface water or groundwater bodies.

Additional developments	Planning application reference	Distance from proposed scheme (km)	Potential cumulative impact on WFD Regulations quality elements
Longfield Solar Farm - a new solar photovoltaic array generating station (500MW). North-east of Chelmsford and north of the A12 between Boreham and Hatfield Peverel.	TL 74179	0	The Order Limits cross both Boreham Tributary and the River Ter water bodies upstream of the proposed scheme. Potential construction and operational impact to surface water quality elements. It has been assumed where a potential risk of significant effects could occur, that these risks would be mitigated for, as the planning application is currently in Phase 1 (scoping). No impacts to groundwater are likely on a water body scale. Therefore, the likelihood of significant cumulative impacts on water body quality elements is low.
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.	17/00679/OUT	0.02	The proposed development would drain into the River Blackwater (Combined Essex), while works could impact quantity and quality elements of Essex Gravels. However, proposed permeable paving and detention basins would act to mitigate impacts on water quality prior to draining into the surface water body, and given the size of the development, cumulative impacts on the groundwater body would be unlikely.
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.	19/01896/OUT	0	Although the proposed development is adjacent to the proposed scheme, it remains over 1km (linear distance) from the Brain surface water body with no hydrological pathway present within the site boundary. Moreover, the development is not underlain by any groundwater body. Therefore, cumulative impacts are unlikely to take place.

Additional developments	Planning application reference	Distance from proposed scheme (km)	Potential cumulative impact on WFD Regulations quality elements
Construction of B1c (Light Industrial), B2 (General Industry) and B8 (Storage and Distribution) uses, comprising a maximum gross internal floor space of 15,470m^2, (166,518ft^2) with associated service yards, HGV and trailer parking, car parking provision, revised landscape provision and new service road with access onto Eastways.	20/00128/OUT	0	Although the proposed development is adjacent to the proposed scheme, it remains over 1km (linear distance) from the Brain surface water body with no hydrological pathway present within the site boundary. Moreover, the development is not underlain by any groundwater body. Therefore, cumulative impacts are unlikely to take place.
Erection of two warehouse buildings providing multiple industrial units, with ancillary mezzanines, of flexible use (Use Class B2, B8, E(g) and Sui-Generis), retention of existing vehicular accesses off Freebournes Road and Wheaton Road with reconfigured car parking, service yards and associated landscaping.	20/01754/FUL	0	Proposed development does not appear to have a hydrological pathway to any nearby designated surface water bodies. Demolition and construction works have been found to contain few contaminants to significantly impact the Essex Gravels quality elements.
Proposed western extension to the current site using existing approved facilities (site access, plant site, mineral processing plant and other ancillary facilities); including for the diversion of the Burghey Brook; with restoration to arable land using imported inert restoration materials, and on-site materials in advance of the A12 Chelmsford to A120 widening scheme.	ESS/36/21/BTE	0	Proposed development could have a localised impact on groundwater flows affecting quantity elements, surface water quality elements and local groundwater receptors. However proposed measures including those detailed for licensed groundwater abstraction LPA-24, liaison with the proposed scheme operators and measures included in Chapter 14: Road drainage and the water environment, of the Environmental Statement ([TR010060/APP/6.1]) are likely to mitigate. Significant impacts cumulative with the proposed scheme are unlikely on a water body scale. Accidental releases of contaminants are to be mitigated via the proposed scheme's water management scheme.

Additional developments	Planning application reference	Distance from proposed scheme (km)	Potential cumulative impact on WFD Regulations quality elements
Extraction of sand and gravel at Colemans Farm.	ESS/39/14/BTE	0	Although the proposed development is adjacent to the proposed scheme, it remains over 1km upstream of nearby surface water body ((Blackwater (combined Essex)). Therefore, no cumulative impacts are likely to take place along the surface water body. Excavations could lead to changes in groundwater body quantity and quality but measures included in Chapter 14: Road drainage and the water environment, of the Environmental Statement [TR010060/APP/6.1] would prevent cumulative effects with the proposed scheme on a water body scale.
Retail unit and six-unit retail terrace.	193163	0.44	The proposed development does not appear to have a hydrological pathway to any nearby designated surface water bodies. Construction works and drainage could impact groundwater quantity and quality depending on method. However, this is unlikely to cause cumulative impacts with the proposed scheme on a water body scale.
Erection of Business Park, comprising 3,009m^2 of B1(a) offices in three two-storey blocks with associated parking.	190699	0.29	The proposed development does not appear to have a hydrological pathway to any nearby designated surface water bodies. Construction works and drainage could impact local groundwater quantity and quality. However, this is unlikely to cause cumulative impacts with the proposed scheme on a water body scale.

6.4 Compliance with WFD Regulations objectives

6.4.1 Table 6.7 provides a summary of the compliance of the proposed scheme against the legislative objectives of the WFD Regulations (see Section 1 of this appendix). In summary, it is considered that at a water body scale, the proposed scheme would be compliant for all designated water bodies assessed.

6.4.2 Some of the construction and operation activities of the proposed scheme would lead to localised negative changes to water quality elements, as detailed in Section 6.1 of this appendix. However, with the additional mitigation provided in Section 6.1, these impacts are unlikely to lead to deterioration in classification and/or prevent the water quality elements from either achieving good classification or achieving their RBMP objectives.

Table 6.7 Compliance with the environmental objectives of the WFD Regulations

Environmental objective	Conclusions for this proposed scheme	Compliant with WFD Regulations
No changes affecting high status sites	Not applicable – no high-status water bodies present.	Yes
No changes that would cause failure to meet surface water GES or GEP or result in a deterioration of surface water Ecological Status or Potential	The proposed scheme, as outlined, would not cause deterioration in the status of most identified quality/supporting elements.	Yes
No changes which would permanently prevent or compromise the Environmental Objectives being met in other water bodies	The proposed scheme options would 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 would cause failure to meet good groundwater status or result in a deterioration of groundwater status.	The proposed scheme options would not cause deterioration in the status of any groundwater body.	Yes

References

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Acronyms

Abbreviation	Term
A/HMWB	Artificial/Heavily Modified Water Body
DCO	Development Consent Order
GES	Good Ecological Status
GEP	Good Ecological Potential
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EQS	Environmental Quality Standard
GWDTE	Groundwater Dependent Terrestrial Ecosystems
LGA	Licensed Groundwater Abstraction
PGA	Private Groundwater Abstraction
RBMP	River Basin Management Plan
UK	United Kingdom
WFD Regulations	Water Environment (Water Framework Directive) (England and Wales) Regulation 2017

Glossary

Term	Definition
Benthic invertebrates	Invertebrates which remain on the substrate of a water body
Bed substrate	The material that rests at the bottom of a stream and along the channel margins.
Discharge	The volume of flow passing a point in a given time period.
Environmental Quality Standard	The maximum permissible concentration of a potentially hazardous chemical. The Environmental Quality Standard is used to assess the risk to the health of aquatic flora and fauna.
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.
Flow dynamics	The manner in which flow behaves, i.e., turbulent flows, non-energetic and laminar flows.
Hydromorphology	The scientific study of the form and function of rivers and the interaction between streams and the landscape around them.
Invertebrates	Organisms which lack a spinal column.
Macrophytes	An aquatic plant large enough to be seen with the naked eye.
Ordinary Watercourse	All watercourses that are not designated Main River, and which are the responsibility of local authorities or, where they exist, Internal Drainage Boards. Note that Ordinary Watercourse does not imply a ‘small’ river, although it is often the case that Ordinary Watercourses are smaller than Main Rivers.
Outfall	Point of discharge into a water body.
Planform	The bird’s-eye view of the channel and the form of the channel from that perspective.
Pools and riffles	Periodic undulations in bed elevation where relatively shallow, coarse-grained riffles are separated by deeper pools.
Phytobenthos	Organisms found attached to bottom surface of aquatic environments.
Reach	A length of river along which the channel controls are sufficiently uniform to allow a fairly consistent morphological structure to be maintained.
Realignment	The artificial relocation, or straightening, of a river channel to accommodate structures, flood control, or navigation.
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.

Term	Definition
Routine runoff	The normal runoff from roads including any contaminants washed off the surface in rainfall events which can result in either acute or chronic impacts. Routine runoff excludes the effect of spillages and major leaks which usually result in acute impacts.
Sinuosity	The degree to which a channel meanders; a sinuous channel generally has a sinuosity ratio between 0 and 1.5.

Annex A Figures

Figure 14.2.1 WFD Regulations Assessment WFD Regs. Surface Water Bodies

Figure 14.2.2 WFD Regulations Assessment WFD Regs. Groundwater Bodies

FIGURE 14.2.1

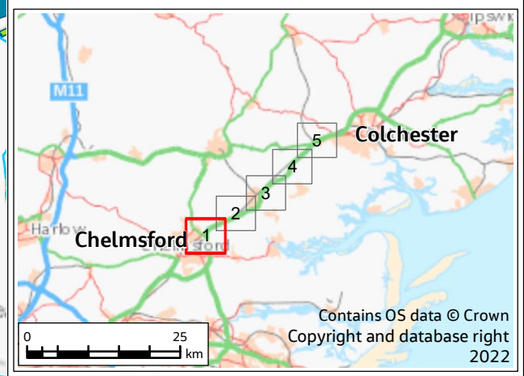
Legend

Proposed scheme

- Order Limits
- Study area
- Scheme
- Walking, cycling and horse riding route
- Haul roads
- Temporary roads
- Private means of access and pond access tracks
- Outfall
- Drainage pond
- Borrow pits
- Compounds and laydown areas

Water environment

- Main River
- Ordinary Watercourses
- WFD Fluvial Water Bodies
- Existing water features (river, ponds, lakes and reservoirs)



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Rev.	Rev. Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
P03	20/07/22	For DCO application	JC	RW	RW	SG

Development Consent Order Drawing Number: TR010060/APP/6.3

APFP Regulation: Regulation 5(2)(l)

Client: national highways

Project: REGIONAL DELIVERY PARTNERSHIP
A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: WFD REGULATIONS ASSESSMENT
WFD REGS. SURFACE WATER BODIES
SHEET 1 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

Scale @ A3	1:20000		DO NOT SCALE
Jacobs No.	B36601D1	Rev	P03
Client No.	HE551497		

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FIGURE 14.2.1

Legend

Proposed scheme

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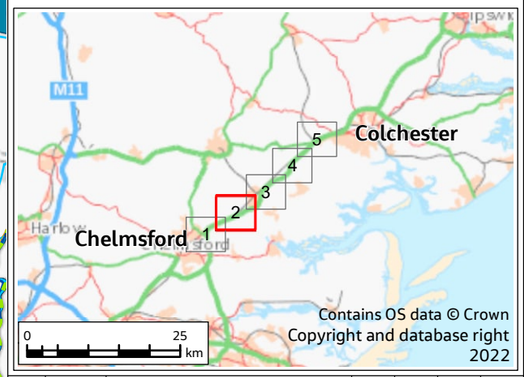

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Drawing Title: WFD REGULATIONS ASSESSMENT
WFD REGS. SURFACE WATER BODIES
SHEET 2 OF 5

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FIGURE 14.2.1

Legend

Proposed scheme

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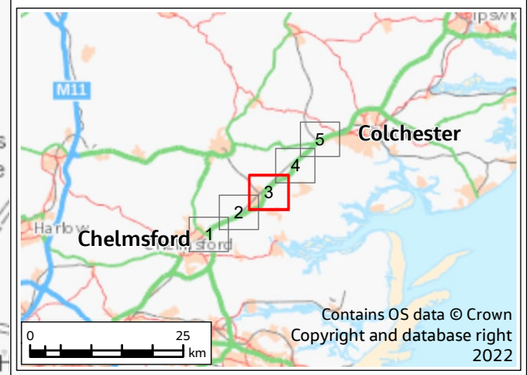
- Existing water features (river, ponds, lakes and reservoirs)

Ordinary Watercourse 33
Ordinary Watercourse 17
Ordinary Watercourse 18
Ordinary Watercourse 21
Ordinary Watercourse 15
Ordinary Watercourse 17
Ordinary Watercourse 12a
Ordinary Watercourse 15a
Ordinary Watercourse 12
Ordinary Watercourse 12
Ordinary Watercourse 13a
Ordinary Watercourse 13
Ordinary Watercourse 11
Ordinary Watercourse 10
Ordinary Watercourse 9a
Ordinary Watercourse 9i
Ordinary Watercourse 9h
Ordinary Watercourse 9g
Ordinary Watercourse 9f
Ordinary Watercourse 9
Ordinary Watercourse 9e
Ordinary Watercourse 9b
Ordinary Watercourse 9c
Ordinary Watercourse 9d
BP-I
BP-J
River Blackwater
Rivenhall Brook
Blackwater (Combined Essex)
River Brain
Brain



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Development Consent Order Drawing Number: TR010060/APP/6.3

APFP Regulation: Regulation 5(2)(l)

Client: national highways

Project: REGIONAL DELIVERY PARTNERSHIP
A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: WFD REGULATIONS ASSESSMENT
WFD REGS. SURFACE WATER BODIES
SHEET 3 OF 5

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FIGURE 14.2.1

Legend

Proposed scheme

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- Existing water features (river, ponds, lakes and reservoirs)

Ordinary Watercourse 42
Ordinary Watercourse 41
Ordinary Watercourse 38b
Ordinary Watercourse 38
Ordinary Watercourse 39
Ordinary Watercourse 40
Ordinary Watercourse 23
Ordinary Watercourse 24
Ordinary Watercourse 37
Ordinary Watercourse 37b
Ordinary Watercourse 21a
Ordinary Watercourse 35
Ordinary Watercourse 33
Ordinary Watercourse 34
Ordinary Watercourse 34a
Ordinary Watercourse 34b
Ordinary Watercourse 34c
Ordinary Watercourse 18
Ordinary Watercourse 21
BP-J

Blackwater (Combined Essex)
River Blackwater
Domsey Brook

Kelvedon
Newtown
Feering
Coggeshall Hamlet
Coggeshall Hall
Pound Farm
Monk's Farm Cottages
Kings Cottages
Crole Cottage
Cockerell's Farm
Weavers
Hornigals Barn
Langley Cottages
Great Domsey Farm
Popps Cottage
Bury Lodge
Threadkells
Brooks Barn
Stocks Green
Little Toms Cottage
Hill House Farm
Trewlands
Scottie's Farm
Badcock's Farm
Eastorpe Cottages
Eastorpe Green Farm
Chase House
Messing Lodge
Yewtree Farm
Parsonage Farm
North Lodge
Messing
Harborough Hall Farm
Messing Park
Messing Park Farm
Haynes Green Cottages
Haynes Green
Pods Wood
Napiers Farm
Ewell Hall
Badgers Farm
Highfields Farm
Hill Farm
Newbarn Cottages
Ashman's Farm
Old House
Rye Mill Cottage

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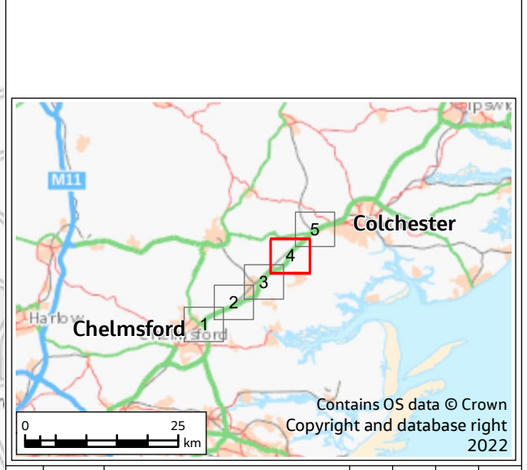
0 1 Kilometres



Rev.	Rev. Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
P03	20/07/22	For DCO application	JC	RW	RW	SG

Development Consent Order Drawing Number: TR010060/APP/6.3

APFP Regulation: Regulation 5(2)(l)

Client: national highways

Project: REGIONAL DELIVERY PARTNERSHIP
A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: WFD REGULATIONS ASSESSMENT
WFD REGS. SURFACE WATER BODIES
SHEET 4 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

Scale @ A3	1:20000	DO NOT SCALE
Jacobs No.	B36601D1	Rev P03
Client No.	HE551497	

Drawing Number: HE551497-JAC-LDC-SCHW-SK-GI-0223

FIGURE 14.2.1

Legend

Proposed scheme

- Order Limits
- Study area
- Scheme
- Walking, cycling and horse riding route
- Haul roads
- Temporary roads
- Private means of access and pond access tracks
- Outfall
- Drainage pond
- Borrow pits
- Compounds and laydown areas

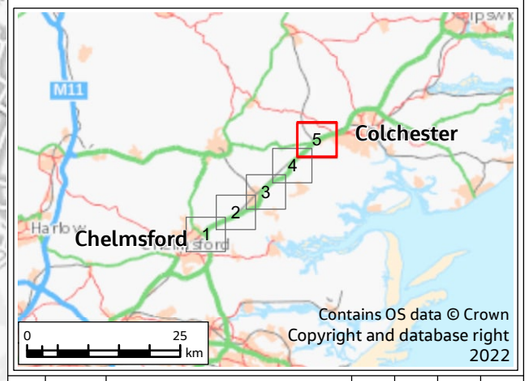
Water environment

- Main River
- Ordinary Watercourses
- WFD Fluvial Water Bodies
- Existing water features (river, ponds, lakes and reservoirs)

Ordinary Watercourse 36
Ordinary Watercourse 36b
Ordinary Watercourse 26
Ordinary Watercourse 26a
Ordinary Watercourse 42
Ordinary Watercourse 41
Ordinary Watercourse 38b
Ordinary Watercourse 38

Marks Tey
Colchester
Roman River
Domsey Brook

0 1 Kilometres



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Development Consent Order Drawing Number: TR010060/APP/6.3

APFP Regulation: Regulation 5(2)(l)

Client: national highways

Project: REGIONAL DELIVERY PARTNERSHIP
A12 CHELMSFORD TO A120 WIDENING SCHEME

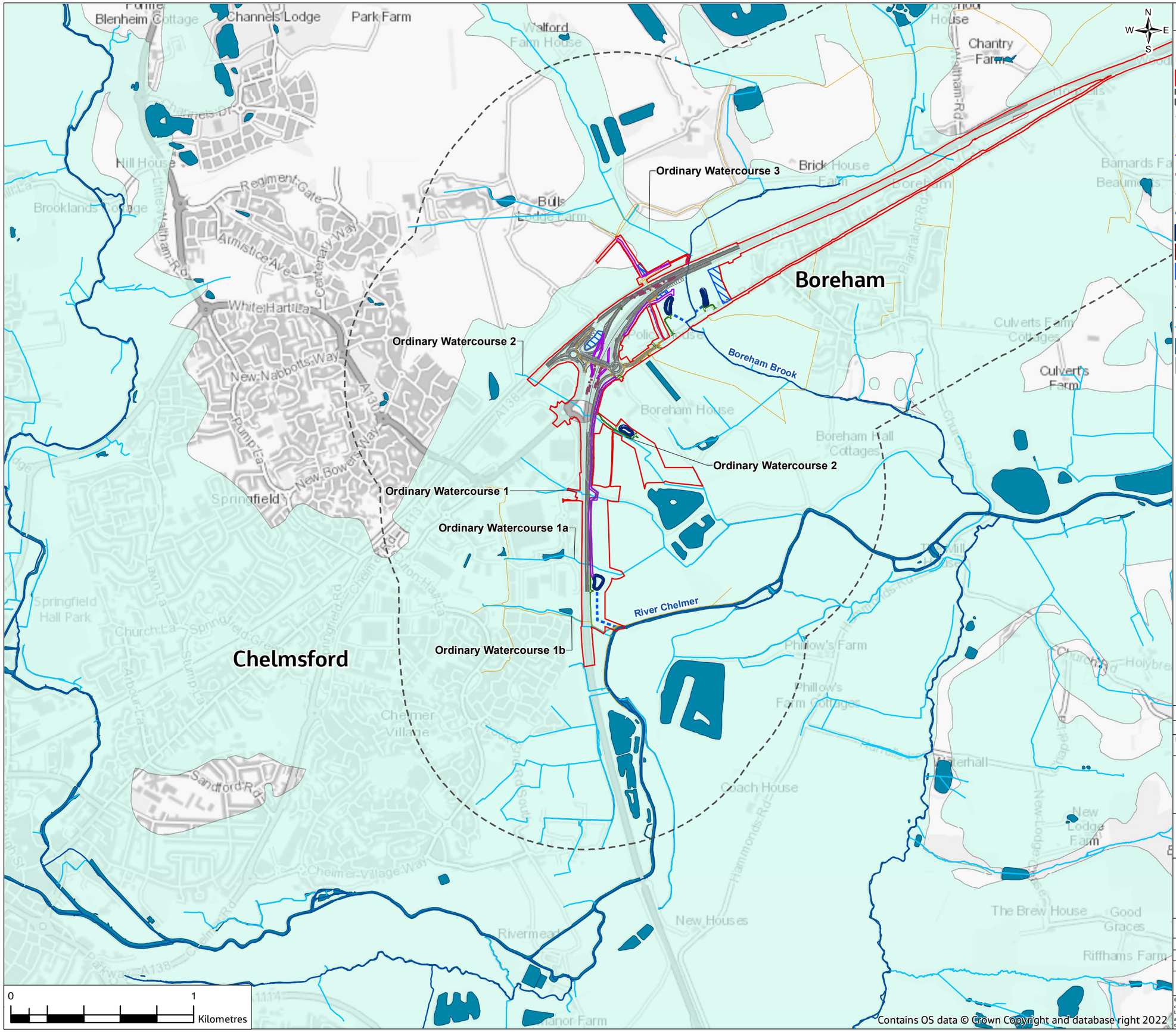
Drawing Title: WFD REGULATIONS ASSESSMENT
WFD REGS. SURFACE WATER BODIES
SHEET 5 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

Scale @ A3	1:20000	DO NOT SCALE
Jacobs No.	B36601D1	
Client No.	HE551497	Rev P03

Drawing Number: HE551497-JAC-LDC-SCHW-SK-GI-0224

FIGURE 14.2.2



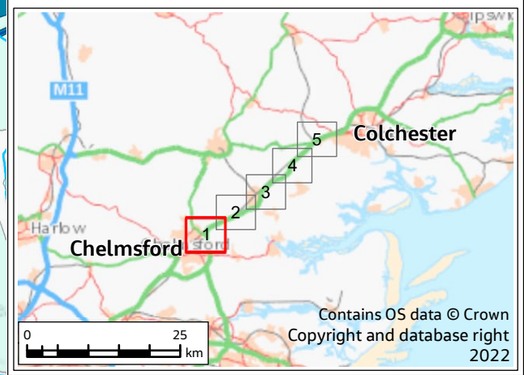
Legend

Proposed scheme

- Order Limits
- Study area
- Scheme
- Walking, cycling and horse riding route
- Haul roads
- Temporary roads
- Private means of access and pond access tracks
- Outfall
- Drainage pond
- Borrow pits
- Compounds and laydown areas

Water environment

- Main River
- Ordinary Watercourses
- Existing water features (river, ponds, lakes and reservoirs)
- Essex Gravel groundwater WFD water body



Rev.	Rev. Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
P03	20/07/22	For DCO application	JC	RW	RW	SG

Development Consent Order Drawing Number: TR010060/APP/6.3

APFP Regulation: Regulation 5(2)(l)

Client: national highways

Project: REGIONAL DELIVERY PARTNERSHIP
A12 CHELMSFORD TO A120 WIDENING SCHEME

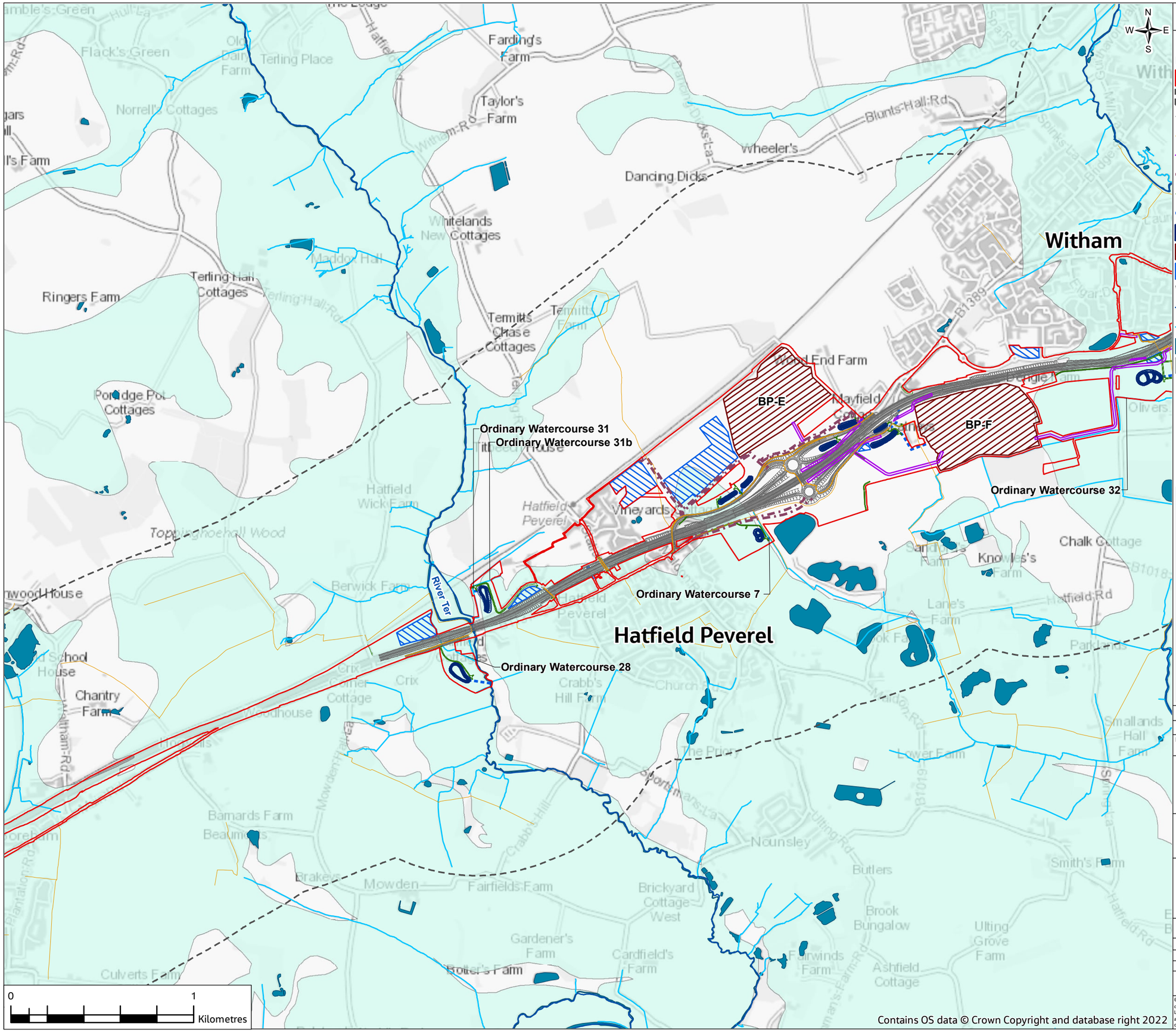
Drawing Title: WFD REGULATIONS ASSESSMENT
WFD REGS. GROUNDWATER BODIES
SHEET 1 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

Scale @ A3	1:20000	DO NOT SCALE	
Jacobs No.	B36601D1	Rev	P03
Client No.	HE551497		

Drawing Number: HE551497-JAC-LDC-SCHW-SK-GI-0225

FIGURE 14.2.2



Legend

Proposed scheme

- Order Limits
- Study area
- Scheme
- Walking, cycling and horse riding route
- Haul roads
- Temporary roads
- Private means of access and pond access tracks
- Outfall
- Drainage pond
- Borrow pits
- Compounds and laydown areas

Water environment

- Main River
- Ordinary Watercourses
- Existing water features (river, ponds, lakes and reservoirs)
- Essex Gravel groundwater WFD water body

Rev.	Rev. Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
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Development Consent Order Drawing Number: TR010060/APP/6.3

APFP Regulation: Regulation 5(2)(l)

Client: national highways

Project: REGIONAL DELIVERY PARTNERSHIP
A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: WFD REGULATIONS ASSESSMENT
WFD REGS. GROUNDWATER BODIES
SHEET 2 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

Scale @ A3	1:20000	DO NOT SCALE	
Jacobs No.	B36601D1		
Client No.	HE551497	Rev	P03

Drawing Number: HE551497-JAC-LDC-SCHW-SK-GI-0226

FIGURE 14.2.2

Ordinary Watercourse 33
Ordinary Watercourse 17
Ordinary Watercourse 18
Ordinary Watercourse 21
Ordinary Watercourse 15
Ordinary Watercourse 17
Ordinary Watercourse 12a
Ordinary Watercourse 15a
Ordinary Watercourse 12
Ordinary Watercourse 12
Ordinary Watercourse 13a
Ordinary Watercourse 13
Ordinary Watercourse 11
Ordinary Watercourse 10
Ordinary Watercourse 9a
Ordinary Watercourse 9i
Ordinary Watercourse 9h
Ordinary Watercourse 9g
Ordinary Watercourse 9f
Ordinary Watercourse 9
Ordinary Watercourse 9e
Ordinary Watercourse 9b
Ordinary Watercourse 9c
Ordinary Watercourse 9d
BP-J
BP-I
River Blackwater
Rivenhall Brook
River Brain
Witham
Rivenhall
Whiteheads Farm
Rivenhall Oaks Golf Centre
Hoo Hall Lodge
The Granary
Crabb's Farm
Ewell Hall
Highfields Farm
Kelvedon Lodge
Merlins Hall Farm
Applefords Farm
Braxted Park
Hill Broad
The Old Schoolhouse
Garden Cottage
Jaycey's Cottage
Pundicts Lodge
Noak's Cross Farm
Little Braxted
Wood Lodge
Broomfield's Farm
Great Braxted
Sextons Farm
Porter's Farm
Threadgold's Farm
Little Oaks
Little Mountains Farm
Keepers Cottage and Pantry
Blue Mills
Frensham House
Benton Hall
Powers Hall End
Chipping Hill
Cypress Rd
Church Rd
Rickstones Rd
Cressing Rd
Sturmans Hall Rd
B1389
Chanty Wood
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0 1 Kilometres

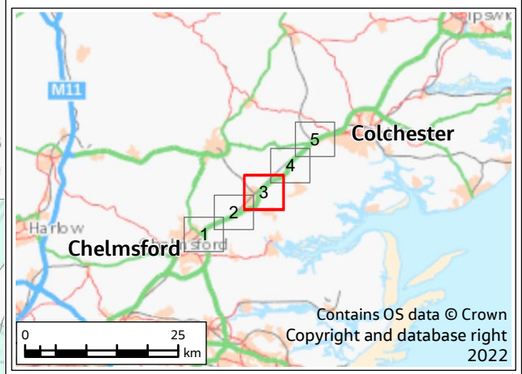
Legend

Proposed scheme

- Order Limits
- Study area
- Scheme
- Walking, cycling and horse riding route
- Haul roads
- Temporary roads
- Private means of access and pond access tracks
- Outfall
- Drainage pond
- Borrow pits
- Compounds and laydown areas

Water environment

- Main River
- Ordinary Watercourses
- Existing water features (river, ponds, lakes and reservoirs)
- Essex Gravel groundwater WFD water body



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Development Consent Order Drawing Number: TR010060/APP/6.3

APFP Regulation: Regulation 5(2)(l)

Client: national highways

Project: REGIONAL DELIVERY PARTNERSHIP
A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: WFD REGULATIONS ASSESSMENT
WFD REGS. GROUNDWATER BODIES
SHEET 3 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

Scale @ A3	1:20000	DO NOT SCALE
Jacobs No.	B36601D1	
Client No.	HE551497	Rev P03

Drawing Number: HE551497-JAC-LDC-SCHW-SK-GI-0227

FIGURE 14.2.2

Legend

Proposed scheme
- Order Limits
- Study area
- Scheme
- Walking, cycling and horse riding route
- Haul roads
- Temporary roads
- Private means of access and pond access tracks
- Outfall
- Drainage pond
- Borrow pits
- Compounds and laydown areas

Water environment
- Main River
- Ordinary Watercourses
- Existing water features (river, ponds, lakes and reservoirs)
- Essex Gravel groundwater WFD water body

Ordinary Watercourse 42
Ordinary Watercourse 41
Ordinary Watercourse 38b
Ordinary Watercourse 38
Ordinary Watercourse 39
Ordinary Watercourse 40
Ordinary Watercourse 23
Ordinary Watercourse 24
Ordinary Watercourse 37
Ordinary Watercourse 37b
Ordinary Watercourse 21a
Ordinary Watercourse 35
Ordinary Watercourse 33
Ordinary Watercourse 34
Ordinary Watercourse 34a
Ordinary Watercourse 34b
Ordinary Watercourse 34c
Ordinary Watercourse 18
Ordinary Watercourse 21
BP-J
Domsey Brook
River Blackwater
Kelvedon
Colchester
Chelmsford
M11
0 1 Kilometres
0 25 km
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Rev.	Rev. Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
P03	20/07/22	For DCO application	JC	RW	RW	SG

Development Consent Order Drawing Number: TR010060/APP/6.3
APFP Regulation: Regulation 5(2)(l)

Client: national highways

Project: REGIONAL DELIVERY PARTNERSHIP
A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: WFD REGULATIONS ASSESSMENT
WFD REGS. GROUNDWATER BODIES
SHEET 4 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

Scale @ A3	1:20000	DO NOT SCALE
Jacobs No.	B36601D1	
Client No.	HE551497	Rev P03

Drawing Number: HE551497-JAC-LDC-SCHW-SK-GI-0228

FIGURE 14.2.2

Legend

Proposed scheme

- Order Limits
- Study area
- Scheme
- Walking, cycling and horse riding route
- Haul roads
- Temporary roads
- Private means of access and pond access tracks
- Outfall
- Drainage pond
- Borrow pits
- Compounds and laydown areas

Water environment

- Main River
- Ordinary Watercourses
- Existing water features (river, ponds, lakes and reservoirs)
- Essex Gravel groundwater WFD water body

Ordinary Watercourse 36
Ordinary Watercourse 36b
Ordinary Watercourse 26
Ordinary Watercourse 26a
Ordinary Watercourse 42
Ordinary Watercourse 41
Ordinary Watercourse 38b
Ordinary Watercourse 38
Roman River
Domsey Brook
Colchester
Marks Tey
Chelmsford

0 1 Kilometres

0 25 km

Rev.	Rev. Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
P03	20/07/22	For DCO application	JC	RW	RW	SG

Development Consent Order Drawing Number: TR010060/APP/6.3

APFP Regulation: Regulation 5(2)(l)

Client: national highways

Project: REGIONAL DELIVERY PARTNERSHIP
A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: WFD REGULATIONS ASSESSMENT
WFD REGS. GROUNDWATER BODIES
SHEET 5 OF 5

Drawing Status: S4 - SUITABLE FOR STAGE APPROVAL

Scale @ A3	1:20000	DO NOT SCALE
Jacobs No.	B36601D1	
Client No.	HE551497	Rev P03

Drawing Number: HE551497-JAC-LDC-SCHW-SK-GI-0229