Longfield Solar Farm

Environmental Statement PINS Ref: EN010118

Volume 2

Appendix 9B: Water Framework Directive Assessment

Document Reference: EN010118/APP/6.2

Revision Number: 1.0

February 2022

Longfield Solar Energy Farm Ltd

APFP Regulation 5(2)(a)

Planning Act 2008

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

Quality information

Prepared by	Checked by	Verified by	Approved by
AE	CB	CP	NT
Graduate Engineer	Principal Engineer	Regional Director	Technical Director

Prepared for:

Longfield Solar Energy Farm Ltd

Prepared by:

AECOM Limited
Midpoint, Alencon Link
Basingstoke
Hampshire RG21 7PP
United Kingdom

T: +44(0)1256 310200
aecom.com

Table of Contents

Tables

1. Introduction

1.1 Background

1.1.1 This Water Framework Directive Assessment (WFDa) has been prepared in support of the Development Consent Order (DCO) application (hereafter referred to as the 'Application') for Longfield Solar Farm (hereafter referred to as the 'Scheme'). The Scheme interacts with three Water Framework Directive (WFD) water bodies and thus it is necessary to consider the activities and constituent parts of the Scheme to determine compliance with WFD objectives. This includes assessing the impact of new Solar PV Panels, supporting infrastructure, site drainage and cable crossings of water bodies on the biological, physico-chemical and hydromorphological quality elements that comprise the WFD to ensure no deterioration and no prevention of future improvement in water body status.

1.1.2 The Scheme will comprise the construction, operation (including maintenance), and decommissioning of a solar PV electricity generating facility and energy storage facility with a total capacity exceeding 50MW and export connection to the National Grid, including the extension of the existing Bulls Lodge Substation. The Scheme will be located within the 'Order limits' and is the subject of the DCO Application.

1.1.3 The Order limits, shown in Figure 1-2: Order Limits, comprises an area of 453 hectares (ha) and comprises:

a) Solar Farm Site (Work No. 1): up to 279.5ha;

b) Battery Energy Storage System (BESS) Compound (Work No. 2): up to 5.2ha;

c) Longfield Substation (Work No. 3): up to 1.63ha;

d) Grid Connection Route including access tracks (Work No. 4): up to 30.4ha;

e) Bulls Lodge Substation Extension Site (Work No. 5) including electricity switching station (Work No. 5A) and temporary overhead line alterations (Work No. 5B): up to 4.4ha;

f) Work No 6: works including:

- Electrical cables including electrical cables connecting to Work No. 1 to Work No. 3;
- Fencing, gates, boundary treatment and other means of enclosure;
- Works for the provision of security and monitoring measures such as CCTV columns, lighting columns and lighting, cameras, weather stations, communication infrastructure, and perimeter fencing;

- Landscaping and biodiversity mitigation and enhancement measures including planting;
- Improvement, maintenance and use of existing private tracks; and
- Laying down of internal access tracks, ramps, means of access, footpaths, permissive paths, cycle routes and roads, including the laying and construction of drainage infrastructure, signage and information boards;
- Temporary footpath diversions;
- Earthworks;
- SuDs Ponds, runoff outfalls, general drainage and irrigation infrastructure and improvements or extensions to existing drainage and irrigation systems;
- Up to 10 secondary temporary construction compounds, both within the permanent work area and outside the permanent work area;
- Works to divert and underground existing electrical overhead lines.

g) Work No 7: Temporary construction and decommissioning compounds (Work No. 7A, up to 6.9ha), secondary temporary construction compounds within the Solar Farm Site (part of Work No. 6), and temporary construction laydown for the Bulls Lodge Substation Extension (Work No. 7B, up to 6.4ha);

h) Ancillary Buildings, being office, warehouse and plant storage building (Work No. 8): up to 0.6ha;

i) Works to facilitate site access to the Solar Farm Site and the Bulls Lodge Substation Extension (Work No. 9, up to 6.5ha); and

j) Habitat Management Areas (Work No. 10): a minimum of 41.1ha.

1.1.4 The proposed Grid Connection Route comprises an area within which the high voltage cables will be laid within the Order Limits, connecting the Solar Farm Site to the Bulls Lodge Substation Site. The Scheme also includes the Bulls Lodge Substation Extension, which relates to upgrade and modification works.

1.1.5 Further description of the Scheme is provided in ***Chapter 2: The Scheme*** of the Environmental Statement (ES) **[EN010118/APP/6.1]**.

1.2 Study Area

1.2.1 The Scheme is located within the administrative areas of Chelmsford City Council and Braintree District Council, in the county of Essex and approximately 7km north west of Chelmsford.

1.2.2 For the purposes of this assessment, and consistent with the Water Environment Impact Assessment presented in ***Chapter 9: Water***

Environment of the ES **[EN010118/APP/6.1]**, a general study area of approximately 1km around the Order Limits has been considered in order to identify water bodies that are hydrologically connected to the Order Limits and potential works associated with the Scheme that could cause direct impacts.

1.2.3 A plan of the Order Limits, with water bodies and their attributes is shown in ***Figure 9-1: Water Resource Features and Attributes*** **[EN010118/APP/6.3]**.

1.2.4 However, given that watercourses flow and water quality impacts may propagate downstream, where relevant the assessment also considers a wider study area to as far downstream as a potential impact may influence the quality or quantity of the water body (which in this case is typically for a few kilometres). Professional judgement has been applied to identify the extent to which such features are considered.

1.2.5 The study area falls within three WFD surface water body catchments: The Ter, Boreham Tributary and Chelmer (Gt. Easton - R. Can). There are also several tributaries of these water bodies present within the study area; these are predominantly unnamed agricultural ditches, drains and springs, some of which provide connectivity between the Scheme, the River Ter and Boreham Tributary, which for the purpose of this assessment have been labelled T1, T2 etc (see ***Figure 9.1***).

1.2.6 The study area is also underlain by one WFD groundwater body, the Essex Gravels waterbody.

1.3 Introduction to the Water Framework Directive

1.3.1 The WFD, EC Directive 2000/60/EC, (Ref 1) aims to protect and enhance the quality of the water environment across all European Union (EU) member states. England and Wales have adopted the WFD as national law by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (Ref 2). Following the departure of the United Kingdom from the European Union these Regulations continue to apply until they are revoked or superseded by new legislation.

1.3.2 The WFD takes a holistic approach to the sustainable management of water by considering the interactions between surface water, groundwater and water-dependent ecosystems. Ecosystem quality is evaluated according to interactions between biological, physico-chemical and hydromorphological elements (or ‘Quality Elements’).

1.3.3 Under the WFD, ‘Water bodies’ are the basic management units and are defined as all or part of a river system or aquifer. Water bodies form part of larger River Basin Districts (RBD), for which River Basin Management Plans (RBMPs) are developed and environmental objectives are set. RBMPs are produced every six years, in accordance with the river basin management planning cycle. Cycle 2 plans were published in February 2016, and the most recent RBMP data available on the online Catchment Data Explorer is from 2019, which are due to be updated to Cycle 3 plans in 2021 (not yet published

at time of writing in January 2022, and due to be submitted to the Secretary of State for approval by September 2022).

1.3.4 The WFD requires water bodies to be classified according to their current condition (i.e. the 'Status' or 'Potential,' depending on whether they are heavily modified or artificial water bodies) and to set a series of objectives for maintaining or improving conditions so that water bodies maintain or reach Good Status or Potential.

1.3.5 The Environment Agency is under a duty to exercise its relevant functions so as to best secure that the requirements of WFD for the achievement of environmental objectives are co-ordinated. The Planning Inspectorate's Advice Note 18 (Ref 3) summarises the overall aims and objectives of the WFD as to:

a) Enhance the status and prevent further deterioration of surface water bodies, groundwater bodies and their ecosystems;

b) Ensure progressive reduction of groundwater pollution;

c) Reduce pollution of water, especially by Priority Substances and Certain Other Pollutants;

d) Contribute to mitigating the effects of floods and droughts;

e) Promote sustainable water use; and

f) Achieve at least good surface water status for all surface water bodies and good chemical status in groundwater bodies by 2015 (or good ecological potential in the case of artificial or heavily modified water bodies).

1.3.6 As a result, new developments that have the potential to impact on current or predicted WFD status are required to assess their compliance against the WFD objectives of the potentially affected water bodies. It must be demonstrated that there is no deterioration or prevention of future improvement against any WFD element for a designated waterbody. As such, this report presents the compliance assessment against the WFD objectives for the Scheme.

1.3.7 Regulation 33 of the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (i.e. the WFD) states that, like other public bodies, local authorities have a statutory duty to "have regard to the River Basin Management Plan" and "any supplementary plans" covering proposed activities when exercising its functions. Local authorities must therefore reflect water body improvement priorities as outlined in RBMPs.

1.3.8 In determining whether a development is compliant or non-compliant with the WFD objectives for a water body, the EA and partnering organisations must also consider the conservation objectives of any Protected Areas (i.e. sites within the national site network or water dependent Sites of Special Scientific Interest) and adjacent WFD water bodies, where relevant (e.g. Ref 3).

2. Methodology

2.1 Methodology

2.1.1 Guidance on how to undertake WFD assessments can be found in the 'Water Framework Directive risk assessment - How to assess the risk of your activity' (Ref 4) and 'The Water Framework Directive - Advice note eighteen: The Water Framework Directive' (Ref 3). These guidance documents have informed the approach taken in this assessment.

2.1.2 A stepwise approach consisting of screening, scoping and impact assessment phases is generally followed in order to: (a) rationalise the levels of WFD assessment and impact mitigation that are required; and (b) verify that proposals meet the requirements of the WFD. The general approach is described by The Planning Inspectorate (2017) is the approach taken in this assessment, and is briefly summarised below.

Stage 1: Screening

2.1.3 Screening identifies the zone of influence of a proposed development, and if proposed activities pose a risk to the water environment. It is used to identify if there are activities that do not require further consideration for WFD objectives, for example activities which have been ongoing since before the current RBMP plan cycle and which have thus formed part of the baseline.

Stage 2: Scoping

2.1.4 Scoping is used to identify any potential impacts of the proposed activities to specific WFD receptors and their water quality elements. This involves review of WFD impact pathways, shortlisting which WFD water bodies and quality elements could or could not be affected by proposed activities, and collecting baseline information from the relevant RBMP on the status and objectives for each water body.

Stage 3: Impact Assessment

2.1.5 This involves rationalised assessment of water bodies and quality elements that could be affected by proposed activities, in order to identify any areas of WFD non-compliance. Proposed activities are reviewed in terms of both positive and negative impacts, and the baseline mitigation measures, enhancements, and contributions to the WFD objectives described in the RBMP. Any proposed activities with potentially deleterious impacts are reviewed simultaneously with their corresponding mitigation proposals, to determine a net effect on WFD objectives.

Mitigation Commitments

2.1.6 Proposed mitigation activities relied upon to demonstrate compliance at any of the stages referred to above must be appropriately defined and secured.

Article 4.7 Derogation

2.1.7 Where the potential for deterioration of water bodies is identified, and it is not possible to mitigate the impacts to a level where deterioration or failure to improve can be avoided, the project would need to be assessed in the context of Article 4.7 of the Directive. Where a derogation is necessary, Applicants will need to provide the necessary information to justify their case, bearing in mind that Applicants must always seek to avoid deterioration of the water environment. It is a matter for the Secretary of State to consider whether derogation under Article 4.7 is justified in relation to a proposed development. At this stage a derogation under Article 4.7 is not considered necessary.

2.2 Desk Study

2.2.1 A desk-based study was carried out to capture information pertaining to the Scheme to support the understanding of baseline conditions. Review of relevant information relating to the study area was undertaken to develop a baseline overview for WFD catchments, watercourses and surrounding areas. The following data sources were used for the desk study:

a) WFD status and objectives from the appropriate River Basin Management Plan for cycle 2 data, available from the Catchment Data Explorer (Ref 5);

b) Defra's Multi-agency geographical information for the countryside website (MAGIC), including contemporary Ordnance Survey (OS) maps (Ref 6);

c) Historical maps (Ref 7);

d) British Geological Survey maps (Ref 8);

e) Soilscapes website (Ref 10);

f) Aerial photography (Ref 11);

g) Hydrological information (Ref 12);

h) Climate information (Ref 13; and

i) Environment Agency Fish and Ecology Data Viewer (Ref 14)

2.3 Field Survey

2.3.1 An initial site walkover survey was undertaken by a water scientist and hydromorphologist on 16 February 2021 to assess watercourse quality and condition. Wet and snowy weather conditions in the days preceded the walkover. An additional walkover of the grid connection route, shown in Figure 2-5: Operational Layout, to Bull's Lodge Substation, located at the south-western extent of the Order limits, was undertaken on 13 September 2021. Potential watercourse crossing locations for access tracks were also surveyed on this later visit.

2.4 Assumptions and Limitations

2.4.1 This WFDa is based on baseline and Scheme design information available at the time of writing in January 2022. It is based on the Scheme design set out in ***Chapter 2: The Scheme*** **[EN010118/APP/6.1]**, design principles outlined in ***Appendix 2A: Concept Design Appendix*** **[EN010118/APP/6.2]** and further information provided in ***Chapter 9: Water Environment*** **[EN010118/APP/6.1].**

2.4.2 A request for water resources data (e.g. licensed abstractions, Water Activity Permit locations, pollution incident locations), WFD information and water quality and flow data was requested from the Environment Agency to inform the desk study in November 2020. A response had not been received at the time of writing this chapter in January 2022 despite re-submitting the request in August 2021 and October 2021. This means that Mitigation Measures (outlined by the Environment Agency for watercourse improvements) for each water body within this assessment were not available, and therefore measures for the wider operational catchment were used. This is a precautionary approach allowing some form of assessment as Mitigation Measures for the individual water bodies are likely to follow similar themes as the measures for the operational catchment; this part of the assessment should be refined if the Mitigation Measures for the individual water bodies within this assessment are made available.

2.4.3 This assessment draws on desk study and ecological surveys undertaken between 2020 and 2021. These are outlined in ***Chapter 8: Ecology*** and ***Chapter 9: Water Environment*** **[EN010118/APP/6.1].**

2.4.4 At the time of writing the full details regarding locations and methodologies of the cable route construction and installation has not been confirmed. At the time of writing, it is known that there will be three cable crossings of the Boreham Tributary, however the exact locations of these crossings have not been defined. These are approximately located at NGR TL 75877 10899, TL 75747 10495 and TL 75396 10374, but final locations are subject to the limits of deviation. It is known that the cables will cross the water body underground, i.e. launch and receive pits will be excavated either side of the water body, at a distance of at least 10m away, and the cables will be installed beneath the water body by directional drilling (a minimum of 1.5 m below the bed, meaning there will be no physical impact to the channel). The launch and receiving pits will be a maximum of 2 by 2 m, and 2 m deep. This is outlined in the ***Outline Construction Environmental Management Plan (OCEMP)*** **[EN010118/APP/7.10]**.

2.4.5 The Scheme involves works at ten watercourse crossing locations to ephemeral ditches to facilitate access tracks for the Scheme. At the time of writing (January 2022) it is known there may be improvements (e.g. strengthening, minor extensions) needed at these existing crossing locations, and this will be determined by further site investigation in advance of any construction works. As such, no further details of the proposals are available at this stage. Therefore, as a reasonable precautionary worst-case scenario it

is assumed the works to the culverts will consist of minor extensions, of a maximum length of 2m (as outlined in the applicable Design Principles within ***Appendix 2A: Concept Design Appendix*** **[EN010118/APP/6.2].** These works will take place on crossings at the following locations (also shown on ***Figure 9-1***: ***Water Resource Features and Attributes*** **[EN010118/APP/6.3]**):

a) TL 74150 14727;

b) TL 74741 15059;

c) TL 74383 14052;

d) TL 74719 14468;

e) TL 74585 13836;

f) TL 75123 13809;

g) TL 75683 13787;

h) TL 75890 13943;

i) TL 75271 12681; and

j) TL 76430 12512.

2.4.6 A 1.55m widening of the culvert of Boreham Brook under Cranham Road may also be required to accommodate road widening of Cranham Road to improve access to the Scheme during construction, operation and decommissioning. This is again precautionary worst case This culvert would have an environmentally sensitive design with a sunken bed to allow a natural substrate to develop, and would aim to minimise changes in alignment and length as much as is feasible. The requirements for access tracks and the Cranham Road culvert are secured through Design Principles in ***Appendix 2A: Concept Design Appendix*** **[EN010118/APP/6.2]**.

2.4.7 The Scheme will require two new surface water outfalls. Firstly, there will be an outfall carrying drainage from the Bulls Lodge Substation Extension to Boreham Brook at approximate NGR TL 75109 10354. Secondly, there will be an outfall conveying drainage from the BESS attenuation pond to a drain at approximate NGR TL 77140 12023 (watercourse labelled T22 on ***Figure 9-1***). The final location, position and orientation of any new outfall will be carefully determined and informed by a hydromorphological survey to minimise any adverse local impacts on river processes. Appropriate micro-siting of the outfall will minimise loss of bank habitat, the need for bed scour or hard bank protection, and localised flow disturbance or disruption to sediment transport processes. It can also avoid the creation of ‘dead’ spaces with sedimentation and vegetation blockage risks and to that effect it is not proposed that outfalls are recessed into the bank.

3. WFD Screening and Scoping

3.1 WFD Screening

3.1.1 The purpose of the WFD screening stage as outlined in PINS Advice Note 18 (Ref 3) is to identify a zone of influence of the Scheme and to determine whether that influence has the potential to adversely impact upon WFD water body receptors; this approach has been taken in this assessment and is outlined in this section.

3.1.2 A study area of generally 1 km around the Order Limits has been considered in order to identify water bodies that are potentially hydrologically connected to the Scheme and potential works associated with the Scheme that could cause direct impacts.

3.1.3 The screening stage also identifies specific activities of the Scheme that could affect receptor water bodies' WFD status and carries them forward to subsequent stages of the assessment process. Justification is provided where water body receptors are screened out and are not carried forward through the assessment. Water bodies or activities screened 'out' of the assessment are therefore not considered further at the impact assessment stage.

3.2 Screening of WFD Water Bodies

3.2.1 The Scheme interacts with a number of WFD water bodies. WFD Screening of these water bodies is provided in **Table 1**. Water bodies such as smaller tributaries within each of the WFD water body catchments that may be impacted by the Scheme will be considered in this assessment. Any other remaining downstream water bodies not mentioned below are considered sufficiently far downstream to avoid impacts of the Scheme and are therefore screened out of further assessment.

Table 1: Screening of WFD Water Bodies Potentially Impacted by the Scheme

Water Body ID	Screening Outcome	Justification
Ter (GB105037033940)	In	WFD water bodies may be directly impacted by the Scheme due to a range of activities that would interact with the local watercourse network during construction, operation and decommissioning phases of the Scheme.
Boreham Tributary (GB105037033910)	In	
Chelmer (Gt. Easton - R. Can) (GB105037033950)	Out	No proposed components of the Scheme will interact directly or indirectly with this water body. Potential secondary impacts during construction will be mitigated by the Construction Environmental Management Plan (CEMP), which will be secured under the DCO (see the ***OCEMP* [EN010118/APP/7.10]**], and Water Management Plan (WMP). The CEMP will be

Water Body ID	Screening Outcome	Justification
		standard procedure for the Scheme and will describe the principles for the protection of the water environment during construction. The CEMP will be supported by the WMP appendix, that will provide greater detail regarding the mitigation to be implemented to protect the water environment from adverse effects during construction including requirements for water quality monitoring.
Essex Gravels (GB40503G000400)	In	Activities relating to the construction and operation of the Scheme have been assessed in terms of their potential impact upon this groundwater water body. There are potential anticipated impacts at the water body scale, therefore assessment of impacts to groundwater is scoped in.

3.3 Screening of Activities

3.3.1 As described in Section 1: Background, the Scheme comprises a number of activities that present a potential risk to the WFD status of water bodies. These components and activities are listed in **Table** 2 together with a screening assessment.

Table 2: Screening of the Scheme's Development Activities Against WFD Quality

Activity	Description	Screening Outcome	Justification
PV Panels and PV Mounting Structures (combining to form PV Tables)	PV Panels will be mounted on PV Mounting Structures with legs above the ground, rather than raising the ground. This will avoid creation of an impermeable surface on the ground or the need for extensive earthworks. PV Panels will also not be located	**Out** – River Ter (GB10503 7033940), Boreham Tributary (GB10503 7033910), Essex Gravels (GB40503 G000400)	Installation of PV Arrays does not involve the introduction of hardstanding at ground level meaning superficial cover for the Scheme will remain largely the same as the baseline. Additionally, the PV Tables will have large rainwater gaps to prevent water being concentrated along a single drip line and appropriate planting beneath the panels to disperse drips (a mix of native species rich grassland and wildflowers). Surface water management techniques will be used to

Activity	Description	Screening Outcome	Justification
	within 8m of the edge of watercourses defined broadly by the position of the main channel and normal flow water's edge, and 10m from main rivers, which in practice only affects the River Ter. PV Mounting Structures will likely be galvanised steel or Anodised aluminium poles driven or screwed into the ground; indicative maximum depth of 2m (see ***Chapter 2: The Scheme*** and ***Appendix 2A*****: Concept Design Appendix [EN010118/APP/6.2])**.		control runoff based on rural SuDS (RSuDS). Such measures will manage surface water within the Order Limits through interception and absorption via natural mechanisms in order to drain the Order Limits as per the existing scenario. In addition, the risk of agricultural diffuse pollution would be reduced from the change in land use as the application of agro-chemicals, inorganic and organic fertilisers to crops, and soil erosion from livestock poaching of riverbanks will no longer occur in panelled fields. Therefore, there are no anticipated impacts to surface water bodies from this source. Review of borehole scans from the Geoindex website (Ref 9) shows the majority of boreholes do not strike water; therefore, the mounting structures are anticipated to be above the water table and as such would have a very negligible effect on groundwater flow. Local changes in runoff patterns due to the presence of the solar panels may result in a small, insignificant change to the recharge distribution of groundwater. This is not considered to have an impact on groundwater levels or groundwater dependent receptors.
Solar Station	A Solar Station will comprise an inverter, a transformer, and switchgear, which	**Out-** River Ter (GB10503 7033940), Boreham	Infrastructure will not be located within 8m of a watercourse, so there are no mechanisms for impacts to surface water bodies.

Activity	Description	Screening Outcome	Justification
	can be grouped together or distributed throughout the Solar Farm Site. The Solar Station can sometimes be enclosed in a single container.	Tributary (GB10503 7033910), Essex Gravels (GB40503 G000400)	Indicative foundations will have a maximum depth of 1m, which will likely be above the water table, with negligible or no impact to the groundwater body.
Low Voltage Distribution cables	Low voltage cables, which transmit electricity from the Solar Stations or BESS Compound to the Longfield Substation, located within the Solar Farm Site. All cable circuits within The Solar Farm Site will be secured to the PV Mounting Structures or will be buried within underground trenches. Maximum depth 0.8 – 1.2m.	**Out-** River Ter (GB10503 7033940), Boreham Tributary (GB10503 7033910), Essex Gravels (GB40503 G000400)	Infrastructure will not be located within 8m of a watercourse, and so there are no mechanisms for impacts to surface water bodies. Depth of trenches will likely be above the water table, as indicated by Geoindex borehole scans (Ref 9), with negligible or no impact to the groundwater body.
BESS Compound, Battery Containers, Switchgear and control room	The compound will include battery storage containers, battery inverters, transformers and switchgear and access tracks. Access tracks are considered separately below.	**Out-** River Ter (GB10503 7033940), Boreham Tributary (GB10503 7033910), Essex Gravels (GB40503 G000400)	Infrastructure will not be located within 8m of a watercourse, so there are no mechanisms for hydromorphological impacts to surface water bodies. Runoff from the 1.94 ha area of hardstanding at the BESS Compound will be drained via an attenuation pond before discharging to an existing drain (T22 on ***Figure 9-1***), refer to ***Chapter 9: Water Environment*** **[EN010118/APP/6.1]** for further

Activity	Description	Screening Outcome	Justification
			details. Given the drainage design, the outfalls of which are considered separately below, no impacts to WFD quality elements are expected. Indicative foundations will have a maximum depth of 1m, which will likely be above the water table, with negligible or no impact to the groundwater body.
BESS: Firewater storage	In the instance there is a small fire which cannot be directly contained there may be potential for contaminated runoff into the SuDS system. The suppressant of firewater by applying firewater to cool surrounding areas will be the intent of firefighting operations, with any direct firefighting to occur during small events requiring limited firewater. During larger fire events, whereby fires are to be managed onsite most likely by the application of water to adjacent equipment and land to cool them and prevent the spread of the fire,	**Out-** River Ter (GB10503 7033940), Boreham Tributary (GB10503 7033910), Essex Gravels (GB40503 G000400)	A bung and penstock system has been included in the drainage design to isolate the network. The penstock will then enable potential contaminated suppression waters to be isolated and extracted in order to be suitably tested and disposed of offsite without entering the surrounding hydrological network (see ***Appendix 9C: Longfield SuDS Strategy*** **[EN010118/APP/6.2]**. Given there are procedures in place to avoid the production of contaminated waters, and that any potential contaminated water can be contained and removed, there is minimal risk of an impact being transmitted to the surface water bodies. No anticipated mechanism for impacts to the groundwater body.

Activity	Description	Screening Outcome	Justification
	water will be immediately available from four 108,000 litre storage tanks. This will provide up to 4 hrs of water supply at the rate agreed with Essex County Council Fire and Rescue. A bung and penstock system has been included to intercept and isolate potentially contaminated runoff from the wider SuDS system for all fire events and thus prevent contaminated runoff entering the wider hydrological network. This contaminated runoff would be suitably tested and disposed of offsite without entering the surrounding hydrological network. Refer to ***Appendix 9C: Longfield SuDS Strategy*** for further details.		
Longfield Substation	The onsite substation will be located adjacent to the BESS Compound. The	**Out-** River Ter (GB10503 7033940), Boreham	Infrastructure will not be located within 8m of a watercourse, so there are no

Activity	Description	Screening Outcome	Justification
	precise location will be determined during detailed design.	Tributary (GB10503 7033910), Essex Gravels (GB40503 G000400)	mechanisms for impacts to surface water bodies. Foundations are anticipated to be above the water table (indicative foundations will have a maximum depth of 1.5m), with negligible or no impact to the groundwater body. The drainage for the Longfield Substation is considered within the BESS Compound, and is outlined above.
Electrical compound control buildings	27m by 14m footprint and 6m in height, adjacent to the BESS Compound.	**Out-** River Ter (GB10503 7033940), Boreham Tributary (GB10503 7033910), Essex Gravels (GB40503 G000400)	Infrastructure will not be located within 8m of a watercourse, so there are no mechanisms for impacts to surface water bodies. Foundations are anticipated to be above the water table, with negligible or no impact to the groundwater body. The drainage for this component of the Scheme is considered within the BESS Compound, and is outlined above.
Office/ warehouse building	36m by 15m footprint and 7.2m in height.	**Out-** River Ter (GB10503 7033940), Boreham Tributary (GB10503 7033910), Essex Gravels (GB40503 G000400)	Infrastructure will not be located within 8m of a watercourse, so there are no mechanisms for impacts to surface water bodies. Foundations are anticipated to be above the water table, with negligible or no impact to the groundwater body. The drainage for this component of the Scheme is considered within the BESS Compound, and is outlined above.
Permanent plant storage buildings	Indicative footprint of length 36m, width 15m, indicative	**Out-** River Ter (GB10503 7033940), Boreham	Infrastructure will not be located within 8m of a watercourse, so there are no

Activity	Description	Screening Outcome	Justification
	maximum height 7.2m	Tributary (GB10503 7033910), Essex Gravels (GB40503 G000400)	mechanisms for impacts to surface water bodies. Foundations are anticipated to be above the water table, with negligible or no impact to the groundwater body.
Grid Connection Route – the below ground Grid Connection Cables	The cable corridor is expected to require a 25m wide working area within the Grid Connection Route. The cable corridor will cross the Boreham Tributary three times, by an underground technique, i.e. directional drilling to install the cable a minimum of 1.5m beneath the channel bed. Launch and receive pits would be dug either side of the water body from which the cable would be installed.	**Out-** River Ter (GB10503 7033940) **In-** Boreham Tributary (GB10503 7033910), Essex Gravels (GB40503 G000400)	Potential direct impacts to the channel and riparian zone should be avoided by this technique. Indirect impacts from uncontrolled release of construction site runoff that may include high levels of fine sediment, oils and drilling muds (water based) is a possibility if this runoff is not carefully managed. However, there are potential impacts from groundwater ingress to excavations and the risk of 'break out' of drilling muds into watercourses.
National Grid Connection, including Bulls Lodge Substation Extension	Works are required for Bulls Lodge Substation Extension, which will involve an extension to existing electrical infrastructure. This will consist of electrical infrastructure such as the transformers,	**Out-** River Ter (GB10503 7033940), Boreham Tributary (GB10503 7033910), Essex Gravels (GB40503 G000400)	The proposed extension will not interact with any surface water bodies, so there are no mechanisms for hydromorphological impacts to surface water bodies. The substation will not be manned, and not heavily trafficked, there will be no significant discharge of contaminants emanating from the development site apart

Activity	Description	Screening Outcome	Justification
	switchgear and metering equipment required to facilitate the export of electricity from the Solar Farm Site to the National Grid. Runoff from the new area of hardstanding will be discharged via infiltration through a permeable paving system for events up to and including the 1 in 5-year return period discharge. A piped outfall will be set to a level above this to discharge surface water runoff for events up to and including the 1 in 100 year plus 20% climate change events to Boreham Brook with a limited discharge rate (1.9l/s).		from the standby generator with associated fuel tank, and this will be self-bunded with a capacity of 150% that of the tank. It is anticipated that with the embedded mitigation of an appropriate drainage strategy mimicking natural flow status there would be no effect on flow pathways from runoff from the Scheme. Further details can be found in ***Chapter 9: Water Environment*** **[EN010118/APP/6.1] and** ***Appendix 9D: Bulls Lodge Substation Extension: Drainage Strategy*** **[EN010118/APP/6.2].** No infrastructure is anticipated to be below the water table, so there is expected to be negligible or no impact to the groundwater body.
Internal access tracks	It is proposed to utilise the existing hard-surfaced tracks that run throughout the Order limits where possible as the Primary Access Tracks,	**Out-** Essex Gravels (GB40503 G000400) **In-** River Ter (GB10503	It is assumed for the purposes of this assessment that the worse-case scenario would be extensions of these culverts, and this is secured through Design Principles in ***Appendix 2A: Concept Design Appendix*** **[EN010118/APP/6.2]**. Two of

Activity	Description	Screening Outcome	Justification
	and to construct additional Secondary Access Tracks where connectivity is required. There may be improvements (e.g. strengthening, minor extensions) needed to existing ditch crossing culverts at 10 locations.	7033940), Boreham Tributary (GB10503 7033910)	the culvert locations will fall within the catchment of the Boreham Tributary WFD water body, and eight within the River Ter WFD water body catchment, with potential impacts to the hydromorphological quality of the water bodies. Note that the WFD designated watercourses themselves would not be culverted for access tracks. No anticipated mechanism for impacts to the groundwater body, as no significant changes in runoff patterns compared to existing are expected from the internal access tracks. Best practice measures during the construction phase will be outlined in the ***OCEMP***, which is secured under the DCO **[EN010118/APP/7.10]**.
Surface water outfalls	The Scheme will require two new surface water outfalls. Firstly, there will be an outfall carrying drainage from the Bull's Lodge Substation Extension to Boreham Brook at approximate grid reference TL 75109 10354. Secondly, there will be an outfall conveying drainage from the BESS Compound attenuation pond to a drain at TL 77140 12023 (watercourse	**Out-** Essex Gravels (GB40503 G000400) **In-** River Ter (GB10503 7033940), Boreham Tributary (GB10503 7033910)	Surface water outfalls can impact the hydromorphological quality and water quality of the surface water bodies. No anticipated mechanism for impacts to the groundwater body.

Activity	Description	Screening Outcome	Justification
	labelled T22 on ***Figure 9-1***).		
Road widening	Road widening works may be required along Cranham Road and Waltham Road. A 1.55m widening of the culvert of Boreham Brook under Cranham Road may also be required to accommodate the widening in order to improve access to the Scheme during construction, operation and decommissioning.	**Out-** River Ter (GB10503 7033940), Essex Gravels (GB40503 G000400) **In-** Boreham Tributary (GB10503 7033910),	A culvert extension has the potential to impact the hydromorphological quality elements of the surface water body. No anticipated mechanism for impacts to the groundwater body

4. Baseline Conditions and Desk Study

4.1 Catchment Characteristics

Boreham Tributary – General Characteristics

4.1.1 Boreham Tributary is a waterbody of roughly 17.4 km^2, found slightly to the east of Chelmsford, in the county of Essex. The channel rises from a small pond (TL 7367 1332) and flows initially south-southeast through a quarried area that runs alongside and just to the west of Waltham Road and Boreham Road. The channel then turns westwards at TL 7575 1051 and flows for approximately 1.4 km as far as TL 7463 1001. At this point, it is joined by a tributary from the northwest, and the channel becomes WFD designated. It flows south under the A12, and to the west of Boreham village, curving round the south of the village so that it joins the Chelmer at the southern tip of the village (TL 7627 0859).

4.1.2 Close to two-thirds of the land use in the Boreham Tributary catchment is arable, with improved grassland making up much of the remaining area. In addition to these, there are also pockets of deciduous woodland, and some urban and suburban centres. The quarried area in the east of the catchment

contains a selection of freshwater filled pits. There are no SSSIs or SACs within the waterbody.

4.1.3 The village of Boreham (centred around TL 7551 0859) is the only significant built-up area in the waterbody and is found in the south. Boreham Road and Waltham Road stretch north to south close to the eastern boundary of the waterbody and is crossed by the A12 at TL 7466 0993, and the railway line running parallel and north of the road. The A12 and railway line, therefore, constitute the most significant nearby infrastructure: the A12 runs for some 2.86 km from east to west across the south of the waterbody, just to the north of Boreham (from TL 7690 1099 to TL 7432 0973).

Boreham Tributary – Catchment Geology and Soils

4.1.4 The waterbody's bedrock is composed wholly of sedimentary clay, silt, sand, and gravel, formed 34 to 56 Mya in the Palaeogene Period, and is part of the Thames Group that covers much of the area around and slightly to the north of London. This geology suggests that the environment was previously covered by shallow seas, and so consists of siliciclastic sediments that were deposited to form the silts, sands, and gravels mentioned above.

4.1.5 Superficial geology in the waterbody consists mainly of till diamicton, glaciogenic deposits that were formed some 2 Mya by the action of ice and meltwater in the Quaternary. In addition to this, Brickearth silt is found in the east of the waterbody, over which much of the watercourse flows. These deposits formed slightly earlier than the till diamicton at around 3 Mya through aeolian processes and have formed a range of beds, lenses, and dunes.

4.1.6 Soils down the centre of the waterbody are freely draining, slightly acidic, and loamy, with low fertility and are typical of arable and grassland. This central column is flanked on both the east and west of the waterbody by more fertile, slightly acidic, loamy and clayey soils with impeded drainage (Ref 10). The western band curls around the south of the waterbody to underlie most of Boreham, and so the majority of the WFD watercourse within the waterbody flows over this more fertile soil.

Boreham Tributary – Catchment Hydrology

4.1.7 There is one NRFA gauging station in the Ter waterbody, located at Crabbs Bridge (TL 786 107), around 1 km south-southwest of Hatfield Peverel and 2km southeast of the Order Limits near Toppinghoehall Wood. This station has been in operation since 1932 and has measured a mean flow of 0.299 m3/s and a bankfull stage of 1.35 m. Highest flows are typically found in the winter months, and lowest flows in the summer (Ref 12).

4.1.8 As with the Boreham Tributary waterbody, the closest Met Office weather monitoring station is also in Writtle, around 11.3 km southwest of the Crabbs Bridge gauging station. The wettest period of the year is from October through to January, and the driest February to April. Annual temperature change is typical of a northern hemisphere climate, with June, July, and August the

hottest, and December, January, February the coldest. For more detailed climate statistics, see Boreham Tributary: Catchment Hydrology.

Boreham Tributary – Historical Channel Change

4.1.9 Large stretches of the course of the river Ter show clear signs of being subject to human intervention due to the straightness of the channel, with much of these amendments made prior to the availability of historic maps. In the upper course of the Ter at TL 70899 20918 to TL 71445 20683, whereas in the early 1900s the channel turned 90 degrees to flow west for a short distance to Thorpe's Farm, then turned south again, and back east, to re-join what is now the channel. The pair of artificial lakes at TL 7080 1845 have been constructed fairly recently, at some point between 1970 and 1985. Finally, just after flowing under the A131, south of Great Leighs, the channel flows southwest with evidence of straightening and meander removal since 1970 (Ref 7).

4.2 Boreham Tributary

WFD Status

4.2.1 The WFD Status of the Boreham Tributary (GB105037033910) is presented in **Table 3**, and further details on the baseline status of the water body, where data is available, are provided in subsequent sections.

Table 3: Summary of the WFD Status of the Boreham Tributary Water Body

WFD Parameter	Status / Summary
Water Body ID	GB105037033910
Water Body Name	Boreham Tributary
Water Body Type	River
Water Body Area (m)	17.4 km^2
Water Body Length (m)	2.7 km
Hydromorphological Designation	Not designated artificial or heavily modified
Overall Ecological Status	Good
Current Overall Status	Moderate
Status Objective	Good by 2015
Biological Quality Elements	Good
Physico-chemical Quality Elements	Good

Hydromorphological Quality Elements	Supports good
Chemical	Fail

4.3 Hydromorphological Quality Elements

Boreham Tributary

4.3.1 The character of the Boreham Tributary varies through the study area; towards the northern lengths of the water body, a short distance south of the gravel pits, the watercourse presents a clean, gravel bed with a relatively suitable channel bed width and is relatively well connected to the woodland floodplain area (***Plate 1***). A small number of woody features were observed in the channel, providing diversity in flow conditions.

Plate 1: Boreham Tributary, with Clean Gravel Bed Yet a Modified Bank Profile

4.3.2 It is likely that the channel was historically straightened or modified (prior to the creation of early OS maps), and this becomes more apparent moving downstream through the water body. This includes the nature of the river banks; although they consist of natural earth, they appeared to have been profiled in the past as they present an unnatural v-shape (***Plate 1***). In addition, very uniform lines of trees were present along the banks suggesting they were possibly planted at the time the watercourse was straightened or modified.

4.3.3 The water body is increasingly silty with reduced flow velocities further downstream, around the location of the bend just north of the railway. This is likely a result of a reduced channel gradient, with inputs of fine sediment to

the water body from the field hillslope, exacerbated by the poor buffer between the field and channel (***Plate 2***).

Plate 2: Boreham Tributary, Heavily Silted (Left) with Limited Buffer to Fine Sediment Input (Right)

4.3.4 The watercourse likely has good connection to groundwater bodies, given there were no hard structures observed on the river bed, and groundwater levels are likely shallow in the superficial deposits local to the water body. Similarly, longitudinal connectivity was good, no weirs or culverts appeared to be present, although lateral connectivity with the floodplain is limited due to modification of the channel and local land use. The riparian zone is relatively simple, and was largely characterised by a single line of trees and shrubs.

Unnamed minor tributaries within the Boreham Tributary WFD water body

4.3.5 Five of the drainage channels, to be subject to culvert modifications, were visited during the walkover undertaken in September 2021. The drainage channels that are subject to culvert modifications all fall on existing field boundaries, where existing crossing locations, and culvert structures, are present. This factor, in combination with a review of desk based resources, indicates that the channels subject to culvert modifications are likely to be artificial and created for land drainage and agricultural purposes.

4.3.6 At the time of survey on 13th September 2021, each of the channels were observed to be dry, aside from one, which held a small area of pooled water. The channel beds visible consisted of earth and did not present any morphological features of interest. The planform of the channels was generally straight, with channel profiles also very uniform, indicative of their artificial nature. The character of these channels is shown in ***Plate 3.***

Plate 3: Typical Character of Water Body at the Location of Culverting Activities (Channel Obscured by Vegetation on Day of Survey)

4.4 Biological Quality Elements

Composition, Abundance and Age Structure of Fish Fauna

4.4.1 Boreham Tributary has no WFD classification for fish fauna. No Environment Agency fish surveys are available for the Boreham Tributary waterbody.

Composition and Abundance of Benthic Invertebrate Fauna

4.4.2 Boreham Tributary was designated as Good in 2015 for invertebrates. Invertebrate sampling has been conducted four times since 2000 by the Environment Agency in the Boreham Tributary waterbody, with all samples occurring at TL 76024 09001, around 0.6 km upstream of the tributary's confluence with the River Chelmer. Over the four samples, 67 different taxa of macroinvertebrate were found, none of which are classified as protected, and only one of which (Potamopyrgus antipodarum) is categorised as non-native. Interpretation of the results of the two surveys carried out in 2015 suggests the samples were indicative of moderative levels of organic pollution and degradation.

Composition and Abundance of Aquatic Flora

4.4.3 Boreham Tributary had a WFD classification of Good for Macrophytes and Phytobenthos Combined in 2015. However, there have been no macrophyte Environment Agency surveys are available for the waterbody.

4.5 Physico-Chemical Quality Elements

4.5.1 Routine water quality sampling of Boreham Brook is conducted by the Environment Agency at 75420 09220, a site around 1.3 km upstream of the brook's tributary with the River Chelmer and just downstream of a sewage pumping station. Analysis is conducted on the most recent 12 samples, which covers a time period from January 2016 to April 2017. Summary statistics and the resultant WFD classification are displayed in **Table 4.**

Table 4: Summary of Physico-Chemical Parameters of Boreham Tributary

Physico-chemical quality element	Average	Minimum/maximum	WFD Classification (2015)
pH	8.08	7.95/8.19	High
Temperature (°C)	10.5	4.6/16.6	High
Dissolved oxygen (% sat.)	97.7	86.2/118	High
Ammonia (mg/l)	0.00064	0.00039/0.00089	High
Orthophosphate (mg/l)	0.0521	0.024/0.12	Good

4.5.2 **Table 4** indicates the Boreham Brook is slightly alkaline in nature with an average pH of 8.08 and falls within the WFD High classification based on the 12 samples considered here. Dissolved oxygen saturation is classified as High which suggests the waterbody is not limited by dissolved oxygen levels. Ammonia levels fall within the WFD classification for Good which similarly suggests pollution from organics such as sewage materials are not having a detrimental impact on the waterbody.

4.5.3 Further detail on the physico-chemical quality and chemical quality of Boreham Tributary is provided in **Table 9-6** and relevant discussion of ***Chapter 9: Water Environment*** **[EN010118/APP/6.1].**

4.6 Ter

WFD Status

4.6.1 The WFD Status of the Ter water body (GB105037033940) is presented in **Table 5.**

Table 5: Summary of the WFD status of the Ter water body

WFD Parameter	Status / Summary
Water Body ID	GB105037033940
Water Body Name	Ter
Water Body Type	River
Water Body Area (m)	79.5 km^2
Water Body Length (m)	31.4 km
Hydromorphological Designation	Not designated artificial or heavily modified
Overall Ecological Status	Moderate
Current Overall Status	Moderate
Status Objective	Moderate by 2015
Biological Quality Elements	Moderate
Physico-chemical Quality Elements	Moderate
Hydromorphological Quality Elements	Supports good
Chemical	Fail

4.6.2 Reasons for not achieving good status for the water body are all related to levels of phosphate and include point source, continuous sewage discharge from the water industry, and diffuse source pollution from urban transport drainage, agricultural tracks / rural roads, and poor nutrient management in agriculture and rural land management.

4.7 Hydromorphological Quality Elements

4.7.1 The character of the River Ter is briefly summarised below, however given that the WFD screening and scoping of this assessment identified risks to the minor tributaries within the Ter WFD water body, and no potential risks to the River Ter, these minor tributaries will form the basis of the hydromorphological baseline for this assessment.

River Ter

4.7.2 The River Ter in the vicinity of the study area is a single thread sinuous channel with a relatively confined floodplain, bordered by woodland and arable fields. The river flows through a relatively narrow corridor of alluvium. Given the underlying London Clay Formation bedrock, and the relatively confined valley, the river planform would typically have relatively tight bends, rather than large meanders, developed from local channel adjustment, particularly as it

interacts with surrounding woodland. This type of river was observed on the site visit in the area just downstream of Sandy Wood, though mapping also indicates the river has been modified and straightened both upstream and downstream of this location.

4.7.3 The river was observed during relatively high flows, following a period of snowy weather in February 2021. At this time the water was slightly silty and turbid, and in some places the river bed was not visible though it is assumed to be gravelly with some local silt and sand deposition.

4.7.4 The river was observed to be relatively active; bank erosion, indicated by exposed tree roots, and failure was observed in places through the surveyed reach ***Plate 4*** In some locations, woody features within the channel created variety in local flow dynamics and were influencing the local planform through deflecting flow on the outer bends, which also exposed cleaner gravels on the river bed in the area of increased velocity, and in other locations narrowed the channel to create a slower flowing area where sand had deposited (***Plate 5).***

Plate 5: Localised Bank Failure in Process (Left) and Bank Erosion (Right) on the River Ter

Plate 4: Sand Deposits Behind Woody Feature (Left) and Woody Feature Influencing Bank Erosion and Channel Dynamics (Right)

4.7.5 A number of drainage channels and tributaries, some through the steep hillsides, were observed to feed into the River Ter through the surveyed reach. These were often very straight with no features and limited vegetation, and it is likely they increase the fine sediment delivery to the watercourse during high flows

Unnamed minor tributaries within the Ter WFD water body

4.7.6 Five of the drainage channels, to be subject to culvert modifications, were visited during the walkover undertaken in September 2021. The drainage channels that are subject to culvert modifications all fall on existing field boundaries, where existing crossing locations, and culvert structures, are present. This factor, in combination with a review of desk based resources, indicates that the channels subject to culvert modifications are likely to be artificial and created for land drainage and agricultural purposes. The only exception to this is at culvert location eight, and the water body near Roll's Spring, which downstream (east) of Terling Hall Road appears to develop into a more significant tributary of the River Ter. However, at the time of survey, the watercourse was dry, therefore the character of the watercourse at the culvert location can be considered to be the same as the remaining watercourses discussed below.

4.7.7 At the time of survey, each of the channels were observed to be dry, aside from one, which held a small area of pooled water. The channel beds visible consisted of earth and did not present any morphological features of interest. The planform of the channels was generally straight, with channel profiles also very uniform, indicative of their artificial nature. The character of these channels is shown in ***Plate 6.***

Plate 6: Typical character of water body at the location of culverting activities, dry at the time of survey

4.8 Biological Quality Elements

Composition, Abundance and Age Structure of Fish Fauna

4.8.1 A WFD classification for Fish is not provided for the Ter water body. However, four Environment Agency fish survey sites have been operation in the Ter waterbody over the past ten years, two of which are found in the headwaters (TL 7264 1632 and TL 7182 2009) and two of which are in the main channel downstream of the A12 crossing (TL 79598 10158 and TL 79556 09193). Over the surveys, 16 different species of fish were found, such as common bream *(Abramis brama*), European eel (*Anguilla Anguilla*), bullhead (*Cottus gobio*), pike (*Esox lucius),* chub (*Leuciscus cephalus*), dace (*Leuciscus leuciscus*), perch (*Perca fluviatilis*), brown trout (*Salmo trutta*), rudd (*Sardinus erythrophthalamus*), tench (*Tinca tinca*), and a handful of smaller species. Of these, European eel are listed as Critically Endangered, and bullhead are an Annex II species and so protected under the Habitats Directive.

Composition and Abundance of Benthic Invertebrate Fauna

4.8.2 The Ter was given a classification of Good for Invertebrates in 2015, which was upgraded to High in 2019. Two macroinvertebrate survey sites have been in operation in the Ter waterbody over the past ten years (TL 7887 1070 and TL 7553 1535). Over the operating period, 126 different macroinvertebrate taxa were recorded, none of which are protected, and only two of which are

non-native (the New Zealand mud snail, *Potamopyrgus antipodarum* and freshwater shrimp, *Crangonyx pseudogracilis/floridanus*).

4.8.3 Macroinvertebrate sampling of the River Ter was undertaken on 14 May 2020 and 23 September 2020, refer to ***Appendix 8D: Aquatic Ecology Report*** **[EN010118/APP/6.2]** for details. The aquatic macroinvertebrate survey contained 52 macroinvertebrate taxa; the results interpretation indicates the River Ter is a Good, Clean and Slightly Impacted watercourse. There is likely a small impact from sedimentation, water quality or other environmental influences. Two non-native species were identified in the macroinvertebrate samples, the New Zealand mud snail and the freshwater shrimp. These species are now classed as naturalised in the UK and are not thought to impact native flora and fauna. No white-clawed crayfish (*Austropotamobius pallipes*) were recorded during the field survey.

Composition and Abundance of Aquatic Flora

4.8.4 The Ter was given a WFD classification of Moderate for Macrophytes and Phytobenthos Combined in 2019. There are Environment Agency macrophyte surveys for one location in the Ter waterbody, found at TL 7873 1075. In total, macrophytes of 14 different taxa were recorded, none of which are protected or invasive.

4.9 Physico-Chemical Quality Elements

4.9.1 Routine water quality sampling of the River Ter is conducted by the Environment Agency at Crabb's Bridge (TL 78870 10688), with 17 samples made from May 2019 to September 2021. Results are made openly available via the Water Quality Archive (Ref 15). Summary statistics and resultant WFD classification are displayed in **Table 6.**

Table 6: Summary of Physico-Chemical Parameters of the River Ter

Physico-chemical quality element	Average	Minimum/maximum	WFD Classification (2015)
pH	8.08	7.78/8.21	High
Temperature (°C)	9.57	5/15.3	High
Dissolved oxygen (% sat.)	91.5	79.6/102	Good
Ammonia (mg/l)	0.0007	0.0003/0.0011	High
Orthophosphate (mg/l)	0.3384	0.1/0.68	Poor

4.9.2 **Table 6** indicates the River Ter is slightly alkaline in nature with an average pH of 8.08 and falls within the WFD High classification, based on the 17 samples considered here. Dissolved oxygen saturation is in the High WFD

classification which suggests the waterbody is not limited by dissolved oxygen levels.

4.9.3 Ammonia levels fall within the WFD classification for High which similarly suggests pollution from organics such as sewage materials are not having a detrimental impact on the waterbody.

4.9.4 Further detail on the physico-chemical quality and chemical quality of the Ter is provided in **Table 6** and relevant discussion in ***Chapter 9: Water Environment*** **[EN010118/APP/6.1].**

5. Groundwater

5.1.1 Superficial deposits through the study area are a mixture of Lowestoft Formation (diamicton), Brickearth (clay, silt and sand), glaciofluvial deposits (sand and gravel), alluvium (clay, silt, sand and gravel), and head deposits (clay, silt and sand). The glaciofluvial and alluvium deposits are found in bands around the River Ter and Boreham Tributary. These deposits are predominantly Secondary A and Secondary undifferentiated aquifer. Secondary A aquifers comprise permeable layers that can support local water supplies and may form an important source of base flow to rivers. Secondary undifferentiated aquifers have been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

5.1.2 The Order limits are partially underlain by the Essex Gravels WFD groundwater body (ID: GB40503G00400). The area of this groundwater body mainly follows the location of watercourses including the River Ter and Boreham Tributary.

5.2 WFD Status: Essex Gravels

5.2.1 The Essex Gravels WFD waterbody is at Poor Status, with Good Quantitative Status and Poor Chemical Status. Reasons for not achieving Good Status include poor livestock and nutrient management relating to agriculture. This WFD waterbody had an Overall Water Body objective of Poor in 2015. It is not higher due to an unfavourable balance of costs and benefits. A summary of the Essex Gravels WFD status is provided in **Table 7.**

Table 7: Summary of the WFD Status of the Essex Gravels Groundwater Body

WFD Parameter	Status / Summary
Water Body ID	GB40503G000400
Water Body Name	Essex Gravels

WFD Parameter	Status / Summary
Water Body Type	Groundwater body
Water Body Area (m)	1274.639 km^2
Overall Ecological Status	**Poor**
Quantitative	**Good**
Quantitative Status Elements	***Good***
Quantitative Saline Intrusion	Good
Quantitative Water Balance	Good
Quantitative Groundwater Dependent Terrestrial Ecosystems (GWDTEs) test	Good
Quantitative Dependent Surface Water Body Status	Good
Chemical	**Poor**
Chemical Status Elements	***Poor***
Chemical Drinking Water Protected Area	Good
General Chemical Test	Poor
Chemical GWDTEs test	Good
Chemical Dependent Surface Water Body Status	Good
Chemical Saline Intrusion	Good

6. WFD Impact Assessment

6.1 Site Specific Assessment of the Scheme Against WFD Quality Elements

6.1.1 Stage 3 of the staged WFD assessment approach is to undertake a rationalised assessment of water bodies and quality elements that could be affected by proposed activities, in order to identify any areas of WFD non-compliance. Components of the Scheme and their potential impacts have been introduced along with mitigation measures in **Table 8.** The purpose of this table is to introduce the key sources of potential impacts and associated mitigation; the compliance assessment follows which considers impacts on WFD quality elements of each water body. In addition to the measures outlined in **Table 8,** there is a range of mitigation for the water environment within the Scheme, including watercourse buffers, and surface and foul water drainage strategies. Where relevant, these are discussed in the screening of the Scheme's activities and components (**Table 2**) details can also be found in ***Chapter 9: Water Environment*** **[EN010118/APP/6.1]**. The majority of

mitigation related measurements such as buffer distances and maximum length of culvert extensions are outlined and secured in ***Appendix 2A: Concept Design Appendix*** **[EN010118/APP/6.2]**. The drainage strategy mitigation is secured within ***Appendix 9C: Longfield SuDS Strategy*** **[EN010118/APP/6.2]** and ***Appendix 9D: Bulls Lodge Substation Extension: Drainage Strategy*** **[EN010118/APP/6.2]**. Construction mitigation measures are outlined in the ***OCEMP*** **[EN010118/APP/7.10].**

Table 8: Scheme components, potential impacts and associated mitigation for proposed works to water bodies scoped into this assessment

Scheme component	Potential impacts	Mitigation measures
Grid Connection Route: Underground crossing of water body – excavation of launch and receive pits to facilitate directional drilling beneath watercourse bed.	Impacts to physico-chemical quality elements from potential increase in fine sediment load and organic matter delivered to water body. Impacts to biological and physico-chemical quality elements from spillages of drill fluids or pollutants. Change to lateral connectivity of watercourse following the filling in of pits. Potential impacts from groundwater ingress to excavations.	The ***OCEMP*** and WMP **[EN010118/APP/7.10]** will be followed which outlines measures which will be taken to prevent the deposition of fine sediment or other material in, and the pollution by sediment of, any existing watercourse. This will include storage of excavated material a minimum of 20m away from the watercourse on flat land, or where this is not practicable, and it is to be stockpiled for longer than a two-week period, the material would either be covered with geotextile mats, seeded to promote vegetation growth, or runoff prevented from draining to a watercourse without prior treatment. The CEMP will be followed which outlines measures to reduce the risk of spillages. Water-based drilling fluids will be used. A frac-out risk assessment will be carried out, with site specific mitigation included appropriate to the local ground conditions. The WMP (developed as an appendix to the final CEMP) will describe measures for implementation in the event of a 'break-out' under a watercourse to minimise the risk of pollution (secured through the ***OCEMP*** **[EN010118/APP/7.10]**). Launch and receive pits will be located at least 10m from the edge of water/channel for normal flows to reduce the risk of pathways being created for runoff or pollutants to enter water bodies (see ***OCEMP*** **[EN010118/APP/7.10]**). Cables will be installed at least 1.5m below river bed level (secured in ***Appendix 2A: Concept Design Appendix*** **[EN010118/APP/6.2]**). Pits will be re-instated to previous ground levels to avoid any restriction in lateral connectivity. Following reinstatement of ground levels, the areas will be seeded to reduce the risk of runoff and fine sediments entering the watercourse. Excavations for watercourse crossings and programmed so that works are completed in the most efficient and timely manner possible. This will be detailed in the ***OCEMP*** **[EN010118/APP/7.10]**). Installation of the cables will be short term, temporary, transient and phased. Sides of excavations will be shored, the nature of which will depend on ground conditions, size, depth and purpose of excavation, which will further minimise groundwater ingress.

Scheme component	Potential impacts	Mitigation measures
Internal access tracks: Culvert extensions at ten locations, and extension of Cranham Road culvert.	Direct loss of riparian habitat. Direct loss of bed and bank habitats. Interruption to floodplain and longitudinal connectivity and associated impacts on biological communities.	Impacts will be minimised by extending existing culverts rather than constructing new, additional structures. Where feasible based upon the nature of the existing structure, the channel gradient will not be disrupted; there will be a smooth transition through the channel bed to the extension of the culvert.

6.1.2 Site-specific impacts of the Scheme on the biological, physico-chemical and hydromorphological quality elements of the Boreham Tributary and Ter surface water bodies are provided in **Table 9** and **Table 10** respectively. This assessment considers the water bodies and activities screened into the assessment (**Table 1** and **Table 2**) and the WFD quality elements identified through the scoping assessment as being at risk from the Scheme (**Table 3**). The impact assessment on the Essex Gravels groundwater body is provided in **Table 11**. The mitigation referred to in these tables forms the basis of this assessment, and the outcomes of the assessment are subject to the appropriate implementation of the mitigation measures provided.

6.1.3 WFD Impact Assessment6: WFD Impact Assessment – Construction Impacts addresses construction impacts of the Scheme, though where potential construction may have an effect that is not temporary, these are considered within the impact assessments in **Table 9** and **Table 11.**

Table 9: Impact assessment on the WFD quality elements of the Boreham Tributary water body screened into this assessment

WFD Quality Element	Source of potential impact	Mitigation	Compliance assessment
Biological Quality Elements			
Fish	Grid Connection Route: Underground cable crossings of the water body	The CEMP and WMP (see ***OCEMP*** **[EN010118/APP/7.10]**) will be followed which outline measures which will be taken to prevent the deposition of fine sediment or other material in, and the pollution by sediment of, any existing watercourse. This will include storage of excavated material a minimum of 20m away from a watercourse on flat land. The CEMP and WMP will outline measures to reduce the risk of spillages. Water-based drilling fluids will be used. A frac-out risk assessment will be carried out, with site specific mitigation included appropriate to the local ground conditions (secured through the ***OCEMP***. Launch and receive pits will be located at least 10m away from the watercourse (edge of normal flow) to reduce the risk of pathways being created for runoff or pollutants to enter water bodies. This is secured through the ***OCEMP***.	Possible harm to fish from spillages or pollution from fine sediment, drilling fluids (water based) and chemicals used during construction (e.g. fuel and hydraulic oil). Given the proposed mitigation it is not expected that there would be an impact to this quality element.
	Internal Access Tracks & Road Widening: Culvert modifications, including widening of Cranham Road culvert	The culverts are being extended rather than replaced, which will minimise impacts on fish populations.	Culvert extensions, with increased shading of the water body, may reduce potential fish passage and biological continuity through the location. This can block the exchange of individuals among populations, reduce gene flow and disrupt the ability of 'source' populations to support declining populations nearby. The majority of the minor watercourses affected were dry at the time of survey, suggesting they are limited in providing habitat for fish. It is likely that a number of the culverts are currently fairly blocked, so localised connectivity along the water body may improve following works to the culverts. The length of

WFD Quality Element	Source of potential impact	Mitigation	Compliance assessment
			culvert extensions are small in relation to existing structure lengths, a maximum of 2m (secured through Design Principles in ***Appendix 2A Concept Design Appendix*** **[EN010118/APP/6.2]**), therefore no measurable impact is expected upon this quality element.
Invertebrates	Grid Connection Route: Underground cable crossings of the water body	The OCEMP and WMP (see ***OCEMP*** **[EN010118/APP/7.10]**) will be followed which outline measures which will be taken to prevent the deposition of fine sediment or other material in, and the pollution by sediment of, any existing watercourse. This will include storage of excavated material a minimum of 20m away from the watercourse on flat land. The OCEMP and WMP will outline measures to reduce the risk of spillages. Water-based drilling fluids will be used. Launch and receive pits will be located at least 10m away from a watercourse (edge of normal flow) to reduce the risk of pathways being created for runoff or pollutants to enter water bodies (secured through the ***OCEMP***.	Possible harm to invertebrates from spillages or pollution from fine sediment, drilling fluids (water based) and chemicals used during construction (e.g. fuel and hydraulic oil). Given the proposed mitigation it is not expected that there would be an impact to this quality element.
	Internal Access Tracks & Road Widening: Culvert modifications, including widening of Cranham Road culvert	The culverts are being extended rather than replaced, which will minimise impacts on existing habitats and invertebrates.	There would be a direct loss of invertebrate habitat as a result of the culvert extensions. However, the length of culvert extensions are small in relation to existing structure lengths, a maximum of 2m (secured through Design Principles in ***Appendix 2A: Concept Design Appendix*** **[EN010118/APP/6.2]**), therefore no measurable impact is expected upon this quality element at the water body scale. It is likely that a number of the culverts are currently fairly blocked, so localised connectivity along the water body may improve following works to the culverts

WFD Quality Element	Source of potential impact	Mitigation	Compliance assessment
Macrophytes and phytobenthos	Grid Connection Route: Underground cable crossings of the water body	The ***OCEMP*** and WMP (see ***OCEMP*** **[EN010118/APP/7.10]**) will be followed which outline measures which will be taken to prevent the deposition of fine sediment or other material in, and the pollution by sediment of, any existing watercourse. This will include storage of excavated material a minimum of 20m away from a watercourse on flat land. The ***OCEMP*** and WMP will outline measures to reduce the risk of spillages. Water-based drilling fluids will be used. Launch and receive pits will be located at least 10m away from a watercourse (edge of normal flow) to reduce the risk of pathways being created for runoff or pollutants to enter water bodies (secured through the ***OCEMP*****.**	Possible smothering of macrophytes and phytobenthos from excessive fine sediment on construction runoff or drilling fluids or toxic effects from chemical pollutants that may be spilt within the Order limits. Given the proposed mitigation it is not expected that there would be an impact to this quality element.
	Internal Access Tracks & Road Widening: Culvert modifications, including widening of Cranham Road culvert	The culverts are being extended rather than replaced, which will minimise impacts on existing habitats and macrophytes and phytobenthos.	There would be a slight increase in shading of these water bodies due to the culvert extensions. However, the majority of the minor watercourses affected were dry at the time of survey, suggesting they are limited in providing habitat for macrophytes and phytobenthos combined. Therefore, no measurable impact is expected upon this quality element at the water body scale.
Physico-chemical Quality Elements			
Oxygenation conditions	Grid Connection Route: Underground cable crossings of the water body	The ***OCEMP*** and WMP will be followed (see ***OCEMP*** **[EN010118/APP/7.10]**) which outline measures which will be taken to prevent the deposition of fine sediment or other material in, and the pollution by sediment of, any existing watercourse. This will include storage of excavated material a	Possible reduction in levels of dissolved oxygen from excavation activities for launch and receive pits, which may create a source and pathway for the delivery of fine sediments and organic material to the water body. Given the proposed mitigation it is not expected that there would be an impact to this quality element.

WFD Quality Element	Source of potential impact	Mitigation	Compliance assessment
		minimum of 20m away from the watercourse on flat land, other measures will be applied if this is not practicable. Launch and receive pits will be located at least 10m from the edge of the watercourse based on normal flow extents to reduce the risk of pathways being created for runoff or pollutants to enter water bodies (see ***OCEMP* [EN010118/APP/7.10]**). A temporary drainage system will be implemented to ensure that construction site runoff to is carefully managed and excess fine sediments, that may be a vector for nutrients, are removed prior to any water being discharged to a watercourse. A Water Activity Permit from the Environment Agency may be required (refer to Section 9.7 of ***Chapter 9: Water Environment* [EN010118/APP/6.1]** for further details of permits and consents).	
Nutrient conditions	Grid Connection Route: Underground cable crossings of the water body		Possible increase in nutrient levels from excavation activities for launch and receive pits, which may create a source and pathway for delivery of nutrients to the water body. Given the proposed mitigation it is not expected that there would be an impact to this quality element.
Hydromorphological Quality Elements			
River continuity	Grid Connection Route: Underground cable crossings of the water body	No mitigation required.	No anticipated impact.
	Internal Access Tracks & Road Widening: Culvert modifications, including widening	There will be no abrupt changes in channel bed level on the entrance and exit to the culvert.	The water bodies affected the culvert locations typically hold very low flows and have been observed to be dry. They likely have limited lateral connectivity. Therefore, given the embedded mitigation and that there is an existing structure in place, there is not expected to be an impact to continuity at the water body scale.

WFD Quality Element	Source of potential impact	Mitigation	Compliance assessment
	of Cranham Road culvert		
River depth and width variation	Grid Connection Route: Underground cable crossings of the water body	No mitigation required.	No anticipated impact.
	Internal Access Tracks & Road Widening: Culvert modifications, including widening of Cranham Road culvert	There will be no abrupt changes in channel bed level on the entrance and exit to the culvert.	The water bodies affected the culvert locations are generally uniform in character with little variation in channel width and depth, which are fixed through the culverts themselves. Given the minor increase in structure length there is not expected to be an impact to continuity at the water body scale.
Structure and substrate of the river bed	Grid Connection Route: Underground cable crossings of the water body	No mitigation required.	No anticipated impact.
	Internal Access Tracks & Road Widening: Culvert modifications, including widening of Cranham Road culvert	The culverts are being extended rather than replaced, which will minimise impacts on the structure and substrate of the river bed.	The bed of the water bodies at this location are formed of silt, and do not exhibit any notable bedforms. There will be no change in the nature of the bed through the structures. Therefore, it is not expected there will be an impact on this element at the waterbody scale.

WFD Quality Element	Source of potential impact	Mitigation	Compliance assessment
Structure of the riparian zone	Grid Connection Route: Underground cable crossings of the water body	Prescribed through the OCEMP **[EN010118/APP/7.10]**, pits will be located at least 10m away from the edge of the watercourse based on normal flow extents, at this distance the vegetation assemblage will likely be a factor of the agricultural / woodland land use rather than riparian habitat. Pits will be kept minimal through use of specialised machinery; likely dimensions of the pits near water bodies would be a maximum of 2m by 2m and 2m deep (secured through the ***OCEMP***.	Loss of riparian habitat at the location of the launch and receive pits. This is not expected to present an impact to the WFD quality element given the proposed mitigation and nature of the vegetation around the crossing locations of this water body.
	Internal Access Tracks & Road Widening: Culvert modifications, including widening of Cranham Road culvert	The culverts are being extended rather than replaced, which will minimise impacts on the riparian zone.	The culvert extensions will cause loss of bank and disconnectivity with any riparian zone. However, the culverts are currently located on a highly modified channel, with limited complexity in riparian vegetation. Given the length of bank lost, a maximum of 2m (secured through Design Principles in ***Appendix 2A: Concept Design Appendix*** **[EN010118/APP/6.2]**), compared to water body length, it is not expected there will be an impact on this element at the waterbody scale.

Table 10: Impact assessment on the WFD quality elements of the Ter surface water body screened into this assessment

WFD Quality Element	Source of potential impact	Mitigation	Compliance assessment
Biological Quality Elements			
Fish	Internal Access Tracks: Culvert modifications	The culverts are being extended rather than replaced, which will minimise impacts on fish populations.	Culvert extensions, with increased shading of the water body, may reduce potential fish passage and biological continuity through the location. This can block the exchange of individuals among populations, reduce gene flow and disrupt the ability of 'source' populations to support declining populations nearby. The majority of the minor watercourses affected were dry at the time of survey, suggesting they are limited in providing habitat for fish. It is likely that a number of the culverts are currently fairly blocked, so localised connectivity along the water body may improve following works to the culverts. The length of culvert extensions are small in relation to existing structure lengths, a maximum of 2m (secured through Design Principles in ***Appendix 2A: Concept Design Appendix*** **[EN010118/APP/6.2]**), therefore no measurable impact is expected upon this quality element.
Invertebrates	Internal Access Tracks: Culvert modifications	The culverts are being extended rather than replaced, which will minimise impacts on existing habitats and invertebrates.	There would be a direct loss of invertebrate habitat as a result of the culvert extensions. However, the length of culvert extensions are small in relation to existing structure lengths, a maximum of 2m secured through Design Principles in ***Appendix 2A: Concept Design Appendix*** **[EN010118/APP/6.2]**), therefore no measurable impact is expected upon this quality element at the water body scale.

WFD Quality Element	Source of potential impact	Mitigation	Compliance assessment
			It is likely that a number of the culverts are currently fairly blocked, so localised connectivity along the water body may improve following works to the culverts
Macrophytes and phytobenthos	Internal Access Tracks: Culvert modifications	The culverts are being extended rather than replaced, which will minimise impacts on existing habitats and macrophytes and phytobenthos.	There would be a slight increase in shading of these water bodies due to the culvert extensions. However, the majority of the minor watercourses affected were dry at the time of survey, suggesting they are limited in providing habitat for macrophytes and phytobenthos combined. Therefore, no measurable impact is expected upon this quality element at the water body scale.
Physico-chemical Quality Elements			
Oxygenation conditions	Internal Access Tracks: Culvert modifications	No mitigation required.	No anticipated impact.
Nutrient conditions	Internal Access Tracks: Culvert modifications	No mitigation required.	No anticipated impact.
Hydromorphological Quality Elements			
River Continuity	Internal Access Tracks: Culvert modifications	There will be no abrupt changes in channel bed level on the entrance and exit to the culvert.	The water bodies affected the culvert locations typically hold very low flows and have been observed to be dry. They likely have limited lateral connectivity. Therefore, given the embedded mitigation and that there is an existing structure in place, there is not expected to be an impact to continuity at the water body scale.

WFD Quality Element	Source of potential impact	Mitigation	Compliance assessment
River depth and width variation	Internal Access Tracks: Culvert modifications	There will be no abrupt changes in channel bed level on the entrance and exit to the culvert.	The water bodies affected the culvert locations are generally uniform in character with little variation in channel width and depth, which are fixed through the culverts themselves. Given the minor increase in structure length there is not expected to be an impact to continuity at the water body scale.
Structure and substrate of the river bed	Internal Access Tracks: Culvert modifications	The culverts are being extended rather than replaced, which will minimise impacts on the structure and substrate of the river bed.	The bed of the water bodies at this location are formed of silt, and do not exhibit any notable bedforms. There will be no change in the nature of the bed through the structures. Therefore, it is not expected there will be an impact on this element at the waterbody scale.
Structure of the riparian zone	Internal Access Tracks: Culvert modifications	The culverts are being extended rather than replaced, which will minimise impacts on the riparian zone.	The culvert extensions will cause loss of bank and disconnectivity with any riparian zone. However, the culverts are currently located on a highly modified channel, with limited complexity in riparian vegetation. Given the length of bank lost, a maximum of 2m (secured through Design Principles in ***Appendix 2A: Concept Design Appendix*** **[EN010118/APP/6.2]**), compared to water body length, it is not expected there will be an impact on this element at the waterbody scale.

Table 11: Impact assessment of the underground water body crossings on the WFD quality elements of the groundwater body screened into this assessment

WFD Quality Element	Mitigation	Compliance assessment
Quantitative Status Elements		
Quantitative Saline Intrusion	No mitigation required	No anticipated impact
Quantitative Water Balance	Excavations for watercourse crossings and programmed so that works are completed in the most efficient and timely manner possible (see ***OCEMP*** **[EN010118/APP/7.10]**). Installation of the cables will be short term, temporary, transient and phased. Sides of excavations will be shored, the nature of which will depend on ground conditions, size, depth and purpose of excavation, which will further minimise groundwater ingress.	Potential for groundwater ingress to excavations to facilitate the cable crossing. Launch and receive pits will be dug within the superficial sand and gravel deposits where it is likely groundwater will be similar to river water level, so relatively shallow. The level of ingress would depend upon the depth of the pit, and very local geological conditions; pits dug in mostly sand and gravel could potentially have higher levels of ingress in which water levels may equalise with river level, whereas pits in more of a clayey area would have a lower level of ingress. Given the proposed mitigation, impacts would be very localised and temporary, and would not be considered significant at the water body scale.
Quantitative GWDTEs test	No mitigation required.	No GWDTEs are known to be present in the study area.
Quantitative Dependent Surface Water Body Status	Excavations for watercourse crossings and programmed so that works are completed in the most efficient and timely manner possible. This will be detailed in the ***OCEMP*** **[EN010118/APP/7.10]**. Installation of the cables will be short term, temporary, transient and phased. Sides of excavations will be shored, the nature of which will depend on ground conditions, size, depth and purpose of excavation, which will further minimise groundwater ingress.	Potential for groundwater ingress to excavations to facilitate the cable crossing. Launch and receive pits will be dug within the superficial sand and gravel deposits where it is likely groundwater will be similar to river water level, so relatively shallow. The level of ingress would depend upon the depth of the pit, and very local geological conditions; pits dug in mostly sand and gravel could potentially have higher levels of ingress in which water levels may equalise

WFD Quality Element	Mitigation	Compliance assessment
	If required, water could be returned to the watercourse following treatment to maintain flows.	with river level, whereas pits in more of a clayey area would have a lower level of ingress. Groundwater ingress to excavations would be very localised, and given the proposed mitigation, impacts would not be considered significant at the water body scale.
Chemical Status Elements		
Chemical Drinking Water Protected Area	The CEMP and WMP (see ***OCEMP*** **[EN010118/APP/7.10]**) will be followed which outline measures which will be taken to prevent leaks and spills and clean up procedures in case of leaks/spills.	The Chelmer (d/s confluence with Can) Drinking Water Protected Area (GB105037033530) is located at the south east edge of the study area. Excavations for installation of cable crossings may introduce pollutants to groundwater from equipment leaks/spills. Given the proposed mitigation, the risk of impacts are low, and would be temporary and localised, therefore there is not expected to be an impact to the Drinking Water Protected Area.
General Chemical test	The CEMP and WMP (see ***OCEMP*** **[EN010118/APP/7.10]**) will be followed which outline measures which will be taken to prevent leaks and spills and clean up procedures in case of leaks/spills. Installation of the cables will be transient and phased. Sides of excavations will be shored, the nature of which will depend on ground conditions, size, depth and purpose of excavation, which will minimise groundwater ingress. Groundwater will be removed and treated.	Excavations for installation of cable crossings may introduce pollutants to groundwater from equipment leaks/spills. Potential for groundwater ingress to excavations to facilitate the cable crossing. Launch and receive pits will be dug within the superficial sand and gravel deposits where it is likely groundwater will be similar to river water level, so relatively shallow. The level of ingress would depend upon the depth of the pit, and very local geological conditions; pits dug in mostly sand and gravel could potentially have higher levels of ingress in which water levels may equalise with river level, whereas pits in more of a clay-rich area would have a lower level of ingress.
Chemical GWDTEs test	No mitigation required.	No GWDTEs are known to be present in the study area.

WFD Quality Element	Mitigation	Compliance assessment
Chemical Dependent Surface Water Body Status	The CEMP and WMP (see ***OCEMP*** **[EN010118/APP/7.10]**) will be followed which outline measures which will be taken to prevent leaks and spills and clean up procedures in case of leaks/spills.	Excavations for installation of cable crossings may introduce pollutants to groundwater from equipment leaks/spills. Potential for groundwater ingress to excavations to facilitate the cable crossing. Launch and receive pits will be dug within the superficial sand and gravel deposits where it is likely groundwater will be similar to river water level, so relatively shallow. The level of ingress would depend upon the depth of the pit, and very local geological conditions; pits dug in mostly sand and gravel could potentially have higher levels of ingress in which water levels may equalise with river level, whereas pits in more of a clayey area would have a lower level of ingress. Given the mitigation will follow best practice, and any impacts to the water quality of groundwater would be temporary and minimal, no anticipated impacts to this quality element are expected.
Chemical Saline Intrusion	No mitigation required.	No anticipated impact.

7. Construction Impacts

7.1 Potential Construction Phase Risks

7.1.1 There are a number of general adverse impacts to the water environment which may occur from construction activity, including:

a) Pollution of surface or groundwater due to deposition or spillage of soils, sediment, oils, fuels, or other construction chemicals, or through uncontrolled site run-off;

b) Temporary impacts on sediment dynamics and hydromorphology within watercourses and waterbodies, where new crossings are required due to construction works to lay cables, or where culverting is required for new access tracks;

c) Temporary changes in flood risk from changes in surface water runoff and exacerbation of localised flooding, due to deposition of silt, sediment in drains and ditches;

d) Temporary changes in flood risk due to the construction of solar PV panels, site compound and storage facilities, which alter the surface water runoff from the Order limits; and

e) Potential impacts on local water supplies.

7.1.2 Further details are provided in ES ***Chapter 9: Water Environment*** **[EN010118/APP/]*.***

7.2 Construction Mitigation

7.2.1 The construction will take place in accordance with a CEMP. The CEMP details the measures that would be undertaken during construction to mitigate the temporary effects on the water environment. The ***OCEMP*** **[EN010118/APP/7.10]**) has been developed and will be finalised in advance of construction works by the Principal Contractor.

7.2.2 The CEMP will comprise good practice methods that are established and effective measures to which the development will be committed to by a requirement under the DCO. An ***OCEMP*** has been prepared for the purpose of the Application. The measures within the CEMP will focus on managing the risk of pollution to surface waters and the groundwater environment, but also considers other issues such as flood risk.

7.2.3 Construction of the Scheme will need to be in accordance with the CEMP and that document will describe, amongst other things, the principles for the protection of the water environment during construction. The CEMP will be supported by a WMP that will provide greater detail regarding the mitigation to be implemented to protect the water environment from adverse effects during construction.

7.2.4 Good Practice Guidance is summarised in ***Chapter 9: Water Environment*** **[EN010118/APP/6.1]** of the Environmental Statement, which includes information on:

a) Permissions and Consents;

b) Management of Construction Site Runoff;

c) Management of Construction Site Spillage Risk; and

d) Management of Flood Risks.

7.2.5 It is anticipated that all WFD construction risks could be adequately mitigated with appropriate planning and management.

8. Assessment of the Proposed Development Against WFD Objectives

8.1 Assessment of the Scheme against Water Body Mitigation Measures

8.1.1 The EA identifies mitigation measures for water bodies, which are actions that can be implemented to protect and improve the water environment and help achieve the objectives for each RBMP. This section of the assessment considers the nature of the measures identified by the EA for each water body and assesses whether the Scheme may prevent such measures being implemented. However, given that specific measures for each water body have not yet been provided in response to a data request, the Scheme has been appraised against measures identified for the relevant operational catchment; namely the Chelmer operational catchment for the Boreham Tributary and the Ter water bodies, which are available via the Catchment Data Explorer (Ref 5). This appraisal is presented in **Table 12.**

Table 12: Appraisal of the Scheme against the delivery of measures identified for the Chelmer operational catchment scoped into this assessment

Measure theme	Further detail on measure	Appraisal of the Scheme
The control or manage point source inputs	Install nutrient reduction to mitigate impacts on receptor	The drainage strategy for the Scheme (***Appendix 9C: Longfield SuDS Strategy*** and ***Appendix 9D: Bulls Lodge Substation Extension: Drainage Strategy*** **[EN010118/APP/6.2]**) would ensure no negative effects on nutrient pathways, as existing drainage would be mimicked, and the change in land use may result in a decrease in the production of

		source inputs. Therefore, the Scheme would not impact the implementation of this measure.
To control or manage diffuse source impacts	Reduce diffuse pollution pathways (surface run-off and drainage management)	The drainage strategy for the Scheme (***Appendix 9C: Longfield SuDS Strategy*** and ***Appendix 9D: Bulls Lodge Substation Extension: Drainage Strategy*** **[EN010118/APP/6.2])**, would ensure no negative effects on nutrient pathways, as existing drainage would be mimicked, and the change in land use may result in a decrease in the production of source inputs. Therefore, the Scheme would not impact the implementation of these measures.
	Reduce diffuse pollution at source- nutrients	
	Reduce diffuse pollution at source- arable soils	
	Reduce diffuse pollution at source- livestock	
	Reduce diffuse pollution at source- pesticide management	
To improve modified habitat	Remove or ease barriers to fish migration to enable fish passage	The Scheme, aside from minor culvert activities on seasonal drainage channels, will not interact directly with river channels. Therefore, the Scheme would not impact the implementation of these measures.
	Increase in-channel morphological diversity to improve condition of the channel	
	Plant new vegetation	

8.2 Assessment against WFD objectives

8.2.1 The compliance of the Scheme is determined based upon an assessment against the following objectives relating to WFD quality elements, including biological, physico-chemical and hydromorphological quality elements:

a) Enhance the status and prevent further deterioration of surface water bodies, groundwater bodies and their ecosystems;

b) Ensure progressive reduction of groundwater pollution;

c) Reduce pollution of water, especially by Priority Substances and Certain Other Pollutants (Annex II, Environmental Quality Standards (EQS) Directive (2008/105/EC) as amended);

d) Contribute to mitigating the effects of floods and droughts;

e) Achieve at least good surface water status for all surface water bodies and good chemical status in groundwater bodies by 2015 (Article 4, Water Framework Directive (WFD) (2000/60/EC)) (or good ecological potential in the case of artificial or heavily modified water bodies); and

f) Promote sustainable water use.

8.2.2 The WFD compliance assessment for the proposed Scheme is summarised in **Table 13**. The Scheme is expected to be compliant with the objectives of the WFD.

Table 13: Compliance Assessment of the Scheme

Compliance Elements	Water body assessment	Groundwater body assessment
Water body name and ID	Boreham Tributary (GB105037033910), Ter (GB105037033940)	Essex Gravels (GB40503G000400)
Enhance the status and prevent further deterioration of surface water bodies, groundwater bodies and their ecosystems	The Scheme is not anticipated to cause a deterioration in status.	The Scheme is not anticipated to cause a deterioration in status.
Ensure progressive reduction of groundwater pollution	The Scheme and associated mitigation includes a number of measures to minimise the risk of pollution to water bodies, and therefore will not present a barrier to meeting this objective.	The Scheme and associated mitigation includes a number of measures to minimise the risk of pollution to water bodies, and therefore will not present a barrier to meeting this objective.
Reduce pollution of water, especially by Priority Substances and Certain Other Pollutants	The Scheme and associated mitigation includes a number of measures to minimise the risk of pollution to water bodies, and therefore will not present a barrier to meeting this objective	The Scheme and associated mitigation includes a number of measures to minimise the risk of pollution to water bodies, and therefore will not present a barrier to meeting this objective
Contribute to mitigating the effects of floods and droughts	Flood risk is not increased to the development or elsewhere, refer to ***Appendix 9A: Flood Risk Assessment*** **[EN010118/APP/6.2]**). The Scheme will not require a formal water supply or water abstractions.	Flood risk is not increased to the development or elsewhere, refer to ***Appendix 9A: Flood Risk Assessment*** **[EN010118/APP/6.2]**). The Scheme will not require a formal water supply or water abstractions.
Achieve at least good surface water status for all surface water bodies and good chemical status in groundwater bodies by 2015 (or good ecological potential in the	The Scheme and associated mitigation would contribute to the water body achieving Good Ecological Status and would not impede delivery of objectives.	The Scheme and associated mitigation would not prevent the water body reaching Good Status.

Compliance Elements	Water body assessment	Groundwater body assessment
case of artificial or heavily modified water bodies)		
Promote sustainable water use	The Scheme does not require a formal water supply or abstractions and includes buffers to development around watercourses to enable natural processes to continue.	The Scheme does not require a formal water supply or abstractions and includes buffers to development around watercourses to enable natural processes to continue.

8.3 Conclusion

8.3.1 This assessment has considered the potential impacts and associated mitigation of the Scheme in relation to the WFD quality elements of the Boreham Tributary and Ter surface water bodies and the Essex Gravels groundwater body.

8.3.2 The assessment demonstrates that the Scheme is compliant with the objectives of the WFD: it would not cause deterioration in status of the water bodies and would not prevent the water bodies achieving Good Ecological Status. The Scheme also contributes to the delivery of WFD objectives.

9. Enhancement Opportunities

9.1.1 A number of high-level enhancement opportunities have been considered for the water bodies within this assessment. The opportunities consider the baseline conditions of the water bodies and mitigation measures for the relevant operational catchment.

9.1.2 It is likely that implementation of enhancement opportunities may be limited to water bodies where a significant length of the watercourse is within the Order land, therefore opportunities for enhancement have focussed on Boreham Tributary, and are presented in **Table 14**. It is noted that these enhancement opportunities do not form the basis of the assessment outcome, but they may be available for implementation, to provide further enhancements to water bodies in the study area, in line with the objectives of the WFD. However, it should be noted that this strategy is not relied upon as mitigation for the impact assessment presented within this chapter

Table 14: Potential enhancement opportunities: Boreham Tributary

Water body	Enhancement opportunities
Boreham Tributary	Development of a robust buffer strip, to reduce agricultural runoff, fine sediment and nutrient delivery to the water body from the adjacent arable fields.
	Riparian planting.

Creation of local inset floodplain areas adjacent to the channel to provide diversity in wetted habitat.

9.1.3 In addition, a ***Biodiversity Design Strategy*** is included as ***Appendix B*** to the ***Design Statement*** **[EN010118/APP/7.3]** to illustrate the design approaches that could be incorporated to further enhance biodiversity on and around the Longfield Solar Farm. As set out in the Draft Development Consent Order **[EN010118/APP/3.1]**, Requirement 9 will necessitate the submission and approval of a detailed Landscape and Ecology Management Plan (LEMP) to deliver the provisions as set-out out in the ***Outline LEMP (OLEMP)*** **[EN010118/APP/7.13]** and to confirm how any approaches and measures set out in the Biodiversity Design Strategy have been incorporated into the design. This may include waterscape enhancements. The Applicant will also collaborate with an academic partner to develop a biodiversity trial area within Project. It is the Applicant's ambition that this would add to the accumulated knowledge on biodiversity enhancements and land use at solar farms and help to inform the solar industry, including other future schemes.

10. References

Ref 1 Official Journal of the European Communities (2000) Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy

Ref 2 The Water Environment (Water Framework Directive) (England Wales) Regulations (2016)

Ref 3 The Planning Inspectorate (2017) The Water Framework Directive - Advice note eighteen: The Water Framework Directive.

Ref 4 Environment Agency (2016) Water Framework Directive risk assessment: How to assess the risk of your activity.

Ref 5 Environment Agency Catchment Data Explorer website

Ref 6 Defra's Multi Agency Geographical Information for the Countryside website

Ref 7 Historic mapping: National Library of Scotland

Ref 8 Natural England Citation for the River Ter SSSI

Ref 9 British Geological Survey Borehole and online mapping

Ref 10 Soilscapes website

Ref 11 Bing Maps

Ref 12 National River Flow Archive website

Ref 13 Met Office website

Ref 14 Environment Agency Fish and Ecology Data Explorer.

Ref 15 Environment Agency Water Quality Archive.