River Thames Scheme

Protecting our communities
Securing our economy
Enhancing our Thames

River Thames Scheme

Preliminary Environmental Information Report
Volume 2: Preliminary Environmental Information Report

January 2024

View of the River Thames at Laleham Park looking south towards the M3 crossing

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1 Introduction

1.1 Overview

1.1.1.1 Working in Partnership we, the Environment Agency and Surrey County Council, are together delivering the River Thames Scheme (hereafter referred to as 'RTS' or 'the project').

1.1.1.2 The RTS represents a new landscape-based approach to creating healthier, more resilient, and more sustainable communities. The RTS is an integrated project which responds to the challenges of flooding, creates more access to green open spaces and sustainable travel routes, encourages inclusive economic growth, and responds to the dual challenges of climate change and nature recovery (restoring, enhancing, and protecting natural habitats, their plant and animal communities and biodiversity).

1.1.1.3 A major new piece of blue (water-based) and green (land-based) infrastructure, the project is classified further to a direction made by the Secretary of State (SoS) dated 24 December 2020 as an infrastructure project of national significance, and that must be consented by Development Consent Order (DCO) in accordance with the Planning Act 2008 (PA2008).

1.1.1.4 This Preliminary Environmental Information Report (PEIR) follows on from the Environmental Impact Assessment (EIA) Scoping Report that we prepared for the RTS, issued in October 2022, and is based on the EIA Scoping Opinion from the Planning Inspectorate (PINS), on behalf of the Secretary of State, received in November 2022. The PEIR and ongoing EIA is also informed by feedback from extensive previous engagement with designated stakeholders and the public, including the second public consultation on the River Thames Scheme undertaken for six weeks from 8 November 2022 to 20 December 2022 (hereafter referred to as 'the second public consultation').

1.1.1.5 The PEIR documents our preliminary assessment of likely significant environmental effects of the RTS. It provides the information reasonably required for consultees to develop an informed view of the likely significant effects of the project (as understood at this stage of its development). It forms a key consultation tool for the DCO statutory

consultation by providing an update on the ongoing EIA, consultation, and design of the RTS.

1.2 Background

1.2.1.1 We are committed to supporting sustainable growth in the area, connecting communities, and creating an environment where people, businesses and wildlife can thrive.

1.2.1.2 The River Thames between Egham and Teddington runs through the largest area of undefended flood plain in England. There is little to no flood resilience in place for this area. In addition to the towns and villages in this area, the landscape has been heavily shaped by major infrastructure and extensive mineral workings. This has resulted in an area in which many homes and businesses are at risk of flooding, within a landscape that suffers from visual barriers and physical constraints preventing open space from being used to its full potential.

1.2.1.3 A major flood would put thousands of homes, businesses, and commercial spaces at risk. It would also cause risk to life and severe disturbance to local communities plus disruption on both nationally and locally significant road and rail routes including sections of the M25 and M4, and the Staines to Windsor and Waterloo to Reading railway lines. Several major drinking water abstractions supplying south-east England, and up to 20 local electricity sub-stations would also be affected by a major flood, resulting in disruption to homes and businesses. With climate change, larger and more frequent floods are likely to be experienced in the future, which will have an even greater impact on communities, infrastructure, and the economy.

1.2.1.4 Plate 1-1 (below) shows the flooding at Runnymede M25 junction 13 during flooding in 2014. The Egham By-Pass is submerged by flood water as is the area around the Runnymede Hotel and fields beyond.

Plate 1-1: Flooding at Runnymede (M25 junction 13) in 2014

1.2.1.5 Through extensive studies led by the Environment Agency, we have concluded that the preferred approach to flood risk management in the Lower Thames Area is to improve conveyance and reduce flood risk through construction of a flood relief channel, plus other capacity improvements in the River Thames downstream of the new flood relief channel. These studies are documented in the Lower Thames Flood Risk Management Strategy (LTFRMS) (Environment Agency, 2009), and this has led to the evolution of the RTS.

1.2.1.6 The RTS will reduce flood risk from main rivers in areas of the River Thames floodplain between Datchet and Teddington, particularly in the areas between Hythe End and Shepperton and the settlements of Staines, Egham Hythe, Chertsey, Laleham and Shepperton. The project will reduce the risk of flooding to approximately 11,000 homes, 1,600 businesses, plus existing nationally significant infrastructure including highways, railways, and utilities, as well as heritage and ecological sites.

1.2.1.7 The flood relief channel will work most effectively in moderately sized floods like the 1 in 20 annual chance flood, similar to the 2003 and 2014 floods. These are the conditions where the channel will give the greatest reductions in flood levels. The area around Penton Hook at the upstream end of the Runnymede channel will have the greatest reduction in water levels (of between 0.4m to 0.9m reduction in levels depending on the size of the flood). Information on the background, development, testing, and

confidence in our modelling of river flooding is presented in our Flood Modelling Report Non-Technical Summary (WBi, 2023).

1.2.1.8 We are continuing to work on the landscape and green infrastructure design of the RTS. The aim of this design, once constructed, is to further enhance the health of communities, and encourage sustainable growth through the provision of improved access to green and blue open spaces and an improved active travel network. It will also provide new and enhanced areas for wildlife.

1.3 RTS Vision

1.3.1.1 The RTS project vision is “to reduce flood risk to people living and working near the River Thames, enhance the resilience of nationally important infrastructure, contribute to a vibrant local economy and maximise the social and environmental value of the River Thames”. To achieve the project vision, we have identified the following goals:

- Reduce flood risk to dwellings, businesses, and infrastructure;
- Provide better access to green open spaces, connection with wildlife and more sustainable travel network;
- Create a network of high-quality habitat and achieve biodiversity net gain;
- Facilitate sustainable and inclusive economic growth; and
- Enable delivery and design that contributes to the achievement of Environment Agency, Surrey County Council and Partner climate goals relating to carbon use.

1.4 Overview of the Project

1.4.1.1 A major new piece of blue and green infrastructure, each part of the RTS will work together to deliver benefits for communities. A new flood channel will reduce the risk of flooding to homes, businesses, and infrastructure, while also providing habitat for wildlife and a new feature in the landscape. Areas of publicly accessible green and blue open space next to the flood channel are under consideration for recreation and connecting with nature. New or improved active travel provision will run along the flood channel corridor and areas of enhanced public connection will link the project with communities and provide better connections across the area.

Improved habitat will connect with existing wildlife sites and corridors to provide a new nature recovery network.

1.4.1.2 The RTS will significantly reduce flood risk from main rivers in the areas between Hythe End and Shepperton and the settlements of Staines, Egham Hythe, Chertsey, Laleham and Shepperton. Flood risk will also be reduced in all areas of the fluvial River Thames between Shepperton and Teddington. Furthermore, many properties in the River Thames floodplain in the Royal Borough of Windsor and Maidenhead (RBWM) will have a small reduction in flood risk from the channel sections constructed in Surrey as the benefits extend some way upstream. The RTS will reduce the risk of flooding to approximately 11,000 homes, 1,600 businesses and reduce the risk to existing nationally significant infrastructure, including highways, railways and utilities, as well as heritage and ecological sites.

1.4.1.3 As with all flood alleviation schemes, the risk of flooding is not removed but it is reduced to levels which make communities more resilient for the future. For the RTS the amount of change to the standard of flood protection as a result of the project will vary depending on where you are located within the floodplain. With climate change the background level of flood risk will increase. The RTS will continue to reduce risk throughout its operation, albeit against a changing background of flood risk in the area as a result of climate change.

1.4.1.4 For the PEIR, the area within the project boundary is the pink shaded area shown in Plate 1-2 which includes a large corridor of land south of the River Thames and north of the M3 between Thorpe and Chertsey, and north of the River Thames between Chertsey and Shepperton; as well as separate areas around Sunbury, Molesey and Teddington weirs, plus land south of Island Barn Reservoir and south of Virginia Water. Certain aspects of the RTS design are shown and labelled on Plate 1-2, including the Runnymede Channel (shaded in purple), the Spelthorne Channel (shaded in orange), a section of the River Thames where bed lowering is planned, and Sunbury Weir, Molesey Weir and Teddington Weir where flow capacity improvements are proposed. Landscape and green infrastructure opportunities are proposed across many parts of the pink shaded area within the project boundary for EIA PEIR. The project boundary will be reviewed as the design and EIA progress.

1.4.1.5 An overview of the main features of the RTS, including the project boundary for the EIA PEIR, are shown in Figure 2.1. A full description of the project is provided in Chapter 2 (Project Description).

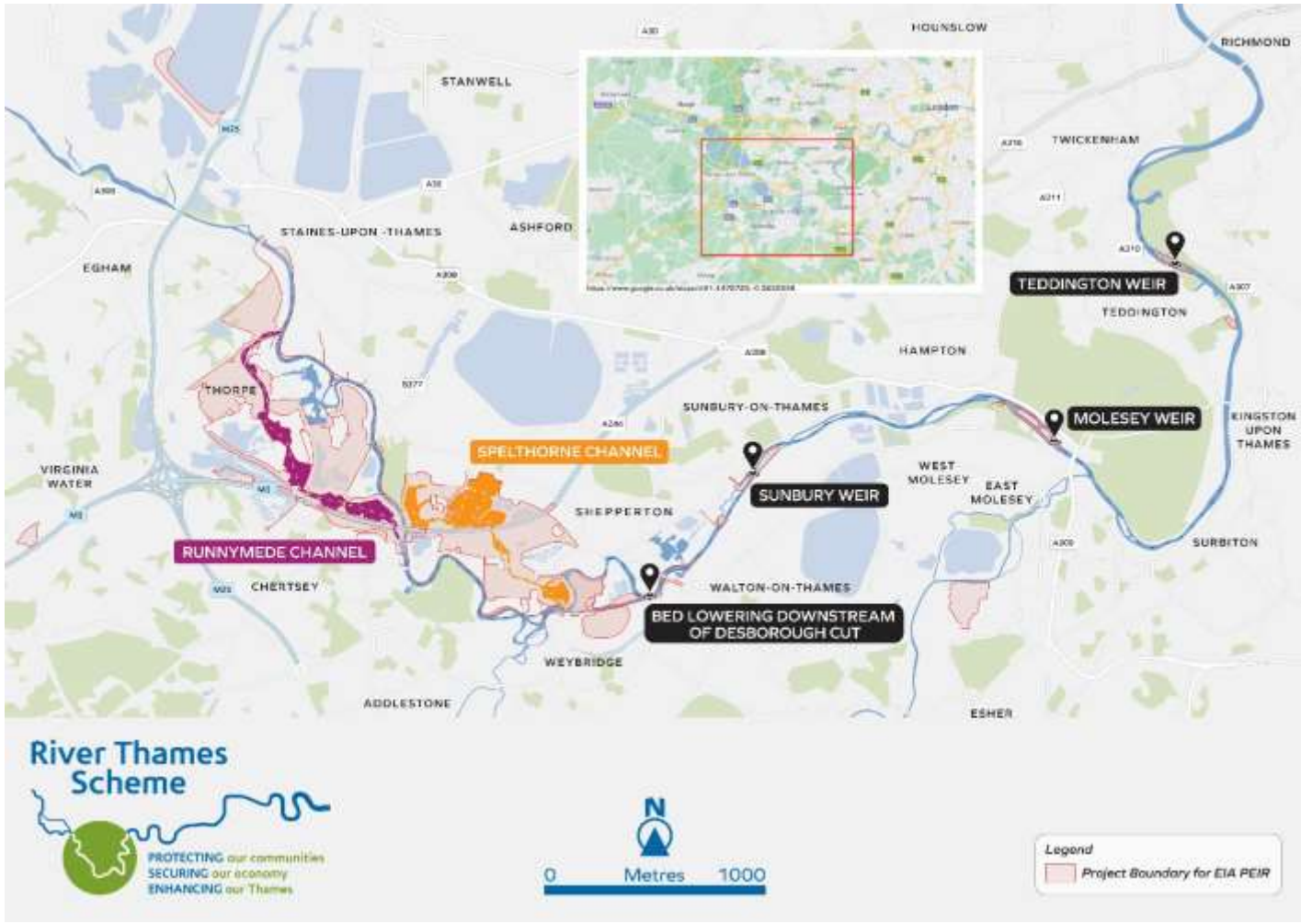

Plate 1-2: Overview of the RTS

1.5 Purpose of the PEIR

1.5.1.1 The PEIR follows on from the EIA Scoping Report, issued in October 2022, and is based on the EIA Scoping Opinion from PINS, on behalf of the SoS, received in November 2022. The PEIR and ongoing EIA is also informed by feedback from extensive previous engagement with designated stakeholders and the public, including the second public consultation.

1.5.1.2 The PEIR has been produced to support the statutory consultation process under PA2008 to comply with Regulation 12 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.

1.5.1.3 In this regulation, preliminary environmental information is defined as:

"*information referred to in regulation 14(2) which:*

(a) has been compiled by the applicant; and
(b) is reasonably required for the consultation bodies to develop an informed view of the likely significant environmental effects of the development (and of any associated development)".

1.5.1.4 The PEIR has been prepared in accordance with PINS (2020) Advice Note Seven: *Environmental Impact Assessment: Process, Preliminary Environmental Information and Environmental Statements.*

1.5.1.5 The PEIR documents our preliminary assessment of likely significant environmental effects of the RTS. Effects reported within this PEIR are considered a 'worst case' as a precautionary approach has been taken in instances where design, construction or baseline information is incomplete, for example, if further surveys are required. The detailed process that we have used to inform the production of the PEIR is explained in Chapter 4 (Approach to the Environmental Assessment).

1.5.1.6 The PEIR forms a key consultation tool for the DCO statutory consultation by providing an update on the ongoing EIA, consultation, and design of the RTS. Feedback from statutory consultation will be used to further develop the project design and produce the Environmental Statement (ES), which will form part of the DCO Application.

1.5.1.7 It should be noted that there is a clear separation of responsibilities and an information barrier in place between the officers advising and

promoting the RTS on behalf of the applicant and the officers who will perform a regulatory function within Surrey County Council and the Environment Agency as part of the PA2008 process and in performing duties under the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.

1.6 Structure of the PEIR

1.6.1.1 The PEIR is presented in four volumes:

Volume 1 – Non-Technical Summary

1.6.1.2 The Non-Technical Summary provides a summary of the PEIR findings in non-technical language.

Volume 2 – The PEIR

1.6.1.3 Volume 2 contains the findings of the PEIR in full and is structured as follows:

- Chapter 1 (Introduction);
- Chapter 2 (Project Description);
- Chapter 3 (Consideration of Alternatives); and
- Chapter 4 (Approach to the Environmental Assessment).

1.6.1.4 Together Chapters 1 to 4 introduce the project, describe the details of the project, explain the alternatives to the project that have been considered, and the approach taken to the environmental assessment.

- Chapter 5 (Site Description): provides a summary of the baseline for each environmental topic chapter;
- Chapters 6 to 18 (environmental topic assessments): present a preliminary assessment of the likely significant environmental effects of the project in relation to specific environmental topics. The 13 topics included are: Air Quality; Biodiversity; Climatic Factors; Cultural Heritage, Archaeology and Built Heritage; Flood Risk; Health; Landscape and Visual Amenity; Materials and Waste; Noise and Vibration; Socio Economics; Soils and Land; Traffic and Transport; and Water Environment;
- Chapter 19 (Cumulative Effects Assessment): considers the potential inter-project (the project interacting with other developments) and

intra-project (effects occurring between the different topics as a result of the project) cumulative effects;

- Chapter 20 (Stakeholder Engagement): provides an overview of engagement planning, the breadth of past stakeholder engagement, how engagement has informed the project design and EIA scoping and proposed future engagement activities;
- Chapter 21 (Next Steps): outlines the remainder of the EIA process;
- Chapter 22 (References): a full reference list for the PEIR;
- Chapter 23 (Abbreviations): a schedule of abbreviations used in the PEIR; and
- Chapter 24 (Glossary): an explanation of terms used in the PEIR to aid reader comprehension.

Volume 3 – Figures

1.6.1.5 Volume 3 contains figures that support Volume 2.

Volume 4 – Appendices

1.6.1.6 Volume 4 contains technical appendices that support Volume 2.

2 Project Description

2.1 The Proposed Development

2.1.1 Overview

2.1.1.1 The River Thames Scheme (RTS) ('the project') is a significant new piece of green and blue infrastructure that will comprise a range of new features working together to deliver its goals. This will include the following project components (also summarised on Figure 2.1):

- A new flood channel in two sections, through the boroughs of Runnymede and Spelthorne in Surrey. Permanent flood channel associated features include flow and water level control structures, flood embankments, erosion prevention, bridges and permanent site compounds for maintenance of the flood channel. The channel will include planting for wildlife;
- Capacity improvements to the River Thames through bed lowering for approximately one kilometre downstream of Desborough Cut (in the boroughs of Spelthorne and Elmbridge) and upgrades to Sunbury Weir (in the borough of Elmbridge), Molesey Weir (on the boundary between the boroughs of Elmbridge and the London Borough of Richmond upon Thames (LBRUT)) and Teddington Weir (within the LBRUT);
- New green (land based) and blue (water based) open spaces are being considered associated with the flood channel, with access for local communities and facilities such as sports fields, accessible pathway networks, nature play spaces and raised landforms that are both sculptural as well as functional;
- Priority areas for habitat creation, enhancement or mitigation, which link with existing and new wildlife corridors, improve fish passage and build upon the network of existing wildlife sites;
- New or improved active travel provision and places for recreational access, which may be along and across the flood channel corridor and new open spaces, with connections to the existing network and two new pedestrian and cycle bridges across the River Thames at Chertsey and Desborough Island;
- Utilities and highways alterations and diversions; and

- Temporary construction features such as site compounds and materials processing and storage sites.

2.1.2 Design Parameters and Assumptions

2.1.2.1 We are still developing the design, which continues to be informed by consultation and ongoing technical surveys and assessments. As such, an understanding of the potential environmental impacts of the RTS is still being developed and the information provided within this Preliminary Environmental Information Report (PEIR) is preliminary. It may be subject to change prior to the production of the Environmental Statement (ES), as the design and assessment work develops.

2.1.2.2 In order to ensure a robust assessment on the current project design, we are following the Environmental Impact Assessment (EIA) guidance contained in Planning Inspectorate (PINS) Advice Note Nine: 'Rochdale Envelope' (PINS, 2019a), regarding the degree of flexibility that will be considered appropriate in order to address uncertainties within an application for development consent under the Planning Act 2008 (PA2008) process. The guidance states that the assessment of likely significant effects should establish relevant parameters (i.e. assumptions) for the purposes of the assessment "likely to result in the maximum adverse effect (the worst-case scenario) and be undertaken accordingly to determine significance".

2.1.2.3 The environmental baseline and assessments we present in this PEIR are based on design parameters for the construction and operation of the RTS that we set in March 2023, particularly in terms of the maximum or minimum dimensions of structures and ranges of potential uses and locations. The use of design parameters is required at this stage of the project to enable environmental assessments, consultation responses and technical considerations of the emerging design to further inform the proposals. The design parameters are described in the following sections of Chapter 2 and shown on Figure 2.1 of this PEIR. The design parameters for our EIA PEIR build on those we set for our EIA Scoping Report in 2022; we have identified in Section 2.4 which of these were updated.

2.1.2.4 The design of the project has progressed since March 2023, with the Design for Statutory Consultation being confirmed in October 2023. The

maximum parameters of the Design for Statutory Consultation presented in the Statutory Consultation brochure are almost entirely the same as those previously set for the PEIR, with two matters of deviation, being a reduction in the number of new green open spaces (NGOS) considered and some small additions to the project boundary; we have reviewed these differences and have verified that they do not change the assessment of likely significant effects reported in this PEIR.

2.1.2.5 Appendix 2.1 of this PEIR sets out an analysis of these changes and their impact to the PEIR assessments and conclusions, concluding that the PEIR still remains robust with those changes taken into account.

2.1.2.6 As the EIA process continues, we will continue to refine the design parameters as we progress the design and assessments to inform the DCO application.

2.1.3 Flood Channel

2.1.3.1 The project provides a new flood channel in two sections. The Runnymede Channel will be approximately 4.8 kilometres in length, and the Spelthorne Channel will be approximately 3.2 kilometres in length. The proposed route of the flood channel and the features it intersects are shown on Figure 2.1 of this PEIR. Plate 2-1 is an image of the Jubilee River, a flood channel from the River Thames between Maidenhead and Eton, which provides an impression of how the flood channel will look.

Plate 2-1: An image of the Jubilee River, which provides an impression of how the flood channel will look

2.1.3.2 The Runnymede Channel will start at Egham Hythe and end at Chertsey. The intake to the flood channel will be on the right bank of the River Thames (i.e. the right-hand side when facing downstream). It will pass under the A320 Chertsey Lane, then through agricultural fields before heading south under Green Lane and joining the existing course of the Mead Lake Ditch. From then, it passes through five existing lakes (lake south of Green Lane, lake south of Norlands Lane 1, Fleet Lake and Abbey Lake (the latter two being part of the Thorpe Park Resort). It will then pass under Staines Road (also part of the A320) through Abbey 2 lake towards Abbey Meads, and through the existing Burway Ditch M3 flood culverts, returning to the River Thames just south of the M3 motorway and downstream of Chertsey Weir.

2.1.3.3 The Spelthorne Channel will leave the left bank (i.e. the left-hand side when facing downstream) of the River Thames at Laleham, approximately 0.4 kilometres upstream of the outlet of the Runnymede Channel and Chertsey Weir, and north of the M3 motorway. The flood channel will follow an easterly route through three existing lakes (Littleton North, Littleton East and Sheepwalk 2) and pass under two local roads (Thames Side and Littleton Lane) before turning south underneath the M3 motorway. The flood channel route continues through open land at

Sheepwalk and Manor Farm and will pass under a further three local roads (Sheep Walk, Renfree Way and Ferry Lane) and through Ferry Lane Lake (also known as Ferris Meadow Lake) before re-joining the River Thames (refer also to Chapter 3: Consideration of Alternatives). The outlet to the River Thames is opposite D'Oyly Carte Island, just upstream of Desborough Island, and downstream of Shepperton Weir.

2.1.3.4 The channels will be created by linking together existing lakes formed by historical gravel workings. The new connecting channel sections will generally be 20 metres to 50 metres wide, depending on engineering and environmental constraints (and up to 94 metres wide at the fixed weir water level control structures). During flood conditions, the water level will be between three and four metres deep and will transfer up to 150m^3/s of water.

2.1.3.5 In non-flood conditions the gates in the flow control structures located at the inlet of each channel section intake will be closed. However, the new channels will not be "dry", as the water level in the channels will be maintained by the control structures. The intention will be for water levels to match the existing typical groundwater levels, with an average depth of water of two to three metres. Furthermore, there will be a small, continuous flow into the flood channels that will be limited to 1m^3/s (known as the 'augmented flow'). In-channel water level control structures will, alongside the augmented flow, maintain the water levels within the flood channel and provide for fish passage through the channel. This is a legal requirement to prevent stranding of fish that end up in the flood channel e.g. after a flood event.

2.1.3.6 The flood channels will comprise new sections of engineered channels connecting existing lakes, passing through the following ground conditions:

- Natural ground;
- Reworked natural ground and made ground with some man-made material (e.g. bricks and rubble); and
- Existing or historic landfill sites.

2.1.3.7 The shape of the flood channel will vary according to the ground conditions or lake that it passes through. The width of the channel will be minimised where possible given engineering and environmental

constraints to avoid excess excavation and the processing of material. The new channel will include in-channel and riparian habitat and a wider and softer landscape channel edge where ground and other constraints allow.

Channels through natural ground and made ground

2.1.3.8 Where the channel passes through natural ground or made ground it will be excavated to create ‘natural’ looking trapezoidal cross-sections; this is possible in several locations across approximately 0.5 kilometres of the Runnymede Channel and 0.2 kilometres of the Spelthorne Channel. Locations of the channel through natural ground and made ground can be seen in Figure 2.1.

2.1.3.9 The trapezoidal sections through natural ground and made ground will be approximately 45 metres wide, three to four metres deep (depending on the location) with an average water depth (in a non-flood scenario) of two to three metres. The trapezoidal channel sections will typically be unlined and have been identified as the areas with the most potential to include in-channel and riparian habitats and/ or softer landscaping of the flood channel.

2.1.3.10 The majority of channel in these areas will be excavated through topsoil and sub-soil into the underlying (Shepperton) gravels. These gravels will form the bed of the flood channel, lying anywhere between one and two metres below existing groundwater levels.

2.1.3.11 Plate 2-2 below shows an indicative cross-section through natural ground or made ground for both the Runnymede and Spelthorne Channels. In Plate 2-2, the left bank of the channel is gently sloping with marginal herbaceous vegetation extending from the water, and a tree is shown on the higher ground. The right bank is steeper, but also with herbaceous vegetation extending from the water. There are opportunities for improved active travel alongside the channel edge. Approximately 20 metres from the channel is a band of taller shrubby vegetation; this is approximately 30 metres wide. To the right of this is a three metre wide maintenance access track, flanked by a line of trees to its right.

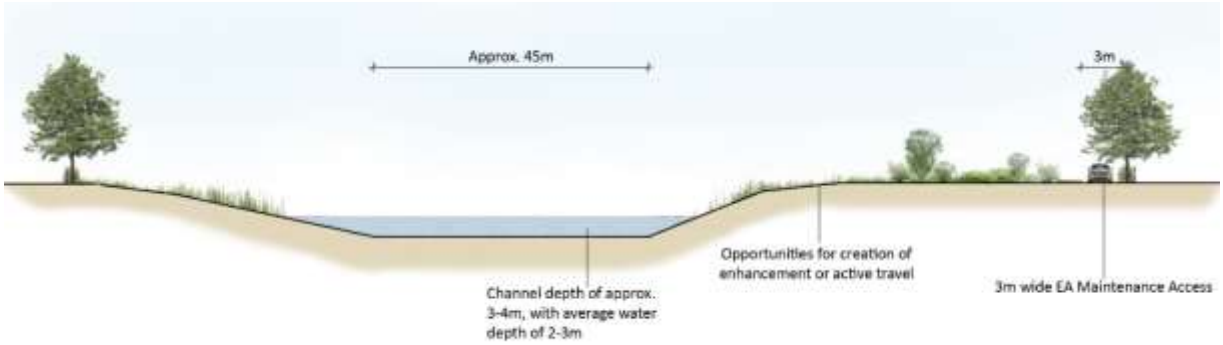

Plate 2-2: Cross-section example of a typical section of the 'natural' looking trapezoidal channel showing softer slopes with river edge habitat.

Channels through landfill sites

2.1.3.12 Sections of the flood channel that pass through existing and historic landfill sites will be extensively engineered with vertical sheet piled sides. The sections of channel in landfill sites will be approximately 0.9 kilometres in length in the Runnymede Channel and 1.2 kilometres in length in the Spelthorne Channel. Locations of the channel through known and expected landfill sites can be seen in Figure 2.1.

2.1.3.13 The channel will be approximately 20 metres wide and four metres deep in these sections of channel. The water depth in these sections of channel will be approximately two to three metres in non-flood conditions. The sheet piled sides of the channel will be driven into the ground from the existing ground level, and an impermeable bed will be in place to isolate the channel from landfill. Where possible, planted edges would be formed to give the channel a more 'natural' appearance (such as in Plate 2-2).

2.1.3.14 Plate 2-3 shows an indicative cross-section through landfill sites for both the Runnymede and Spelthorne Channels. In Plate 2-3, the top of the sheet pile is shown with a raised capping beam flood defence wall on the left bank (but not the right bank). The section shows that there is no vegetation within the channel. On the left bank there is a band of trees and shrubby vegetation, approximately 15 metres wide, and grassy vegetation right up to the channel edge. On the right bank there is longer meadow grass, but no woody vegetation shown. A footpath is indicated adjacent the channel on the right bank, varying in width from five metres

to 13 metres, providing opportunities for enhancement or creation of active travel.

Plate 2-3: Cross-section example of the engineered channel.

Channels through existing lakes

2.1.3.15 Using the network of existing lakes as a flood flow route is an integral part of the project. This means hard engineering can be kept to a minimum. The flood channel will enter each lake; flow will move through the lake and exit the other side. It is not intended to deepen any lakes, however there may be a requirement to reshape the smaller lakes that the channel passes through to ensure flow passes efficiently (e.g. Lake South of Green Lane). Existing silt layers will remain in place, though operation of the flood channel may be expected to add to and redistribute the silt.

2.1.3.16 It is proposed to shallow some of the existing lake banks and use the material generated from reducing their gradients to create shallow margins and wetted habitat around the edges to the lakes for the benefit of wading birds and other species.

Abbey Meads Floodway

2.1.3.17 In flood conditions, water will flow through the Abbey Meads floodway and into the River Thames via existing flood culverts under the M3 and also

via a short reinforced spillway just upstream of the M3 bridge. In non-flood conditions, most of the flood channel will have an augmented flow and always contain water due to the presence of water level control structures (described in Section 2.1.3.5). The Abbey Meads floodway is the exception to this, as the augmented flow will be passed down the Abbey River via a flow control structure on the right bank of the Runnymede Channel (i.e. the right hand side when facing downstream), rather than flowing onward and into the Abbey Meads area. The Abbey Meads area will be partially excavated to form a predominantly dry floodway, varying between 140 metres to 300 metres wide, with the existing ground levels lowered by approximately one metre and profiled to provide a damp to wet summer grazing area (Plate 2-4 and Plate 2-5). This area will typically be partially flooded during wetter winter months and largely dry in the summer with rough grazing pasture. In this area, groundwater levels will continue to be controlled through Affinity Water's pumping of its water supply wells. In non-flood conditions, the partial flooding will be mainly caused by water backing up from the River Thames into the area of lowered ground (via culverts under the M3) rather than from groundwater or flow control structures on the flood channel.

2.1.3.18 Sections of the existing Burway Ditch, which runs through the northern half of the site, will be realigned where required to relocate it within the central section of the Abbey Meads floodway. The existing trees and Affinity Water monitoring boreholes will be retained on slightly raised 'islands'. A permanent backwater of the River Thames will be established north of the M3 culverts, creating a greater range of habitats.

2.1.3.19 Plate 2-4 shows the arrangement of the Abbey Meads floodway, including the levels dropping down to it from the M3 which lies to the south, and from the flood bank to the north, and the raised 'islands' of vegetation.

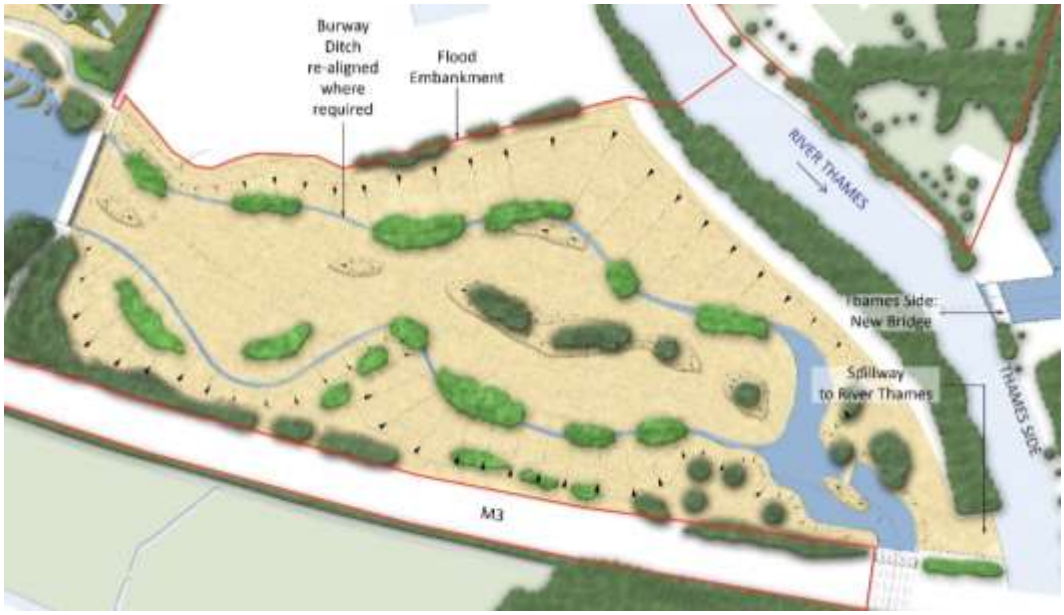

Plate 2-4: Flood channel alignment at Abbey Meads Floodway.

2.1.3.20 The cross section at Plate 2-5 below is cut through the Abbey Meads floodway site running from the north to the south. It shows the area is mostly flat and open, except for the higher ground of the M3 motorway to the south, the flood embankment to the north, and a raised island of vegetation in the centre. The realigned Burway Ditch in the northern half of the site and an unnamed ditch in the southern half are both labelled. Both are flanked with small trees either side.

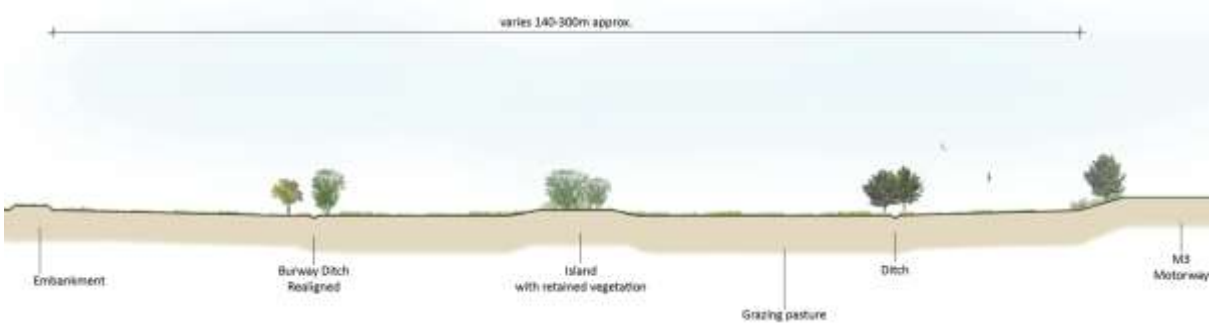

Plate 2-5: Indicative cross-section of Abbey Meads Floodway.

2.1.4 Flood Channel Associated Features

Flow control structures

2.1.4.1 Gated flow control structures (an example image is provided in Plate 2-6) are required on each channel section and at the crossing of Staines Road (A320), downstream of the Thorpe Park Lakes on the Runnymede Channel. These will be required to control the amount of water entering each flood channel. The gated flow control structures on the flood channel will be automated, so the gates move in response to remote signals. This will require warning sounds and lights. For the purposes of our PEIR, it is assumed that strobe lamps will provide the visual warning alongside the warning sounds. It is assumed that initially the gates will be operated on average once a year, although this frequency may increase throughout the lifetime of the project in response to climate change to maintain operation of the channel at the required level of flood risk reduction. The warning sound would typically run for two minute periods, up to 18 times whilst the gate opens and over the same durations while it closes.

2.1.4.2 Fixed water level control structures (an example image is provided in Plate 2-7) are required along both of the flood channel sections. Their function will be to control water levels during non-flood conditions, to ensure that the flood channel does not act as a drain leading to the surrounding groundwater levels being drawn down by the flood channel during normal conditions.

2.1.4.3 Flow control structures are shown in Figure 2.1 and include:

- A gated control structure with nine gates at the inlet of the Runnymede Channel (structure reference IS2). This structure will include a fish pass;
- An uncontrolled inlet (scour protected) at the Drain in Thorpe Hay Meadow (structure reference TCS9);
- A piped inlet with flap valve at Mead Lake Ditch (structure reference FCS6);
- A broad crested weir with submerged orifice (with flap gate) and tilting gate at Abbey Lake outlet to St Ann's Lake (structure reference FCS7);
- Lowering of 20 metres of river bank on the Chertsey Bourne at St Ann's Lake inlet (structure reference FCS8);

- A small structure on the outlet from St Ann's lake into the Twynersh Lakes will be rebuilt to adjust water levels in St Ann's lake whilst also limiting outflows into the Chertsey Bourne River. This will be a small channel with a closed sluice gate or adjustable stop logs, limiting outflows into the Twynersh lakes and from there into the Chertsey Bourne River (structure reference FCS9);
- A gated control structure (nine gates) at the Thorpe Park Lakes outlet (structure reference FCS10). This structure will include a fish pass;
- An uncontrolled inlet (scour protected) on the Abbey River (structure reference TCS10);
- A stop logged channel outlet structure on the Abbey River (structure reference TCS11);
- Sections of the Burway Ditch that are not realigned will be blocked off (structure reference TCS12);
- A fixed level control structure (concrete, 82 metres long) at Ferry Lane (structure reference FCS12);
- A gated control structure (nine gates) on the Spelthorne Channel between Littleton North Lake and Littleton East Lake (structure reference IS3). This structure will include a fish pass;
- A fixed level control structure (concrete, 94 metres long) at Manor Farm (structure reference FCS18). This structure will include a fish pass;
- Flow restriction at the outlet weir from Sheepwalk West 1 lake to the Pool End Ditch;
- An overflow at Drain to Ferry Lane (structure reference TCS13);
- A blanking wall to existing flood culverts beneath the M3 motorway between Sheepwalk East Lake and Manor Farm (structure reference HA4M);
- A blanking wall to existing flood culverts beneath the M3 motorway between Littleton North and Littleton South lakes (structure reference HA5M); and
- A fixed level control structure (concrete, 75 metres long) at Ferry Lane Lake (structure reference FCS19). This structure will include a fish pass.

2.1.4.4 The flow control structure example shown in Plate 2-6 below comprises a series of metal gates spanning the channel, separated by concrete walls,

with an elevated steel walkway and railings running along the top of the whole structure.

Plate 2-6: An example of a typical flow control structure.

Plate 2-7: An example of a typical water level control structure.

Flood embankments and erosion prevention

2.1.4.5 Where the flood channel is in proximity to housing, commercial developments and important utilities at risk of flooding, and where there is

a risk of water bypassing flow control structures, flood embankments will be constructed to address these risks. They will be between approximately 0.3 metres and two metres high, and are shown in Figure 2.1 (referenced as FW5A, FW5B, FW6 and FW8). Embankments will have a cut-off and have minimum top widths of three metres. In addition, an approximately 285 metre long section of flood wall, up to 0.6 metres in height is required and is shown in Figure 2.1 (FW10).

2.1.4.6 Some riverbank protection works will be required, to prevent erosion of the River Thames around the outlet of the Runnymede channel. Some areas will also require some embankment raising (see Figure 2.1). The protection works are likely to include sheet piling, rock armour or concrete revetments.

Structures for intersected features

2.1.4.7 The following existing features will be intersected by the flood channel, requiring a wide range of structures:

- Major and minor roads; this will require road bridges for the channel to pass underneath (whilst mindful of the Environment Agency's overarching policy to minimise the use of culverts where possible) (Plate 2-8 provides an example of a typical road bridge for the channel to pass underneath);
- Natural drainage lines and other ordinary watercourses; this will require drainage structures;
- Public Rights of Way; this will require bridges over the channel; and
- Services including gas, water, electricity etc.; these will require re-location.

Plate 2-8: An example of a typical road bridge for the flood channel to pass underneath.

Bridges

2.1.4.8 Road bridges will be required on minor and major roads and existing property accesses that the channel sections intersect. Some of these bridges will be designed to hydraulically "drown out" during channel operation (i.e. operate safely and efficiently with the soffit of the bridge submerged). Bridges for public rights of way will also be required. The following bridges have been identified as required, and the construction of these may require full or partial road closures;

- Road bridge at Chertsey Lane (structure reference HA1);
- Service bridge upstream of Thorpe Hay Meadow (structure reference FBR5);
- Accommodation bridge at Green Lane (structure reference C2);
- Road bridge at Norlands Lane (structure reference LA6);
- Accommodation bridges at Thorpe Park to provide access (structure references C3 and T5);
- Road bridge at Staines Road (structure reference HA2);
- Accommodation bridge at Monks Walk Access (structure reference T4);
- Accommodation bridge at Ferry Lane Access (structure reference T3);
- M3 motorway crossing using the existing Burway Ditch Culverts (structure reference HA3M);
- Road bridge at Thames Side (structure reference LA7);

- Road bridge at Littleton Lane (structure reference LA9);
- Accommodation bridge at Littleton Sailing Club Access (structure reference T6);
- Public right of way bridge at Littleton East lake (structure reference FBR6);
- M3 motorway crossing at Underbridge (structure reference HA7M);
- Road bridge at Renfree Way (structure reference LA11);
- Road bridge at Ferry Lane (structure reference LA12);
- Public right of way bridge for users of Ferry Lane Lake (structure reference FBR8); and
- Public right of way bridge at the outfall of the Spelthorne Channel (structure reference FBR7).

2.1.4.9 In addition, we propose two new pedestrian and cycle bridges to cross the River Thames in order to accommodate the project's active travel proposals (refer also to Section 2.1.8). One bridge will cross from Abbey Meads to Littleton North lake, approximately 100 metres south of the intake to the Spelthorne Channel. The other bridge will cross from Ferry Lane Lake to Desborough Island. The bridges will be cable stayed and therefore will be a maximum of 50 metres high above ground level at their highest point, with aviation lighting if required. They will include an approximately five to six metre clearance above the maintained water level for the main navigational arch. The bridges will include landing points on each bank, and intermediate pier(s) within the River Thames, positioned approximately one third in from the banks. The bridges will also incorporate walkways with 1:22 gradients to allow access for all, and will likely be constructed from steel or concrete.

Permanent maintenance structures and access

2.1.4.10 Permanent operational compounds will be required at the three gated flow control structures on the flood channels; these will include buildings to house the operational equipment. Anticipated locations of permanent operational compounds are shown in Figure 2.1 and listed below:

- A320 Chertsey Lane, at the intake to the Runnymede Channel;
- A320 Staines Road, downstream of the Thorpe Park Lakes (Runnymede Channel); and
- Littleton Lane, Shepperton on the Spelthorne Channel.

2.1.4.11 In addition to the permanent operational compounds above, we will create further operational and maintenance compounds at Royal Hythe and Sheepwalk. These compounds will contain offices and equipment storage space for those operating the channel and other aspects of the design such as the NGOS and priority areas for habitat creation, enhancement or mitigation. We are currently considering the exact locations of where these compounds will be positioned. The anticipated locations of these permanent operational and maintenance compounds are shown in Figure 2.1.

2.1.4.12 We will consider and incorporate integrated renewable energy opportunities into the project proposals where practicable, in line with the RTS Vision (see Section 1.3 of Chapter 1: Introduction). This may include, for example, solar panels on new buildings and structures that are required as part of the project, such as those described in Section 2.1.4.10.

2.1.4.13 Access tracks along the flood channel will facilitate access for our maintenance purposes together with slipways at appropriate locations. Where appropriate (locations to be confirmed), these access tracks may also be used by the public for walking and cycling.

2.1.5 Capacity Improvements

2.1.5.1 There are four locations in which capacity improvement works to existing River Thames features and assets are required as part of the project to ensure no detriment in flood conditions downstream of the flood channel. All are located downstream of the proposed flood channels and are described below.

Bed lowering downstream of Desborough Cut

2.1.5.2 Bed lowering of a stretch of the River Thames, approximately one kilometre in length, downstream of Desborough Cut will be undertaken through excavation of the river bed to improve channel capacity in this area. Bed lowering is proposed from the confluence of the Desborough Cut with the River Thames to just downstream of Walton Marina.

2.1.5.3 We anticipate that only the central third of the River Thames channel (approximately 20 metres width) will be excavated. No impacts upon the banks of the River Thames are therefore anticipated as a result of this

work. The average total depth of bed lowering will be 0.7 metres, including built-in resilience against siltation. This is shown in the cross section below in Plate 2-9.

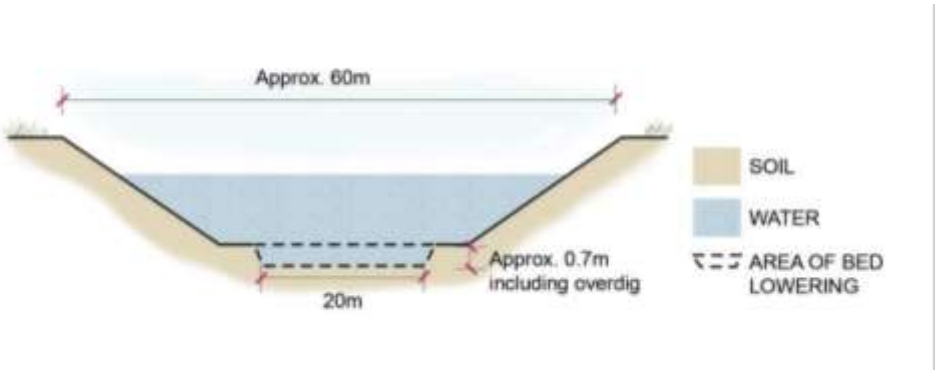

Plate 2-9: Cross-section of proposed bed lowering in the River Thames downstream of Desborough Cut (not to scale).

Upgrades to Sunbury Weir

2.1.5.4 The capacity improvements at Sunbury Weir will be achieved by constructing a new weir complex with three dipping radial weir gates through Sunbury Lock Ait (location shown on Figure 2.1). A channel, approximately 12 metres wide, 75 metres long and five metres deep, will be cut through the island, at a diagonal angle, leaving the existing lock cut just upstream of the footbridge and entering the River Thames (on the other side of Sunbury Lock Ait) downstream of weirs A and B. The proposals have been designed to avoid boat moorings at Sunbury Lock Ait Marina. A typical example of a weir complex with dipping radial weir gates is shown in Plate 2-10.

Plate 2-10: An example of an existing River Thames radial gate weir at Molesey.

Upgrades to Molesey Weir

2.1.5.5 Molesey Weir is on the boundary between the Borough of Elmbridge, in Surrey and the LBRUT (location shown on Figure 2.1). The proposed works are in the LBRUT section of Molesey Weir. The capacity improvements at this weir will be achieved by replacing the existing overfall weir and salmonid fish pass on weir C (Plate 2-11 shows an image of this) with two dipping radial weir gates and a multi species fish pass (with a combined width of approximately 13 metres).

Plate 2-11: Photograph of the existing overfall weir (far left) on weir C at Molesey.

Upgrades to Teddington Weir

2.1.5.6 The Teddington Weir complex is on the official tidal limit of the River Thames. The capacity improvements at this weir will be achieved by constructing a new weir complex with five dipping radial gates through Teddington Lock Island, which also lies on the boundary of the tidal limit (location shown on Figure 2.1). A channel, approximately 20 metres wide, 20 metres long and five metres deep, will be cut through the island, approximately 10 metres upstream of the existing boat rollers and 70 metres downstream of the footbridge.

2.1.6 Landscape and Green Infrastructure Design

2.1.6.1 The project will deliver a wide range of benefits through the development of new landscape and green infrastructure provision in and around the corridor of the proposed flood channel as a part of the integrated design. This will result in several NGOS, possibly new blue open spaces, areas of habitat creation, enhancement or mitigation, and new provision for pedestrians and cyclists.

2.1.6.2 As noted in Section 2.1.2, our design work is ongoing, nevertheless the description here sets out the design parameters for the landscape and green infrastructure aspects of the design that have informed our PEIR. Chapter 3 describes our landscape and green infrastructure design optioneering and how the design has evolved since these parameters

were set. Further optioneering and feasibility assessment, consultation and design work is required before a preferred landscape and green infrastructure design can be presented. The ES will provide information on the optioneering process and its outcomes.

2.1.7 New Green and Blue Open Spaces

2.1.7.1 Within our PEIR, we assume that the project design will likely include the provision of NGOS (land-based), at any or all of the following locations (see Figure 2.1):

- Royal Hythe;
- Penton Park;
- Manor Farm;
- Sheepwalk (this is currently assumed to involve the potential demolition of the buildings within this area of the project boundary); and
- Land South of Chertsey Road.

2.1.7.2 Within our PEIR, we assume that any of the following facilities could be provided within NGOS at any of the above locations:

- Sporting fields;
- Adventure golf;
- Viewing platforms;
- Boardwalks;
- Maze;
- Sculptures and artwork;
- Visitor facilities (for example, end of trip facilities and bicycle storage);
- Amphitheatre;
- Field centres;
- Trim trail;
- Entertainment space;
- BMX pump track;
- Outdoor gym;
- Land art;
- Sculptural landforms;
- Wetlands;
- New woodland planting;

- Accessible pathway networks;
- Enhancing habitats and creating opportunities for interaction;
- Active travel (cycle and pedestrian);
- Educational signage;
- Lighting;
- Playgrounds and nature play spaces;
- Car parking;
- Maintenance facilities (no public access); and
- Re-creation and/or interpretation of historic landscapes.

2.1.7.3 We will be considering these facilities as part of the wider optioneering process for the landscape and green infrastructure opportunities with Plate 2-12, Plate 2-13 and Plate 2-14 giving representative examples.

Plate 2-12: An example of an accessible pathway over a wetland

Plate 2-13: An example of nature play spaces

Plate 2-14: An example of improved active travel provision

2.1.7.4 For the purpose of our PEIR, some height parameters have been applied to the potential features listed above which will be further developed for the ES stage. Raised landforms could be up to a maximum height of eight metres above existing ground levels, whereas items such as lighting, shade structures, signage, artwork and boardwalks could be up to a maximum height of seven metres above proposed ground levels. Stadium style lighting associated with sporting fields could be up to a maximum of 12 metres in height. Buildings (education centres, visitor facilities, field centres or maintenance facilities) could be up to 10 metres in height. We will incorporate integrated renewable energy opportunities, such as solar panels, on the new buildings wherever possible.

2.1.7.5 Use of excavated arisings onsite for construction such as for landscaping (such as raised landforms) will be undertaken where material is geotechnically and geochemically suitable for use and subject to the permitting process. All excavated arisings that are chemically and physically suitable for transfer between the project sites for use will be done so in accordance with the RTS materials management plans. Further information on materials management is included in Section 2.2.6.

2.1.7.6 For the purposes of our PEIR, we consider that the project design may include the provision of new blue (water-based) open spaces, at any or all of the following locations (see Figure 2.1):

- Abbey 1 lake (within Penton Park new green open space);

- Littleton North lake; and
- Sections of the flood channel adjacent to NGOS under consideration.

2.1.7.7 We are considering any of the following for delivery within the new blue open spaces at the above locations:

- Use by recreational non-motorised (e.g. canoes) navigation;
- Visitor facilities;
- Boardwalks;
- Enhancing habitats and creating opportunities for interaction; and
- Jetties and slipways to enable access and egress.

2.1.7.8 Whilst we are investigating possibilities, access to sections of the flood channel (including in lakes) beyond those identified above is unlikely to be possible given flood control structures, bridge soffits, existing uses and access restrictions that will inhibit free passage.

2.1.7.9 We will continue to explore if there are any further sites in the vicinity that would be suitable for the provision of new green and blue open spaces. If further sites are found to be suitable they will be assessed within the ES.

2.1.8 Active Travel

2.1.8.1 New or improved active travel provision is proposed along and across the flood channel corridor and NGOS with connections to the existing network. New or improved active travel measures are being considered for the purposes of the PEIR within the ‘areas of enhanced public connection’, shown in Figure 2.1. This will include new provision for pedestrians and cyclists. We are also considering potential for use by equestrians within the project. This is yet to be confirmed and design and appraisal work is still in development; additional equestrian provision is therefore not assessed within this PEIR. We will continue to explore opportunities for new or improved active travel provision and any additional opportunities that are identified or confirmed, such as equestrian use, will be assessed within the ES.

2.1.8.2 Opportunities to create or improve active travel provision being considered include:

- Creating or improving access paths, Public Rights of Way (PRoW) or roads (including the Thames Path National Trail) (see Appendix 2.2 for details of PRoW which may be improved by the project);
- Incorporating opportunities for active travel route(s) within and between new green and blue open spaces associated with the flood channel, potentially as a raised walkway up to eight metres in height in places;
- Wayfinding devices;
- Improved drainage through sustainable drainage;
- Urban tree planting;
- Lighting;
- Accessible pathway networks;
- Links to existing transportation networks; and
- Pedestrian and cycle bridges (refer also to Section 2.1.4.9).

2.1.9 Priority Areas for Habitat Creation, Ecological Enhancement or Mitigation

2.1.9.1 The RTS aims to achieve a range of biodiversity improvements within the project boundary. The locations and designs of these biodiversity improvements are currently being developed alongside the detailed landscape design. They will be informed by the project goals, in particular that to create a network of high-quality habitat and achieve Biodiversity Net Gain (BNG), as well as the need for carbon sequestration and mitigation for effects on certain habitats and species that may be required from the Ecological Impact Assessment (EcIA), Water Framework Directive (WFD) compliance assessment and Habitats Regulations Assessment (HRA) being undertaken for the project.

2.1.9.2 Types of biodiversity improvements are likely to include:

- Naturalised shallow margins in certain sections of the flood channel and around the edges of some existing lakes and watercourses to improve bankside vegetation growth;
- Sinking of trees removed during construction, along the flood channel and in some other waterbodies to provide alternative habitats;
- Targeted tree planting adjacent to the flood channel and some existing waterbodies plus macrophyte planting and the creation of islands in waterbodies;

- Enhancing the condition of existing terrestrial habitats, such as meadows and grassland, and river habitats;
- Improving connectivity of the River Thames floodplain, between the River Thames and other waterbodies;
- Creating new habitats such as woodland and wetland (an example image is provided in Plate 2-15);
- Creating hedgerows and enhancing existing through infilling of a diverse mix of species; and
- Species specific measures to enhance habitat conditions.

Plate 2-15: An example of a woodland habitat creation

Priority Areas

2.1.9.3 Specifically, to deliver BNG and to supplement the improvement measures above, we are considering a series of potential priority areas for habitat creation, enhancement or mitigation (Figure 2.1).

2.1.9.4 We are looking to achieve BNG firstly through the delivery of habitat creation and enhancement within the flood channel and landscape design footprint. Where possible this will integrate with other desired landscape and green infrastructure outcomes through the provision of recreation and amenity benefits, active travel routes and reconnection to historic landscapes. Potential priority areas for habitat creation, enhancement or mitigation where such multi-functional opportunities are currently being explored include:

- Norlands Lane;

- Former Laleham Golf Course;
- Abbey Meads;
- Littleton Lane;
- Land South of Chertsey Road;
- Sheepwalk;
- Manor Farm; and
- Desborough Island.

2.1.9.5 In addition to these multi-functional sites, it may be necessary to include sites which would be more focussed on habitat creation, enhancement or mitigation. These opportunities are being explored at (this is not an exhaustive list):

- Land South of Wraysbury Reservoir;
- Laleham Reach;
- Abbey River;
- Sheepwalk Lakes;
- Land Between Desborough Cut and Engine River;
- Drinkwater Pit; and
- Grove Farm.

2.1.9.6 All of the potential priority areas for habitat creation, enhancement or mitigation will be the subject of optioneering and design but will typically favour enhancement of the existing habitats where appropriate. This may include, for example, enhancement of neutral grassland, mixed scrub, broadleaved and other woodlands, ponds, wet woodland, and open mosaic habitat. The design of the potential priority areas for habitat creation, enhancement or mitigation will also seek to create high quality habitats including reedbeds, wetlands, ditches, hedgerows and lowland meadows. For the purpose of our PEIR assessments, we assume that works will be undertaken at all potential priority areas for habitat creation, enhancement or mitigation.

2.1.9.7 We are committed to an approach for the delivery of BNG that balances the rules and principles associated with the Department for Environment, Food and Rural Affairs (Defra) Metric version 3.1 by ensuring that sound ecological judgement is used to deliver high quality habitats (i.e. the delivery of BNG will not solely be driven by Defra Metric outputs), whilst balancing the other goals of the project. The ongoing design of habitat

creation, enhancement and mitigation is discussed further in Section 3.3.3 of Chapter 3: Consideration of Alternatives.

2.1.9.8 We will continue to explore if there are any further sites in the vicinity that would be suitable for the provision of habitat creation, enhancement or mitigation. If further sites are found to be suitable they will be assessed within the ES.

Fish Passage

2.1.9.9 The project proposes to improve fish passage along the River Thames and its tributaries, through the installation of multi-species fish passes at five locations on the river within the project boundary; these being (from upstream to downstream) at Chertsey Weir, Beasley's Ait, Sunbury Weir, Molesey Weir and Teddington Weir. As noted above, at Molesey Weir this will involve replacing the existing salmonid fish pass. Assessments are currently ongoing to understand the effects of the project on fish passage. The outcome of these assessments will be reported in the ES.

2.1.9.10 Several flow control structures will include fish passes; these are described in Section 2.1.4.3 and the locations of the proposed fish passes are shown on Figure 2.1. The project is also considering the installation of fish passage on the Abbey River alongside other enhancements in this area to improve the watercourse for fish and other water dependent species.

2.1.10 Primary Environmental Mitigation

2.1.10.1 Our approach to mitigation is described in section 4.5 in Chapter 4: Approach to the Environmental Assessment. This includes for example an explanation of the different categories of mitigation (as classified by IEMA, 2016), how these have been factored into our preliminary assessment of effects in this PEIR, and how we anticipate securing these measures.

2.1.10.2 We have included certain primary (embedded) environmental mitigation in the project design to date and this will be refined as part of the EIA process. This includes for example:

- The sequential approach to flood risk is being followed as part of the ongoing design of the project, for both the permanent and temporary

(e.g. materials processing sites) project components. These will be appropriately located in the areas of lowest flood risk where feasible, and the uses of these areas will adhere to what is appropriate in the different flood zones based on their National Planning Policy Framework (NPPF) vulnerability classification. The NPPF Sequential and Exception Tests will also be applied where appropriate to demonstrate that the project is NPPF compliant. Chapter 10: Flood Risk provides further information in relation to subsequent flood risk tests;

- Section 2.3.2 explains channel maintenance works that are proposed as part of the project. This will include ongoing silt monitoring and maintenance of the flood channel to maintain the design profile and therefore ensure it can continue to function effectively;
- An Outline Climate Adaptation Plan will be developed as a measure to mitigate against the effects of climate change on generic receptors. This will include monitoring and adaptive management measures such as water consumption being reduced by the specification of highly efficient water installations;
- Sustainable Drainage Systems (SuDs) are to be designed to manage flood risk through the construction and operation stages of the project to ensure no increase in surface water flooding (including an appropriate allowance for climate change) and to also address water quality;
- An integrated landscape design process is being pursued, which aims to sensitively integrate all project components within the existing landscape. This will include consideration of: material finishes to buildings and structures; sensitive landscape design and planting in relation to the setting of Scheduled Monuments; the form and contouring of raised landforms; public space and its use; incorporation of existing green infrastructure including trees and vegetation; new planting to achieve carbon mitigation, natural capital outcomes and in relevant locations, screen project components; and sensitively locating material stockpiles;
- The water level control structure between St Ann's Lake and Abbey Lake will isolate St Ann's Lake (part of the Southwest London Waterbodies Special Protection Area (SPA)) from the flood channel and limit nutrient inputs from the River Thames;

- The provision of five fish passes on flow control structures along the new flood channel (shown on Figure 2.1);
- The provision of an augmented flow of up to 1m^3/s along the flood channel (when not being operated with a larger flow during major flooding), which aims to avoid nutrient enrichment of existing lakes and allow for fish passage over water level control structures on the new flood channel;
- Flow devices will control ground and surface water within the flood channel to maintain a minimum water level and flow;
- Design of flood channel morphology and inclusion of control structures on existing water bodies and within the flood channel to improve hydromorphology and prevent contamination;
- The potential for management of the augmented flow during periods of low flow is currently being considered to limit potential impacts on water resources, water quality and biodiversity within the River Thames and new flood channel. This could include temporarily reducing flow to an appropriate level, ceasing or alternating flow between the flood channels;
- Within the Thorpe Park Lakes WFD waterbody, the existing connection between Manor Lake and Fleet Lake will be infilled to limit the nutrient inputs from the River Thames (via the flood channel) reaching Manor Lake;
- Avoidance of work within Thorpe Hay Meadow Site of Special Scientific Interest (SSSI);
- The mitigation hierarchy for habitats and species has been applied in project designs on information currently known. This has worked to initially avoid significant effects on biodiversity (e.g. avoidance of works in sensitive sites). Where this is not achievable, impacts will be minimised and/or mitigated;
- Habitat creation, mitigation or enhancement for other effects on habitats or species will also be incorporated into project designs;
- Enhancement of habitats immediately downstream of three weirs on the River Thames in the reach bypassed by the flood channel (at Penton Hook, Chertsey and Shepperton). Implementation of enhancements will be subject to the EIA confirming effects on these habitats from diverting water along the flood channel, but could include macrophyte planting;

- The carbon reduction hierarchy will be applied to project designs, with a focus on eliminating ‘at source’ carbon emissions. Where emissions cannot be entirely eliminated at source, the hierarchy works to reduce emissions (e.g. through more efficient processes and equipment), substitute (e.g. adoption of renewable technologies) and lastly compensate for unavoidable residual emissions (e.g. through carbon offsetting);
- Designs of temporary and permanent buildings will be climate resilient, using appropriate guidance from the Chartered Institute of Building Service Engineers (CIBSE) to mitigate against the predicted effects of climate change; and
- Off-site car parking for construction workers has been incorporated into the project to reduce the number of vehicles using local roads in proximity to the construction working areas. A total of six potential car park sites are currently being considered. The locations of the potential car park sites are shown in Figure 2.2.

2.1.10.3 Other primary and secondary (additional) environmental mitigation may be required as a result of the EIA, WFD compliance assessment and HRA, and will be developed as these assessments and the project design progress. It may be that some of the biodiversity improvements identified in Section 2.1.9 will be required as mitigation in some locations.

2.1.10.4 In addition, tertiary mitigation (standard practice, such as monitoring and use of construction management plans) will also be required for the project. The individual topic Chapters 6 to 18 set out topic relevant primary, secondary and tertiary mitigation that is being considered at this stage. Mitigation will be further developed as part of the ongoing EIA process.

2.2 Construction

2.2.1 Programme

2.2.1.1 Since the EIA Scoping stage, we have continued further work understand the detailed timelines for each phase of work. As such, no presumptions are made in our PEIR as to phasing, except that habitat creation works will take place as soon as reasonably practicable within the programme.

2.2.1.2 The project is scheduled to be constructed from winter 2026 to early 2032. Maintenance work is expected to commence from early 2032.

2.2.1.3 Construction work will include the following key activities:

- Enabling works - these will take place prior to each site being occupied for the main civil engineering works. They include activities such as surveys, vegetation clearance, demolition of buildings, services diversions, works to some existing structures, bank protection works, and construction of compound areas. These have been considered as construction phase works for the purposes of the PEIR;
- Weirs and bed lowering downstream of Desborough Cut;
- Excavation and construction of the flood relief channel. The channel will not be used for flood conveyance purposes until all capacity improvement works downstream of Desborough Cut are completed and are operational;
- Priority areas for habitat creation, enhancement or mitigation and NGOS – these would be commenced as early in the construction programme as feasible; and
- Landscaping (planting and establishment of soft landscaping) and Mitigation works, such as planting to screen construction features.

2.2.1.4 For the purposes of the technical assessment of effects in our PEIR it is assumed, as a worst case scenario, that all aspects of construction will take place throughout the full construction period. This will be further refined and assessed for the ES however, with the current expectation as follows:

- Construction will start after the detailed design phase is complete and the full business case is approved in Spring 2027. There may some enabling works in the detailed design phase associated with vegetation & tree clearance, intrusive surveys, diversions (utilities, footpaths etc) and environmental mitigation measures.
- The flood channel will be operational from 2030.

2.2.1.5 We anticipate that the majority of construction work will take place during normal working hours between 8am and 6pm, with potential for working seven days a week and across 24 hours on certain construction activities.

Those construction works with potential 24 hour working requirements would have associated lighting and are anticipated to include:

- Traffic management works;
- Road and motorway works;
- Earthworks and processing to take advantage of longer daylight hours during the summer when drier conditions are more favourable to undertake earthworks;
- Delivery of abnormal loads, large plant and materials – generally either side of the core hours for up to 1.5 hours;
- Placing and/or pouring of large concrete structures;
- Piling works for road bridges at existing highways;
- Utilities diversions;
- Water pumps and generators (likely to need to run for extended periods);
- Security; and
- Water treatment plants.

2.2.2 Flood Channel

2.2.2.1 Some sections of the flood channel will pass through existing built properties; this will likely require the demolition of four dwellings and one outbuilding at the northern end of the Runnymede Channel (relevant landowners have been notified). Construction of the Sheepwalk NGOS will also potentially require the demolition of the buildings within this site.

2.2.2.2 Through natural ground, the flood channel will typically be dug ‘wet’ (i.e. groundwater will not be excluded from the excavation). Through landfill, the sheet piles that form the edges of the flood channel will first be driven into the ground. The ground between the piles will either be excavated and drained before processing, resulting in a body of water remaining, or the ground will be dewatered then excavated and transported for processing, resulting in a largely dry excavation. In both approaches, the ground will be excavated to bed level. All effluent from dewatering this material will require treatment and discharge. It is unlikely that this effluent will be able to be discharged to the sewer network. Therefore, temporary works will be required to treat the effluent to ensure acceptable water quality before it is discharged into the River Thames.

2.2.3 Flood Channel Associated Features

Bridges

2.2.3.1 The flood channel crosses several public roads. Bridges are required to carry these public roads over the flood channel. These road bridges will be designed (but not exclusively) to typically adopt a 'top down' construction method. This method involves forming the bridge supports with bored concrete piles and then casting the bridge deck in formwork supported by the ground. The earth beneath the deck will be excavated out after the bridge deck has achieved full strength. This technique allows the bridges to be built in sections whilst managing traffic flows around the site with narrow lanes and traffic light controls. This construction method will reduce the need for full road closures during construction. The construction approach for road bridges will be finalised during the detailed design phase of the project. For the purposes of this PEIR, the construction approach outlined here is assumed to be followed.

Plate 2-16: An example of an accommodation bridge

2.2.3.2 The flood channel crosses several existing access tracks and other roads. Plate 2-16 shows an example of an accommodation bridge; these will be required to carry the access tracks/roads over the flood channel. They are generally located on private land and will be used for operational access around the land by the landowner and Environment Agency Operations teams. The structures are likely to consist of either reinforced concrete slab type bridges or bridges with a composite reinforced concrete and steel deck. Some of the bridges will also be used to carry services across the flood channel. The services are likely to generally be laid in ducts within the structure. For the purposes of our PEIR, it is assumed that both types of bridge outlined here could be constructed.

2.2.3.3 The flood channel crosses several PRoWs. The bridges required to carry these PRoWs and active travel routes over the flood channel are likely to consist of lightweight composite deck bridge structures, but this will be considered further as design work continues.

2.2.4 Flow and Water Level Control Structures

2.2.4.1 Flow control structures and water level control structures in the flood channel will be constructed in cofferdams in a similar manner to the capacity improvements to the River Thames weirs (see also Section 2.2.5).

2.2.5 Capacity Improvements

2.2.5.1 Construction of the capacity improvement works at the River Thames weirs will typically take place within a cofferdam (Plate 2-17 below), likely requiring fender piles to prevent accidental damage from passing vessels. The cofferdam will act to exclude either groundwater or river water or both whilst construction of the new weir gates takes place inside the dam. Plate 2-17 below provides an example of a cofferdam, showing large sheet piles enclosing a working construction area, standing at least 4 metres high above the channel. Sheet piles are likely to be driven into the river bed using a crane and vibrating hammers. Plate 2-18 shows a crawler crane hook above a row of steel sheet piles that are to be hammered into the ground with approximately four metres left protruding; for the purposes of this PEIR, a piling method similar to this is assumed to be required.

Plate 2-17: An example of a cofferdam, used to construct new weir gates.

Plate 2-18: An example of a crawler crane, used to drive sheet piles (photo provided by BAM Nuttall Ltd)

2.2.5.2 We assume that access to some sections of the River Thames will be restricted during construction, but that a degree of navigation will be maintained throughout.

2.2.6 Materials Management

2.2.6.1 We will develop a Materials Management Strategy (MMS) which will apply the waste hierarchy and will be incorporated into the ES (see Chapter 13: Materials and Waste for further information). The project will re-use or recover the minimum amount of excavated material that is required by the design. Design work and associated appraisals are currently ongoing; current assumptions with regards to material volumes and types are described below. These are subject to confirmation following site investigations and further design development, and quantities reported are rounded to the nearest 1,000m^3 or 1 per cent.

2.2.6.2 The estimated amount of excavated material from construction of the flood channel is in the region of 975,000 m^3, which is split between natural ground material (e.g. gravel/ alluvium/ topsoil) and made ground/disturbed natural ground. The natural ground material is estimated to be 447,000 m^3 or 46 per cent of the total amount of excavated material, samples of which will be subject to lab testing. For PEIR purposes, we have assumed that approximately 360,000 m^3 (81 per cent) of the natural material will be reused for landscaping works while the remaining 87,000 m^3 (20 per cent) will be reused for flood embankment or channel improvement works, or exported to market. This will be tested further as the design progresses and the confirmed need for material re-use for the project is finalised.

2.2.6.3 Made ground (i.e. re-worked natural/outside of landfill) and waste (i.e. disposed of in former or existing landfill) is assumed to consist of 528,000 m^3 or 54 per cent of the total amount of excavated material. It is currently estimated that 134,000 m^3 (25 per cent) of this will be recovered for landscaping works; the final extent of this will be as required from the design. The remaining material (394,000 m^3 or 75 per cent) is expected to come from historic landfill sites and will be processed on site. Following this, it is assumed that approximately 119,000 m^3 (30 per cent from made ground/waste) is taken off site for recycling or for off-site disposal (a small percentage of this material is assumed to be hazardous waste). The remaining 275,000 m^3 (70 per cent) of processed material is assumed for PEIR purposes to be recovered for landscaping or other works. This will

be tested further as the design progresses and the confirmed need for material re-use for the project is finalised. All materials will be lab tested to confirm their suitability for these assumed uses.

2.2.6.4 Large, temporary, material processing and storage sites will be required within the project boundary during construction at any or all of the following locations under consideration:

- Royal Hythe;
- Sheepwalk;
- Manor Farm;
- Land south of Chertsey Road; and
- Northwest and south sides of Ferry Lane Lake, on the alignment of the Spelthorne Flood Channel.

2.2.6.5 The temporary material processing and storage sites would include processing lines to undertake the following tasks:

1. Dry excavated material
2. Stockpile the dried material for processing
3. Process the dried material into separate material types
4. Stockpile these different material types before they are either reused or removed from site.

2.2.6.6 It is assumed for the PEIR that material processing lines could cover an area of up to nine hectares each and will likely be in operation for the duration of the construction period, for approximately six days per week over a 12 hour duration. The height range of temporarily stockpiled material is assumed for the PEIR to be up to 12 metres above existing ground level.

2.2.6.7 In addition to the main processing and material storage sites, further temporary material storage is likely to be required within the project boundary for stockpiling of excavations and storage of construction materials (for example steel sheet piles). Heights of stored construction materials in these locations could be (and have been assumed in the PEIR to be) up to 12 metres above existing ground level. The locations currently under consideration are largely alongside proposed main and satellite compounds (discussed in Section 2.2.8), but standalone sites

may also be required for example, at Abbey Meads and Littleton North. Sites currently under consideration are marked on Figure 2.1.

2.2.6.8 Hazardous excavated waste will need to be removed to suitably permitted facilities via the public road network (or other means of transportation).

2.2.6.9 In addition, we have confirmed that there is sufficient capacity at licenced sites within 16 kilometres of the project boundary for placement of material not used on site (i.e. material that is not chemically and/or physically suitable for project purposes or is surplus to requirements). This will be confirmed by the results of ongoing geotechnical and geoenvironmental investigations with regards to waste characterisation. For the purposes of the PEIR therefore, assessments have considered the movement of all excavated materials (plus or minus 15 per cent) off site to the major and strategic road networks only. Transportation from the major road network and placement of material at its end destination is not assessed, as the assumption is that this is managed by the procedures of each licenced site.

2.2.7 Vehicle Movements

2.2.7.1 Plant associated with the earthworks and piling will be heavy and large and thus will require a dedicated haul road along the route of the flood channel as well as compounds sufficiently large to store the plant when it is not in use. By using haul roads along the flood channel route, some movement of construction and excavated materials can be managed without using the public roads in the local area. Some of the haul roads can also be reused following construction as access tracks for maintenance activities. However, there will be unavoidable use of the public road network (or other means of transportation) for delivery of materials and plant and movements of material (for example by Heavy Goods Vehicles (HGVs) and concrete wagons). Figure 17.1 shows the roads under consideration for the movement of HGVs transporting excavated material between construction areas and off-site for recycling or disposal.

2.2.7.2 There will also be movements of Light Goods Vehicles (LGVs) and worker/commuter traffic associated with operatives and construction staff attending site. Nevertheless, the use of off-site car parking (discussed in section 2.1.10) will reduce the construction staff traffic movements in

proximity to the construction working areas. Road access to site will be routed via main thoroughfares from the arterial roads i.e. routes through villages and towns will be avoided in favour of direct links to the motorways and 'A' roads.

2.2.7.3 The construction works will require a large number of construction vehicles, or Non-Road Mobile Machinery (NRMM) to be moving within and between the construction sites. NRMM will range in size and type; the vast majority will be diesel powered and all will have flashing lights as a safety requirement. It is expected that NRMM numbers will reduce through the winter months alongside a reduction in material excavation works. Typical NRMM is expected to include:

- Driven sheet piling rigs;
- Rotary piling rigs;
- 30 tonne and 40 tonne articulated dumpers;
- 36 tonne excavators;
- 21 tonne excavators;
- 20 tonne loading shovels;
- Bulldozers with D6 blades;
- Seven tonne towed rollers;
- Crawler cranes with masts of 65 to 70 metres;
- Tower lights powered by diesel or hybrid;
- Material processing plants, with screeners, washing and crushing stages, powered by electric;
- Water treatment plants; and
- Other standard NRMM e.g. telehandlers, trailers, tractors, fuel bowsers/lorries, and pumps.

2.2.7.4 There are limited options to use the River Thames for transportation given accessibility issues due to existing low bridges on the alignment of the new flood channel and the large volumes of materials that may need to be transported. Nevertheless, river transport of materials is being considered at the intake and outlet of the Runnymede Channel and at land South of Chertsey Road through the construction of temporary wharves on the River Thames (the approximate locations of these three wharves are marked on Figure 2.1). If used, the wharves would each include a pontoon, unloading areas, road access and turning circles. An example image of a temporary wharf is provided in Plate 2-19 below. For the

purposes of the PEIR, impacts of these potential wharves and associated barges used to transport materials are considered however, they are not defined as primary mitigation to reduce traffic from RTS construction on local roads, as there is not yet certainty in their use.

2.2.7.5 River transport is expected to be used for the capacity improvement works i.e. the River Thames bed lowering downstream of Desborough Cut and improvements at three River Thames weirs and fish passage improvements, with road transport required for transportation to the material's final destination. These works would potentially utilise an existing Environment Agency wharf at Sunbury depot.

2.2.7.6 The possibility of using rail for transport of construction materials has been investigated; this is considered unfeasible given the lack of local railheads and additional use of the road network in combination with the rail network in transporting materials from source to destination. The rail transportation option has therefore been discounted.

Plate 2-19: An example of a temporary wharf (photo provided by BAM Nuttall Ltd)

2.2.7.7 Traffic volumes have not been finalised and will be evaluated as part of design development, including in relation to movements to and from identified sites. For the purposes of the PEIR, approximate vehicle numbers associated with the transportation of excavated material between and off site, on the public highway (which is considered to form

the majority of traffic volumes), have been used to determine potential significant effects. These are provided in Appendix 17.2.

2.2.8 Landscape and Green Infrastructure, Active Travel, and Priority Areas for Habitat Creation, Ecological Enhancement or Mitigation

2.2.8.1 Where possible, certain landscaping and land management works will be undertaken in advance of the main construction activities, such as aspects of the habitat creation and improvements to deliver enhancement or mitigation and parts of the NGOS to enable vegetation to become established. There is potential for the buildings within the project boundary at Sheepwalk to be demolished in advance of the new green open space landscaping works. In areas where early establishment is not possible, certain locations of NGOS and priority areas for habitat creation, enhancement or mitigation will be used for site compounds, material storage or processing of excavated materials during construction (see Sections 2.2.9 and 2.2.6 for more detail and locations), before works to develop their final proposed form can proceed. It is anticipated that some of the raised landforms will take much of the construction period to be physically created from excavated and processed materials, allowing for settling, with their completion and landscaping (such as seeding and planting) towards the end of the construction programme.

2.2.8.2 The two new pedestrian and cycle bridges crossing the River Thames to accommodate the project's active travel proposals are described in Section 2.1.4.9. It is assumed they will be constructed using the following process:

- Installation of piling platforms on both river banks for the installation of the bridge abutments;
- Installation of a temporary steel jetty and cofferdam within the river to accommodate the in-channel construction works;
- Construction of the in-channel intermediate pier(s) from the temporary jetty and within the cofferdam. The pier(s) will be supported on concrete rotary piles;
- The bridge deck will arrive at the site by either road or river, and will be lifted into place in sections. The sections will be lifted using either large land-based mobile crane or river-based lifting equipment;

- As the sections are progressively added across the river in both directions, the cable stays will be connected to support the weight; and
- Approach ramps both sides of the river will be constructed after the bridge deck construction.

2.2.8.3 Timeframes and the nature of active travel improvements (both in NGOS and outside of them) are yet to be confirmed, but it is anticipated that these will be completed within the overall construction period.

2.2.9 Site Compounds

2.2.9.1 There will be a series of temporary site compounds required through the construction period. They will be required to store plant and materials and provide office space, welfare facilities and limited parking. These temporary site compounds are distinct from the permanent compounds required. Detail on the permanent compounds is included in Sections 2.1.4.10 and 2.3.2.6.

2.2.9.2 Temporary site compounds will be provided, depending on their respective scale of construction works, in the form of either a main compound, a satellite compound or a mobile compound.

2.2.9.3 Main compounds may be combined with the temporary material processing and storage sites (as described in Section 2.2.6.4). They are anticipated to cover a large area compromising of approximately 2,500m^2 (or 0.25 hectares) for office and welfare facilities, also outdoor space to provide plant and materials storage, and car parking. Locations currently under consideration for main compounds include Royal Hythe, Sheepwalk and/or Manor Farm, as shown in Figure 2.1.

2.2.9.4 Satellite compounds will be smaller than main compounds and will be located across the construction working area. They will vary in size according to the scale of works they are supporting. For the purposes of the PEIR, it is assumed that the satellite compounds would consist of up to five containerised cabins, welfare facilities and storage containers. Satellite compounds may be combined with the temporary construction material storage sites under consideration. Sites of satellite compounds under consideration are shown in Figure 2.1.

2.2.9.5 Mobile compounds would be required for small scale works. The mobile compound would consist of welfare vans and/or single 10 metre cabins or a mobile pontoon for works within the River Thames. A mobile compound would be able to move alongside as works progress. Mobile compounds would be required for sections of piling works on the Runnymede Channel and on the Spelthorne Channel at Land South of Chertsey Road. A mobile compound may also support any works to improve active travel along the Thames Path (see Section 2.1.8).

2.2.9.6 Each priority area for habitat creation, and improvements work to deliver, enhancement or mitigation is expected to have its own temporary site compound; the type of compound will depend on the final design of each area but the satellite compound type is expected to be required at these sites.

2.2.9.7 A summary of compound and material processing and storage sites expected to be used across the duration of the project (construction and operation) is provided in Table 2-1 below.

Table 2-1: Summary of site compounds and material processing and storage sites to be used through construction and operation of the RTS

Compound type	Description of compound
Temporary site compound: Main compound	Located at: Royal Hythe, Sheepwalk and/or Manor Farm. Large area compromising of approximately 2,500m^2 (or 0.25 hectares) open place floor space for office and welfare facilities, also outdoor space to provide plant and materials storage, and car parking. May be combined with temporary material processing and storage sites.
Temporary site compound: Satellite compound	Smaller satellite compounds will be located across the working area and will vary in size according to the scale of works they are supporting. Assumed to include up to five containerised cabins, welfare facilities and storage containers. Satellite compounds may be combined with the temporary construction material storage sites under consideration.

Compound type	Description of compound
Temporary site compound: Mobile compound / pontoon and/or welfare van	Required for small scale works, the mobile compound would consist of welfare vans and/or single 10 metre cabins. A welfare van is able to move alongside as works progress. Mobile compounds would be required for sections of piling works on the Runnymede Channel and on the Spelthorne Channel at Land South of Chertsey Road. A welfare van pontoon may also support any works to improve active travel along the Thames Path.
Temporary material processing / storage sites	Large, temporary stockpiles of excavated materials for processing and reuse or removal from site. Sites currently under consideration are alongside or within main and satellite site compounds at Royal Hythe, Sheepwalk, Manor Farm, Land South of Chertsey Road and at Ferry Lane Lake. Stockpiles could be up to 12 metres in height; the sites could cover an area of up to 9 hectares.
Temporary construction material storage sites	In addition to stockpiles of excavated material, locations are also required for the temporary storage of construction materials before they are used e.g. sheet piles. The locations currently under consideration are largely alongside proposed main and satellite compounds but standalone sites may also be required for example, at Abbey Meads and Littleton North. Stockpiles could be up to 12 metres in height.
Temporary wharves	Required on the River Thames if river transport is used. These are currently being considered at the intake and outlet of the Runnymede Channel, and at Land South of Chertsey Road, within close proximity to potential materials processing / storage sites.
Permanent compounds	Permanent operational compounds will be required at the three gated flow control structures on the flood channels; these will include kiosks to house the operational equipment. Two are located on the Runnymede Channel, and one on the Spelthorne Channel, as described in Section 2.1.4.10. Two further permanent operational and maintenance compounds will likely be required within Royal Hythe and Sheepwalk. These compounds will contain office and equipment storage space for those operating the RTS, as described in Section 2.1.4.11.

2.2.10 Public Rights of Way (PRoW)

2.2.10.1 The network of PRoW within the project boundary for the EIA PEIR will be affected during construction through either temporary diversions and/or closures, and potentially permanent closures in some cases. Where temporary diversions and closures are used these will be in place for the shortest period of time possible with advanced notice of the diversion/closure and alternative route (if applicable) advertised in advance of works. Appendix 2.2 lists the PRoW numbers which will be potentially subject to diversions and/or closures, this should be read in conjunction with Figure 2.3 which shows where these PRoW are located.

2.3 Operation and Maintenance

2.3.1 Operation

2.3.1.1 The capacity improvements in the River Thames at each weir and downstream of Desborough Cut will be ready for use once construction has been completed at each site. We anticipate that the flood channel and associated flood management features will be in operation by the end of 2032.

2.3.1.2 The flood channel will only operate once flow in the River Thames exceeds a certain threshold flow value. This flow value on the River Thames is yet to be confirmed, but it is thought that it will be approximately 230m^3/s (i.e. the River Thames is at bank full condition). Once operational, the flow down the flood channel will be regulated by flow control structures at the intakes (one flow control structure for each section of the flood channel and one just east of the crossing of Staines Road (A320), downstream of the Thorpe Park Lakes). These gates will be opened incrementally so that more and more flow is conveyed by the flood channel (up to approximately 150m^3/s) whilst flow in the River Thames remains at approximately the threshold value (~230m^3/s). If flow down the River Thames is such that the capacity of the flood channel would be exceeded (for example, during a flood event greater than a 1 in 100 flood (one per cent chance of happening in any given year)), the flow control structures will throttle flow to ensure the channel does not overtop its banks. From this point, increased flows in the River Thames will cause flooding in a mechanism similar to the existing situation. Reduced flows at

the end of a flood will see the flow control structures gradually close in a reverse manner to how they were opened.

2.3.1.3 In non-flood conditions, the flood channel will always contain water due to the presence of water level control structures.

2.3.1.4 The Abbey Meads area is the exception, which will be a predominantly dry floodway with the existing levels lowered and profiled to provide a damp to wet summer grazing area.

2.3.1.5 For the most part, the water level control structures on the flood channel route will be fixed weirs (see Plate 2-11). The weirs are necessary to ensure that the existing lakes (which the flood channel flows through) and the adjacent land (where the groundwater is typically only one to two metres below ground level) are not drained below their existing levels. The augmented flow of up to 1 m^3/s will be allowed to pass down the flood channel in non-flood conditions (normal and low flows).

2.3.1.6 The permanent site compounds will primarily serve as an area to operate and maintain the gates of the flow control structures at the channel intakes. A similar compound with the same function as those next to the intake structures will also be located adjacent to the flow control structure on the Runnymede Channel just downstream of Thorpe Park lakes (FCS 10 on Figure 2.1). Further permanent operational and maintenance compounds will likely be required within Royal Hythe and at Sheepwalk to contain office and equipment storage space for those operating the RTS. Other small permanent compounds may be required along the flood channel; this will be confirmed for the ES but is not assessed within this PEIR.

2.3.1.7 The flood channel will also be used to manage flood flows in the Chertsey Bourne. A formalised overspill from the Chertsey Bourne will allow high flows to spill into St Ann's Lake (structure FCS8 as detailed in Section 2.1.4.3) (this formalises a situation that already occurs). The pressure of the rising water level in St Ann's Lake will open a new flap gate between St Ann's and Abbey Lakes (structure FCS7 as detailed in Section 2.1.4.3). Some flows will be diverted back from St Ann's Lake to the Chertsey Bourne (structure FCS9 as detailed in Section 2.1.4.3). In this way, some of the Chertsey Bourne flood flows will be directed towards, and conveyed through, the downstream end of the Runnymede Channel to the River Thames to alleviate flooding in Chertsey.

2.3.1.8 The bed lowering of the River Thames downstream of Desborough Cut will reduce flood levels through this section of the river and upstream to Shepperton weir. The additional gates on the three River Thames weirs downstream of the flood channel will add flow capacity by opening incrementally once all the existing weir gates have been opened fully, reducing flood levels back to the next weir upstream.

2.3.1.9 The capacity improvements ensure there is no increase in flood risk from the River Thames downstream of the RTS. In some flood conditions, the flood channel leads to a small increase in peak flows passing downstream. However, this is fully compensated by the additional capacity provided by the bed lowering downstream of the Desborough Cut and the additional weir gates at Sunbury, Molesey and Teddington. Therefore, the net effect will mean that there is no increase in flood levels in the River Thames at any location in any flood conditions.

2.3.1.10 We are also exploring opportunities with Thames Water to adjust the timing of their abstractions to existing storage reservoirs during large flood events so that the highest rate of abstraction coincides with the flood peak. This would be undertaken in accordance with an agreed protocol between the Environment Agency and Thames Water. There is potential for the abstraction regime to be altered at existing abstraction locations on the River Thames. This includes at Datchet (which primarily supplies the Queen Mother and Wraysbury Reservoirs), Laleham (which primarily supplies the Queen Mary Reservoir) and Walton (which primarily supplies the Queen Elizabeth II Reservoir). Changes to the abstraction regime would help to achieve additional benefit by reducing the peak flows and river water levels downstream of the abstraction points and downstream of the flood channel during large floods.

2.3.1.11 The need for the project is likely to increase over time and therefore it is unlikely that a point in time will be reached when the project is no longer required. Due to climate change it is highly likely that to maintain operation of the project beyond 100 years at the required level of flood risk reduction, changes to its capacity or operation (such as increased frequency of use) may be required.

2.3.1.12 In the unlikely event that the project is no longer required, we do not anticipate that the RTS would be decommissioned (i.e. removed). It is more likely that the flood channel and its associated features would be left

in-situ and its operational regime modified as needed. Similarly, there are no plans to decommission the landscape and green infrastructure opportunities, priority areas for habitat creation, enhancement or mitigation, or improved fish passage being incorporated to the project. Effects associated with decommissioning of the project are therefore scoped out of the EIA. They are not discussed further in this PEIR and will not be discussed in the ES.

2.3.2 Maintenance

General maintenance works

2.3.2.1 Maintenance requirements for the flood channel will consist of vegetation maintenance (trimming, replacement, coppicing trees etc.), removing debris, inspecting the channel banks and structures and maintenance of mechanical and electrical gate parts.

2.3.2.2 Maintenance of Sunbury, Molesey and Teddington Weirs and any other landscape design or green infrastructure aspects of the project (including NGOS, priority areas for habitat creation, enhancement or mitigation and active travel provision) will be maintained in accordance with operational requirements and other regimes agreed with project partners and developed as part of the DCO application (or subject to a DCO requirement to do so).

2.3.2.3 An approximate two-year establishment maintenance period will generally include:

- Watering;
- De-weeding;
- Removing rubbish;
- Pruning of trees to ensure clear trunk;
- Pruning of trees and shrubs as required to maintain visibility into NGOS and active travel routes;
- Deadwooding;
- Mowing;
- Removing graffiti;
- Topping up protective coatings of furniture and fixings;
- Upkeep/ replacing any furniture or fixtures to ensure they are up to standard and functional;

- Maintaining pavement surfaces to be hazard free;
- Re-mulching planting areas;
- Monitoring habitats to ensure the preferred habitat develops; and
- Replacing dead plants and removing undesirable plants.

2.3.2.4 Beyond the two-year establishment period, longer term maintenance will be required that will include the above establishment activities plus potentially the following:

- Grazing of grasslands/ wildflower meadows; and
- Mowing of select amenity grassland (such as around potential visitor centres and along active travel routes).

2.3.2.5 Access tracks along the flood channel will facilitate access to the various flow and water level control structures as well as the flood channel itself for maintenance purposes.

2.3.2.6 A Public Safety Risk Assessment (PSRA) will be developed during the detailed design of the channel and associated features and before construction, building on work being undertaken as the project progresses. The PSRA will be reviewed by the responsible party on completion of construction and after every five years, with safety inspections every year in between. The PSRA will give consideration, for example, to emergency egress points for anyone who might fall into the channel (e.g. a formalised exit point and/or grab chains) and access for emergency vehicles to deal with such situations. The PSRA will also consider the installation of handrails at maintenance sites and strategic provision of life buoys, throw lines and warning signage.

Channel maintenance to restore design profile

2.3.2.7 We anticipate that annual desilting will be required at the entrances to the intake structures on both sections of the new flood channel at Runnymede and Spelthorne in order to ensure the bed levels remain as designed and the channels can therefore function effectively.

2.3.2.8 We also anticipate that sediment could build up within the flood channel and connecting waterbodies following large flood events (greater than a one in ten annual exceedance probability) that would be desilted to retain the designed bed levels if required.

2.3.2.9 No further desilting activities are anticipated to be required as a result of the project. Bathymetric surveys will be undertaken periodically to detect any changes in siltation and erosion over time.

2.4 Updates Since EIA Scoping

2.4.1.1 We have updated the design parameters for this EIA PEIR since the EIA Scoping Report following subsequent stakeholder engagement, assessment and design development. We have done this in order to refine the assumptions and largely reduce the maximum reasonable extent of the following project components:

- Flood channel: the augmented flow has been reduced from 1.5m^3/s to 1m^3/s. This is described further in Section 3.3.5 of Chapter 3: Consideration of Alternatives;
- Flood channel: a short (approximately 600 metres long) section of the Spelthorne Channel is proposed to be realigned at Sheep Walk, where the channel extends south of the M3. This is described further in Section 3.3.2 of Chapter 3: Consideration of Alternatives;
- Landscape and Green Infrastructure Design: the assumption of heights for raised landforms has been adjusted from the maximum height of 22 metres considered in the Scoping Report, to a maximum of eight metres in height (as described in Section 2.1.7.4);
- Landscape and Green Infrastructure Design has identified the possibility of new blue open spaces to support the RTS project goal of creating new open spaces for recreation, Section 2.1.7 details the locations currently under consideration in this PEIR and Section 3.3.3 of Chapter 3: Consideration of Alternatives describes the development of the Landscape and Green Infrastructure Design;
- Landscape and Green Infrastructure Design Active Travel: the PEIR provides greater detail than the EIA Scoping Report on areas of enhanced public connection under consideration. In addition, the project boundary for the PEIR has been amended to accommodate active travel opportunities at Staines between Monk's Walk, the A320 Staines Road and Ferry Lane in Chertsey, plus opportunities at Littleton South, Sheepwalk and Cowey Sale, and the two pedestrian and cycle bridges across the River Thames;

- Materials management: routes, volumes of material and destinations for surplus materials have been identified since the EIA Scoping Report (details summarised in Section 2.2.5 and 2.2.6);
- Areas to the north of Norlands Lane, to the west of Royal Hythe and part of the area south of Wraysbury Reservoir have been removed from the project boundary as they were not required to deliver the project goals or for associated construction activities. Some land east of Laleham Reach has been added to the project boundary to incorporate opportunities for habitat creation, enhancement or mitigation;
- Locations of temporary material processing, storage and construction compounds under consideration;
- Likely locations of permanent operational and maintenance compounds; and
- Off-site car parking for construction workers. This is described further in Section 3.3.4 of Chapter 3: Consideration of Alternatives.

2.4.1.2 Design and assessment work is ongoing. As the EIA process continues, we will continue to refine the design parameters, and these will be described in the ES.

3 Consideration of Alternatives

3.1 Introduction

3.1.1.1 Regulation 14(2)(d) of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 specifies that an Environmental Statement (ES) should include '*a description of the reasonable alternatives studied by the applicant, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment'.*

3.1.1.2 This chapter provides a summary of alternatives that were outlined within the River Thames Scheme (RTS) Environmental Impact Assessment (EIA) Scoping Report (Environment Agency and Surrey County Council, October 2022) ('the EIA Scoping Report'); summarises key alternatives and design development since the submission of the EIA Scoping Report and outlines how we will consider these further within the ES with respect to the requirements of the EIA Regulations outlined above.

3.2 Alternatives considered prior to EIA Scoping

3.2.1.1 The EIA Scoping Report summarised alternatives considered within the history of the project, including by the Lower Thames Flood Risk Management Strategy (LTFRMS) (Environment Agency, 2010). The LTFRMS identified broad approaches to flood risk management that were developed into a long list of over 50 options. Following detailed appraisal, it was concluded that the preferred approach to flood risk management is to improve conveyance and reduce flood risk through construction of a flood channel and capacity improvements in the River Thames downstream of the new flood channel.

3.2.1.2 Since its publication, we have demonstrated that the LTFRMS is still an up to date and appropriate assessment of alternative flood risk management strategies. This was evidenced as part of the Strategic Outline Case (approved in 2017) and Outline Business Case (approved in 2020). The Outline Business Case also included various sensitivity tests to ensure that the preferred option still has the best cost-benefit ratio.

3.2.1.3 The channel was originally proposed to be constructed of up to three sections; the Runnymede Channel, the Spelthorne Channel and a third channel in Berkshire. The channel in Berkshire is not being brought forward as part of the scope of the project, primarily as funding is not available at this time.

3.2.1.4 Planning and iterative design work on the project have been ongoing since 2015, including consultation with the public. During that time an initial design for the RTS has been developed from the recommendations set out in the LTFRMS, that considers economic, environmental, community, technical and landowner factors.

3.2.1.5 The process of iterative design has included considering the technical and economic feasibility, the potential environmental effects and the opinions of landowners and stakeholders. The process has also included ensuring statutory responsibilities are included, such as compliance with the Water Framework Directive (WFD) and Habitats Regulations.

3.2.1.6 Five specific areas of uncertainty were identified by the LTFRMS for further investigation including:

- The channel alignment at Thorpe Hay Meadow Site of Special Scientific Interest (SSSI);
- Assessing the need for a formalised flood control structure between Chertsey Bourne and St Ann's Lake;
- The downstream section of the Runnymede Channel;
- Whether the flood channel should have an augmented flow; and
- The outlet of the Spelthorne Channel.

3.2.1.7 As set out in the EIA Scoping Report, the following additional design developments were investigated as either option appraisals or as part of further investigation:

- Capacity improvements at Desborough Cut;
- Hybrid option to improve capacity at downstream weirs;
- Realignment avoiding Abbey 1 Lake on the Runnymede Channel;
- Spelthorne Channel alternative route (M3 Bridge);
- Abbey Meads Floodway on the Runnymede Channel;
- Littleton East Lake separation bund;
- Sunbury Weir capacity improvements;

- Molesey Weir capacity improvements; and
- Teddington Weir capacity improvements.

3.2.1.8 A summary of the reasonable alternative options that were considered, and reasons for selection of the preferred options, is provided within the EIA Scoping Report.

3.2.1.9 Further detail of these alternatives will be provided within the ES including a comparison of environmental effects.

3.3 Design Development since EIA Scoping

3.3.1 Introduction

3.3.1.1 The following sections provide a summary of the main areas of design development that have progressed since submission of the EIA Scoping Report in October 2022.

3.3.2 Spelthorne Channel Realignment

3.3.2.1 A section of the Spelthorne Channel (approximately 600 metres long) is proposed to be realigned at Sheepwalk, where the channel extends south of the M3. This is a change to the design presented within the EIA Scoping Report, but it is within the Project Boundary for the EIA Preliminary Environmental Information Report (PEIR).

3.3.2.2 Plate 3-1 below shows the approximate location of the Spelthorne Channel through Sheepwalk and Land South of Chertsey Road that was reported in the EIA Scoping Report. Plate 3-2 below shows the indicative alternative route of the channel and position of associated structures in this location that have been assessed for the purpose of our PEIR. The realignment will require relocation of a structure beneath the M3 and a change to the arrangement of the Chertsey Road/Renfree Way junction.

Plate 3-1: Spelthorne Channel Alignment at Sheepwalk / Land south of Chertsey Road and location of associated structures that were reported within the EIA Scoping Report

Plate 3-2: Alternative Spelthorne Channel Alignment at Sheepwalk / Land south of Chertsey Road and location of associated structures

3.3.2.3 Three main reasons for considering a different alignment are as follows. The first is to maximise landscape and ecological opportunities. The realignment of the channel through Sheepwalk to follow the eastern boundary rather than following a central alignment allows additional space for landscape and green infrastructure opportunities, including recreation and habitat enhancements. Secondly, where the alignment has altered within the Land South of Chertsey Road, this allows for accommodation of a possible pathway upgrade along the existing roadside pathway in line with the Active Travel opportunities (see Section 2.1.8). Thirdly, replacing the existing staggered junction along Chertsey Road and Renfree Way with a single junction to serve both Sheepwalk and Chertsey Road will provide an improvement to the safety and use of the road network.

3.3.3 Landscape and Green Infrastructure Design Appraisal

3.3.3.1 The scope and content of the design for the RTS is defined by the RTS vision and goals and the opportunities arising from the DCO regime as a result of the Secretary of State's Section 35 Direction. The outline design has largely been completed for the remainder of the flood alleviation aspects of the project, however, the landscape, environment and green infrastructure design for the RTS is ongoing and is using an iterative and integrated optioneering process. To fully maximise the opportunity to create a connected, high-quality new major public green infrastructure asset, the project team began in early 2022 to develop the Landscape and Green Infrastructure (L&GI) design for the RTS.

3.3.3.2 The process of the design work for the proposed L&GI began with four conceptual landscape 'themes' which focussed on some of the key objectives of the project. These themes were called:

- Theme 1: Visually Connected Green Spaces – open spaces with significantly raised landforms to provide for new visual connections across the breadth of the RTS;
- Theme 2: Active Recreation, Green Spaces – open spaces for intensive active recreation and sports, seeking to attract visitors from a wide area;
- Theme 3: Active Travel, 'Snaking Rampart' - a commuter and recreation route for cyclists, pedestrians and other wheeled mobility users, linking communities and the new green open spaces; and

- Theme 4: Enhanced Ecological Value – maximised ecological benefits for wildlife and habitats, with relatively restricted access opportunities.

3.3.3.3 The themes were put through an options appraisal process which tested the themes against factors such as planning policies, flood risk, buildability, affordability, carbon generation/mitigation and biodiversity/ecology.

3.3.3.4 The process also involved engagement workshops with Local Planning Authorities and special interests groups. The feedback received, together with the result of the appraisal, led to the development of two preferred options and two sub-options. Both options included new green open spaces at Royal Hythe, Penton Park (including a new blue open space at Abbey 1 Lake), Sheepwalk and part of Land South of Chertsey Road. The options also included wide-ranging ecological enhancements. The options were:

- Option 1: A fully connected Active Travel Route, along the length of the scheme, with two new bridges over the river; and
- Option 2: Enhanced active travel provision but without a fully connected active travel route or connections across the river.

3.3.3.5 In addition, two sub-options were identified, which provided for, by example, (a) low-key, passive uses for the open spaces (such as walking, jogging and informal kickabout) or (b) more active, intensive recreational and sporting uses (such as skating/BMX, sport pitches and adventure play). These two sub-options could apply to either of the main options.

3.3.3.6 The options underwent a further stage of appraisal in which Option 1 was selected as the preferred L&GI option to secure connectivity across the River Thames and integration with local communities whilst also achieving better general policy and flood risk compliance.

3.3.3.7 It was decided that the core design under Option 1 sub-option (a) would be taken forward as the primary basis for the Design for Statutory Consultation, based on the stronger support for these types of recreational uses received from some stakeholders. However, it is important to note that the L&GI design at this stage is schematic and allows for further development and a range of uses. This includes

adopting a wide range of recreation opportunities, such as identified by sub-option (b).

3.3.3.8 As part of Statutory Consultation we are seeking views on the activities that could be facilitated by the new green and blue open spaces so that the design of them can be developed further to respond to this feedback. In particular, we are considering whether the focus should be on sub-option (a) or (b); or a combination of the two, and we are keen to understand what types/blend of uses stakeholders would like to see, including any preferences for the following types of uses and elements of the L&GI design that could be provided:

- The low-key recreation/leisure/play uses;
- The active recreation and sporting uses;
- The facilities in the supporting visitor buildings;
- Any education-based facilities or uses;
- Any opportunities to incorporate art into the green open spaces;
- Any entertainment-based facilities or uses; and
- The design of the active travel route, including surfaces, segregation of cycle and pedestrian users, the inclusion of bridges, and lighting.

3.3.3.9 As noted in Section 2.1.2 (see Chapter 2: Project Description) and Appendix 2.1, whilst the design has evolved since the design parameters were set for this EIA PEIR, following the steps set out above, the maximum parameters have varied little and whilst there have been reductions in the number of potential new green and blue open spaces proposed within those parameters, the preliminary assessments identified in this PEIR are still considered valid.

3.3.3.10 As noted above, the landscape and green infrastructure design appraisal development process has included consideration of biodiversity improvements. We are committed to delivering BNG as well as the provision of high-quality habitats. In order to achieve this, we are undertaking a comprehensive options appraisal process to understand which sites to include within the project. So far, this has refined an initial list of over 50 identified locations, down to the priority areas for habitat creation, enhancement or mitigation explained within Section 2.1.9 (see Chapter 2: Project Description) and shown on Figure 2.1. The initial sites were originally identified based on a combination of known areas of

potentially suitable land in geographic proximity to the flood channels, existing baseline information collected for the project, publicly available documents, aerial photography and mapping. They were refined using a multi-criteria analysis which rated against a series of categories including location, size, ground conditions, flood risk, habitat connectivity, BNG potential, cultural heritage, environmental designations, local significance, existing land use and technical feasibility. This process will continue as the project design and habitat requirements continue to develop.

3.3.3.11 The project approach to habitat design continues to develop, seeking to balance the delivery of multiple project goals. This includes consideration of high-quality habitat provision, BNG, carbon sequestration and ecosystem services in order to inform a strategic approach to the placement of habitat creation, enhancement or mitigation.

3.3.3.12 Since EIA Scoping, there have been some changes to the project boundary as a result of ecological and BNG considerations. Key areas are:

- An area to the north of Norlands Lane / west of Royal Hythe was identified as not being required to deliver the project goals or for associated construction activities. This area contained several ecological constraints including the presence of both protected species and invasive non-native species (INNS);
- The statutory designation of Thorpe Hay Meadow as a SSSI means it cannot be considered in the calculation of BNG. This area was therefore removed from the project boundary for EIA PEIR;
- The embankment surrounding Wraysbury Reservoir had been previously identified as having the potential to generate BNG, however, this has since been considered against the requirements of the reservoir. It is understood that the strict maintenance regime on reservoirs requires a grass sward of between five and 15 centimetres to be maintained at all times to enable visual inspections and to provide a mat coverage that binds the banks together. In contrast, grassland that provides higher BNG would require less frequent grazing. This section of the site is therefore not being progressed further however, the flat area of land to the south of Wraysbury Reservoir remains. The project boundary for EIA PEIR has been updated to reflect this change; and

- During recent UKHab surveys an area of land approximately 3.5 hectares in size to the east of Laleham Reach was identified as containing a mixture of modified grassland, woodland and blackthorn scrub of moderate condition. This area provides the potential to achieve BNG and ecological connectivity to RTS and therefore it has been added to the project boundary for the EIA PEIR.

3.3.4 Off-site car parking for construction workers

3.3.4.1 To mitigate for construction disturbance to traffic on roads local to the project boundary for the EIA PEIR, a study is being undertaken to consider off-site car parks for construction workers. This study has been undertaken on the basis of early contractor involvement, but does not account for likely travel plan mitigation measures that we will develop for the DCO Application, which will likely reduce the amount of car parking spaces needed.

3.3.4.2 A long-list of 22 potential car park locations was identified through a desk study. A high-level multi-criteria assessment (MCA) was then undertaken to identify any sites deemed unsuitable for use. The MCA considered factors including current conditions on site (existing surface/hardstanding), the suitability of the existing road network, public transport connections, ecology, cultural heritage/archaeology, ground conditions, flood risk and impact to local community.

3.3.4.3 This has resulted in the refinement to a short-list of six potential off-site car park locations for construction workers. These are not located within the project boundary for the EIA PEIR but are included within the Design for Statutory Consultation. The locations of the potential car park sites are shown in Figure 2.2. As noted in Section 4.2.3 (see Chapter 4: Approach to the Environmental Assessment) effects associated with these car parks are scoped into the assessment as a precautionary measure and will be subject to further detailed study alongside the development of the travel plan mitigation measures which will seek to reduce parking demand.

3.3.5 Augmented flow

3.3.5.1 Following a conceptual water quality modelling exercise at the end of 2022, it was agreed the upper limit of the augmented flow will be modified from 1.5 m^3 /s (as considered in the Scoping Report) to 1m^3 /s (as

described in Chapter 2 Project Description). This reduction in augmented flow is proposed in order to reduce potential effects on the water environment on the section of the River Thames that is bypassed by the flood channel.

3.3.6 Spelthorne Channel at Ferry Lane Lake

3.3.6.1 Our PEIR assumes that the Spelthorne Channel passes through Ferry Lane Lake (also known as Ferris Meadow Lake) as reported in Chapter 2: Project Description. However, during the course of project development the lake has become used for open water swimming. In light of this and associated feedback from stakeholders, we are currently undertaking a water quality assessment of the effects of our current alignment on Ferry Lane Lake and an options study to understand the feasibility of alternative alignment options for the Spelthorne Channel at this location. This assessment and the options study are considering flows within the flood channel when it is being used for flood relief as well as the flow in normal day-to-day conditions (known as the augmented flow).

3.3.6.2 The options study is considering the following options:

1. Spelthorne channel passes through Ferry Lane Lake;
2. Direct the flood channel north of Ferry Lane Lake into the River Thames via the Chap along a newly constructed route;
3. Divert the Spelthorne channel down the west side of Ferry Lane Lake into the River Thames along a newly constructed route;
4. Divide the Spelthorne channel into two sections with half diverted to the north via the Chap and half down the west side of Ferry Lane Lake along a newly constructed route;
5. A tunnel under Ferry Lane Lake for flood flows; and
6. Retain the flood relief channel alignment through Ferry Lane Lake but with the augmented flow diverted into the Chap via a newly constructed route, with sub-options to consider both with (6b) and without (6a) a new flow control structure

3.3.6.3 The study is considering flood capacity, engineering, costs, policy and environmental factors alongside their fit with the RTS Environmental Design Principles (available for review as part of our statutory consultation material), which stem from the project goals.

3.3.6.4 The outcomes of this study will be used, alongside the comments received in this consultation and previous consultations, as part of determining which option will be taken forward. Following this consultation and the completion of the options study, we will engage further with the public.

3.3.6.5 Further detail of the alternatives considered at this location and the reason for selection of the preferred option will be presented in more detail within the ES which will be submitted as part of the DCO application.

3.3.6.6 Our current high-level understanding of the key constraints for the options is provided below. We are considering these and identifying if there are others, as our assessment work is ongoing.

Option 1 – Our current proposal, Spelthorne channel passes through Ferry Lane Lake

3.3.6.7 Under this option both the augmented flow and the flood flow pass through Ferry Lane Lake.

3.3.6.8 We are further developing our understanding of water quality effects including habitats within the lake and impacts on recreational activities, such as swimming.

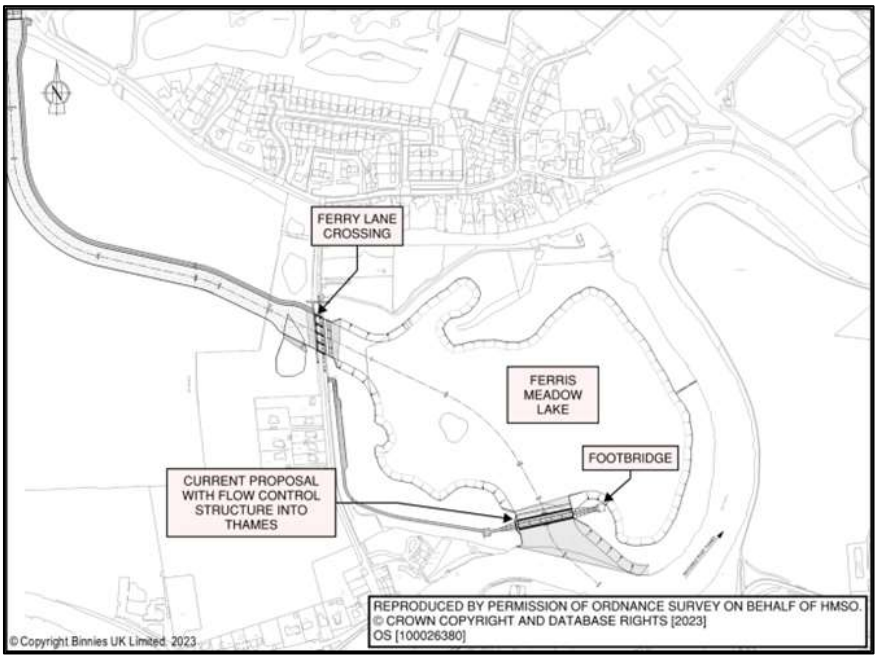

Plate 3-3: Option 1 (our current proposal)

Option 2 - Direct the flood channel north of Ferry Lane Lake into the River Thames via the Chap along a newly constructed new route

3.3.6.9 Under this option:

- The augmented flow and the flood flow pass down the Chap along a newly constructed route;
- Extensive excavation in an area of known landfill would be required to the west of Ferry Lane Lake;
- The sailing club would need to be moved to a new location.
- Extra utility service diversions would be needed;
- The Chap does not currently have sufficient capacity so it would have to be made wider and deeper to pass flood flows; and
- Erosion protection works are likely to be required.

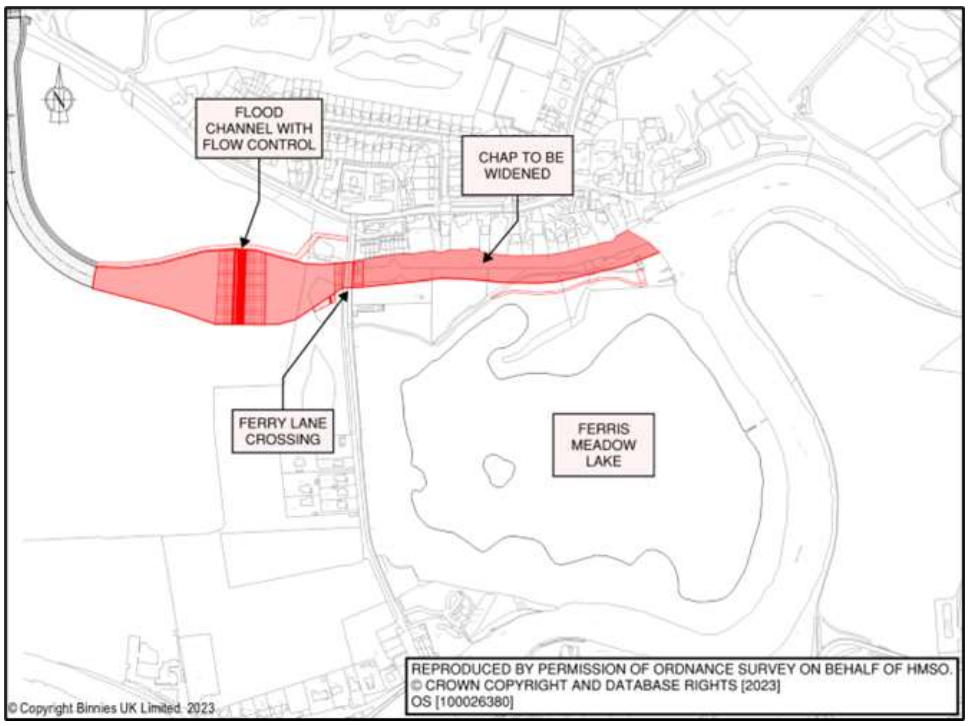

Plate 3-4: Ferry Lane Lake Option 2

Option 3 - Divert the Spelthorne channel down the west side of Ferry Lane Lake into the River Thames along a newly constructed route

3.3.6.10 Under this option:

- Both augmented flows and flood flows pass along a newly constructed route;
- There is very limited space to fit the size of channel required so it would need hard engineered sides such as sheet piles resulting in little potential for habitat improvements within the channel;
- Considerable replacement of lost habitat would be required including grassland and woodland;
- Extensive excavation in an area of known landfill would be required to the west of Ferry Lane Lake; and
- Extra utility service diversions would be needed.

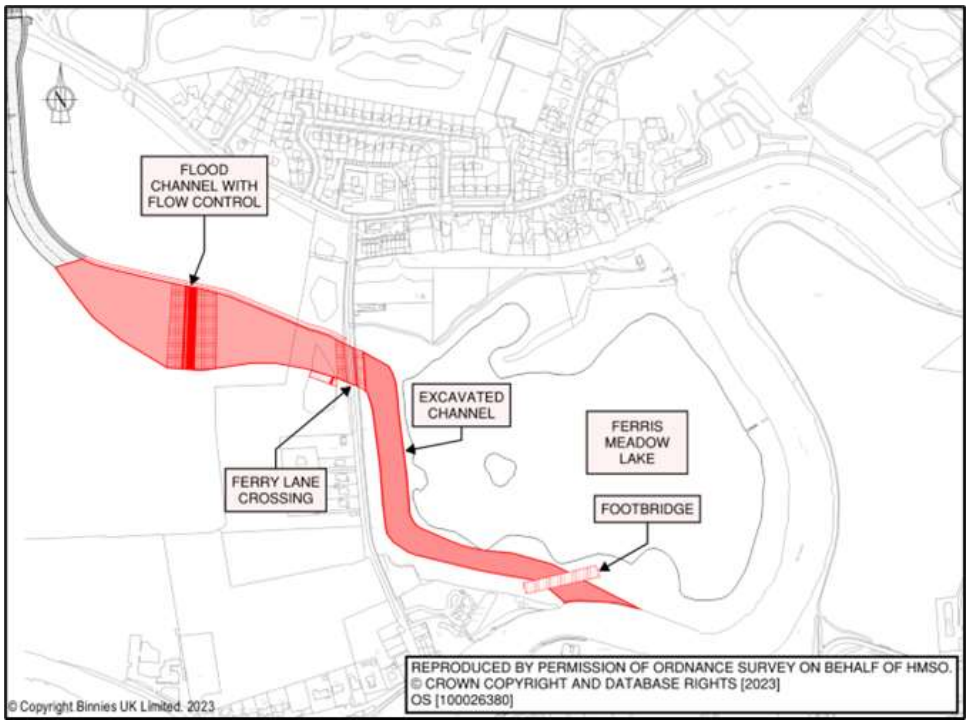

Plate 3-5: Ferry Lane Lake Option 3

Option 4 – Divide the Spelthorne channel into two sections with half diverted to the north via the Chap and half down the west side of Ferry Lane Lake along a newly constructed route.

3.3.6.11 Under this option:

- Both augmented flows and flood flows pass along both the Chap and a newly constructed route;
- Extensive excavation in an area of known landfill would be required to the west of Ferry Lane Lake;
- Extra utility service diversions would be needed;
- Considerable replacement of lost habitat would be required including grassland and woodland;
- The Chap may prove to be wide enough for this option but excavation to provide sufficient depth would be needed. Erosion protection works are likely to be required; and
- Similar to Option 3, for the channel route to the west of the lake there is still limited space for the channel size required (although not such a constraint as Option 3) so sheet piled sides are likely to be needed resulting in little potential for habitat improvements within the channel.

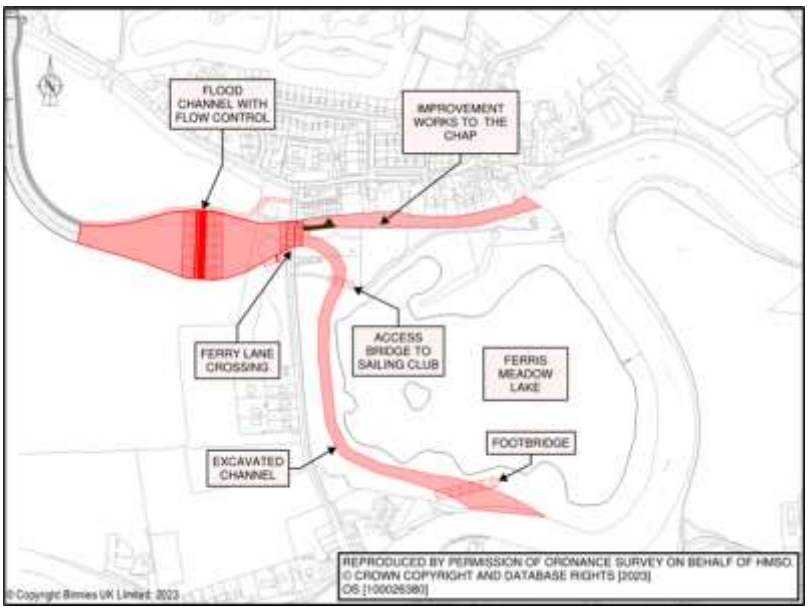

Plate 3-6: Ferry Lane Lake Option 4

Option 5 – A tunnel under Ferry Lane Lake for flood flows with augmented flow diverted into the Chap via a newly constructed route

3.3.6.12 Under this option:

- The augmented flow passes along the Chap via a newly constructed route and the flood flows pass through a newly constructed tunnel;
- This option would be complex to build as a large diameter tunnel would be required to carry flood flow and is likely to be prohibitively expensive;
- Deep tunnel shafts would be needed through poor ground conditions; and
- A separate small channel for augmented flow directed into the Chap would be required.

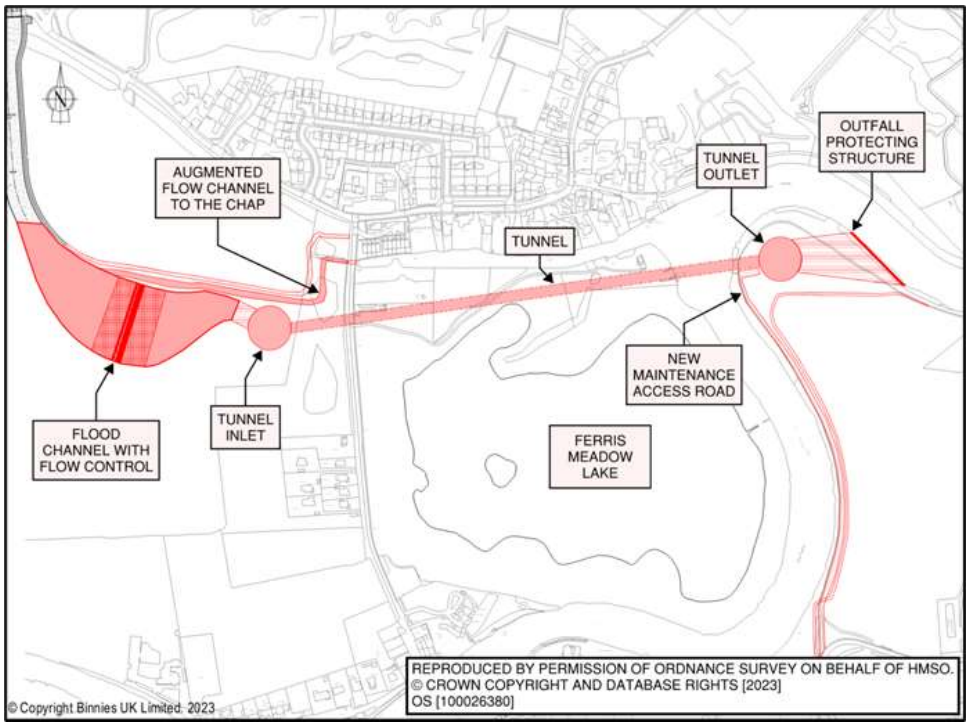

Plate 3-7: Ferry Lane Lake Option 5

Option 6a - Retain the flood relief channel alignment through Ferry Lane Lake with the augmented flow diverted into the Chap via a newly constructed route

3.3.6.13 Under this option:

- Augmented flow passes along the Chap via a newly constructed route and flood flows pass through Ferry Lane Lake. No control structure is provided at the junction;
- A small channel between the Spelthorne channel and the Chap would be needed to carry the augmented flow. This area may be landfill; and
- We are further developing our understanding about how successful this option would be in preventing augmented flow from reaching the lake without having a flow control structure.

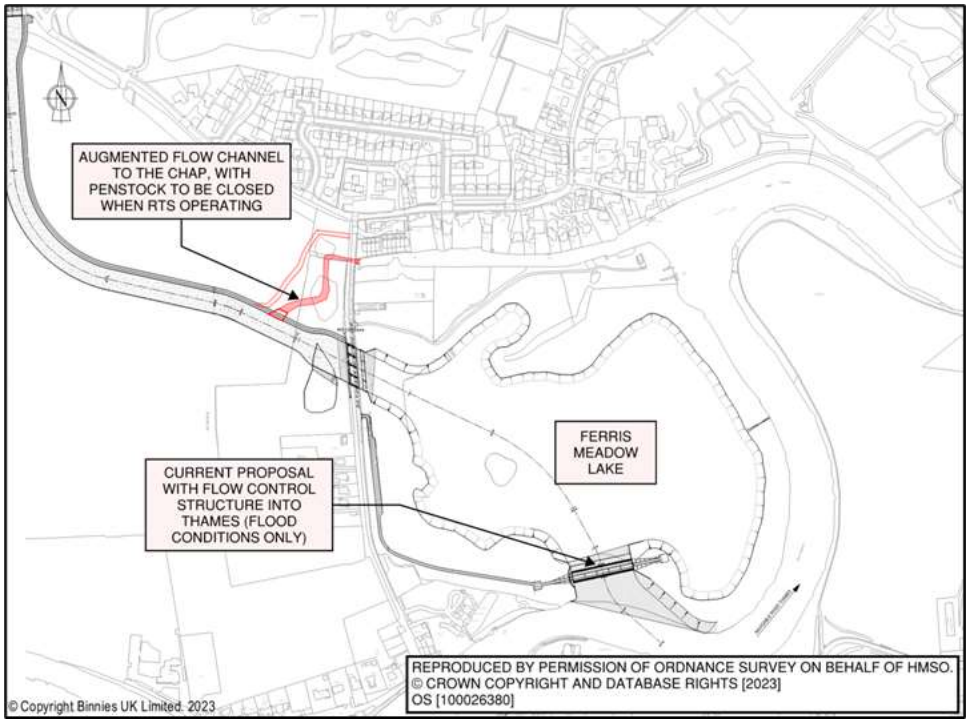

Plate 3-8: Ferry Lane Lake Option 6a

Option 6b - Retain the flood relief channel alignment through Ferry Lane Lake with the augmented flow diverted into the Chap via a newly constructed route with a new flow control structure

3.3.6.14 Under this option:

- Augmented flow passes along the Chap via a newly constructed route and flood flows pass through Ferry Lane Lake. A control structure is provided at the junction to prevent augmented flow from reaching the lake; and
- A small channel between the Spelthorne channel and the Chap would be needed to carry the augmented flow. This area may be landfill.

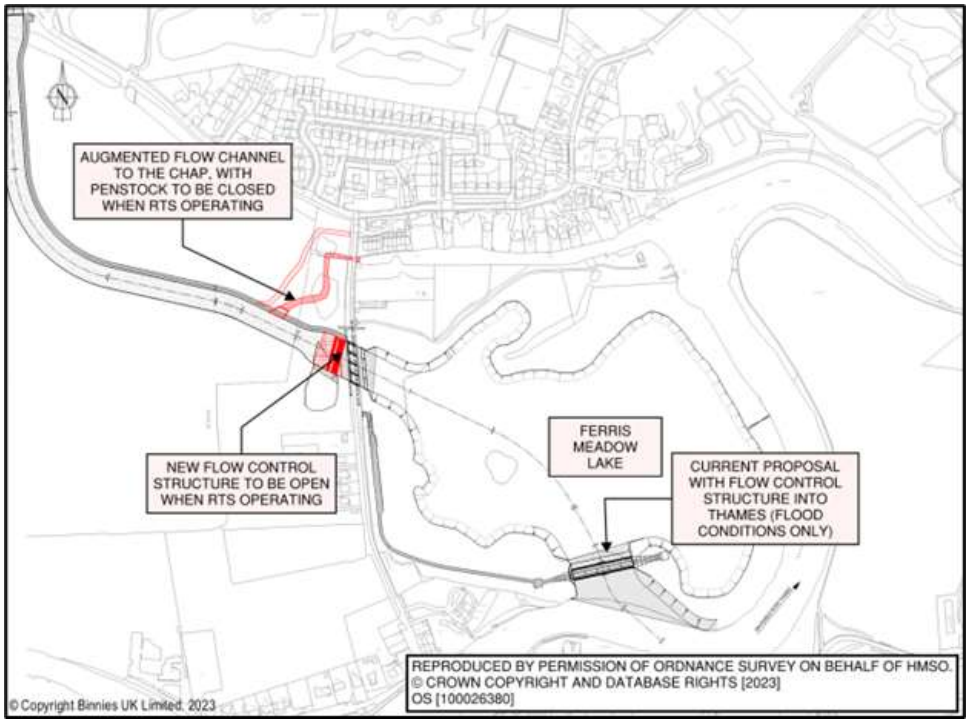

Plate 3-9: Ferry Lane Lake Option 6b

3.4 Assessment of alternatives within the ES

3.4.1.1 Our PEIR chapter presents a summary of the reasonable alternatives that have been considered and taken forward as part of the project as described in Chapter 2: Project Description. In line with the EIA Regulations, the ES will include further detail of the reasonable

alternatives and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.

3.4.1.2 The design to be reported and assessed within the ES will take in to account the outcomes of statutory consultation as well as ongoing environmental assessment, design development and engagement. We will describe any further changes to the design subsequent to the PEIR and the reasons for these within the ES.

4 Approach to the Environmental Assessment

4.1 Introduction

4.1.1.1 Environmental Impact Assessment (EIA) is the process that identifies the key environmental effects of a development and suggests ways that these effects can be avoided, reduced or managed. It is a requirement of UK law for certain developments that are likely to cause significant environmental effects.

4.1.1.2 This chapter presents the key themes of the EIA process that we have used to inform the production of our Preliminary Environmental Information Report (PEIR). An overview is provided of the following:

- The scope of the assessment;
- The assessment methodology including the assessment criteria and approach to defining the current and future baseline environment;
- The approach to limitations and uncertainties;
- The approach to mitigation; and
- The approach to consideration of cumulative effects.

4.1.1.3 Our PEIR forms part of the EIA process under the Infrastructure Planning (EIA) Regulations 2017 and is produced as a key consultation tool for the Development Consent Order (DCO) statutory consultation stage. It provides an update on the ongoing EIA (including consideration of the PINS Scoping Opinion), consultation and design of the River Thames Scheme (RTS). Our PEIR also provides the information reasonably required for consultees, including the public, to develop an informed view of the likely significant environmental effects of the project, as understood at this stage.

4.1.1.4 Our PEIR:

- Reviews relevant legislation, policy and guidance;
- Reviews and updates the baseline (the environmental starting point), and how this is expected to change (the future baseline);
- Reviews the area in which each topic has the potential to experience likely significant effects (the study area);

- Updates or clarifies proposed assessment methods;
- Updates effects scoped into the EIA following the PINS Scoping Opinion plus changes to design and footprint of the project;
- Provides a preliminary assessment of the likely significance of scoped in environmental effects of the RTS; and
- Identifies potential mitigation measures to avoid, reduce or compensate for environmental effects.

4.2 Scope of the Assessment

4.2.1 EIA Screening

4.2.1.1 Screening in the EIA process involves determining whether a development is likely to have a significant effect on the environment. If the development is not likely to have a significant effect no further stages of the EIA process are required.

4.2.1.2 In October 2022, alongside our EIA Scoping Report (see 4.2.2), we confirmed that the RTS is likely to have a significant effect on the environment, and that an EIA would be carried out.

4.2.2 EIA Scoping

4.2.2.1 The EIA scoping process identifies the environmental ‘aspects’ and ‘matters’ (hereafter referred to as ‘topics’ and ‘receptors’ respectively for the RTS EIA) that are likely to experience significant effects (an example of a ‘topic’ is Biodiversity and an example of a ‘receptor’ would be badgers). These effects are described as being ‘scoped in’. Any environmental topics or receptors that are not likely to experience significant effects are ’scoped out’. The EIA Regulations set out the environmental topics that need to be considered during the process.

4.2.2.2 We prepared and submitted the RTS EIA Scoping Report (Environment Agency and Surrey County Council, October 2022) (‘the EIA Scoping Report’) to the Planning Inspectorate (PINS) on 5 October 2022 with a request for a statutory scoping opinion. The EIA Scoping Report set out the environmental baseline, proposed assessment methodologies and effects proposed to be ‘scoped in’ and ‘scoped out’ of the assessment.

4.2.2.3 PINS provided and adopted their EIA Scoping Opinion ('the PINS Scoping Opinion') on 15 November 2022 on behalf of the Secretary of State. We have taken the PINS Scoping Opinion into account when preparing this PEIR and will use it to inform which topics and effects the Environmental Statement (ES) will assess.

4.2.2.4 The PINS Scoping Opinion and feedback from consultees is provided in Appendix 4.1 with project responses. A summary of key points from the PINS Scoping Opinion is provided below.

4.2.3 Effects 'Scoped In' to the Assessment

4.2.3.1 The PINS Scoping Opinion agreed with all of the likely significant effects requiring assessment that are documented within the EIA Scoping Report and did not recommend that any effects should instead be scoped out.

4.2.3.2 We proposed to scope out the following effects (or they were not scoped in) within the EIA Scoping Report, however, they have subsequently been scoped in following comments provided within the PINS Scoping Opinion. The 'Engagement' sub-section in each of the topic chapters of our PEIR (i.e. Chapters 6 to 18) provides further detail:

- Effects arising from channel maintenance required in order to restore the design profile. These effects are identified and given a preliminary assessment in seven relevant topic chapters within our PEIR (Climatic Factors, Biodiversity, Flood Risk, Health, Landscape and Visual Amenity, Materials and Waste, and Water Environment);
- Air quality effects associated with Non-Road Mobile Machinery (NRMM) and associated emissions – see Chapter 6 Air Quality and Appendix 6.3 for further information;
- Air quality effects associated with vehicle movements transporting hazardous waste and materials – see Chapter 6 Air Quality and Appendix 6.3 for further information;
- Air quality effects from use of new green open spaces – see Chapter 6 Air Quality and Appendix 6.3 for further information;
- Air quality effects from ammonia – see Chapter 6 Air Quality and Appendix 6.3 for further information;
- Air quality effects to ecological receptors including statutory and non-statutory nature conservation sites in terms of annual mean NO_x concentrations, nitrogen deposition, acid deposition and

concentrations of ammonia resulting from vehicle exhaust emissions associated with construction or operation of the project – see Chapter 6 Air Quality and Appendix 6.3 for further information;

- Air quality effects associated with the use of barges on the River Thames during construction – see Chapter 6 Air Quality and Appendix 6.3 for further information;
- Effects on the Windsor Great Park Special Area of Conservation (SAC) and Windsor Forest and Great Park Site of Special Scientific Interest (SSSI) – see Chapter 7 Biodiversity and Appendix 7.8 for further information.
- Climate related effects during the construction phase – see Chapter 8 Climatic Factors for further information;
- Effects from the transportation of non-hazardous material on heritage assets – see Chapter 9 Cultural Heritage for further information;
- Effects to heritage assets from the installation of new sources of lighting at new recreational facilities – see Chapter 9 Cultural Heritage for further information;
- Effects to flood risk as a result of construction activities – see Chapter 10 Flood Risk for further information;
- Effects from the loss of any existing public open space – see Chapter 11 Health for further information;
- Effects as a result of noise from the potential new green/blue open spaces – see Chapter 14 Noise and Vibration for further information;
- Effects from the influx of site personnel causing a disruption to community cohesion – see Chapter 15 Socio-economics for further information;
- Effects as a result of loss or reprofiling of land/soils and the impact on ecosystem services that the soils provide. Effects from general activities causing damage, compaction, erosion or instability of soils during construction. – see Chapter 16 Soils and Land for further information;
- Effects arising from the transportation of hazardous waste and materials – see Chapter 17 Traffic and Transport for further information;
- Effects associated with abnormal indivisible loads (AILs) - see Chapter 17 Traffic and Transport for further information;
- Effects on hydrology from mitigation used during construction - see Chapter 18 Water Environment for further information; and

- Effects arising from construction activities that have potential to lead to sediment disturbance and spill contamination – see Chapter 18 Water Environment for further information.

4.2.3.3 Furthermore, since the submission of the EIA Scoping Report, further design information has become available which has resulted in additional effects being scoped in to our PEIR. To mitigate for construction disturbance to traffic on roads local to the project boundary for the PEIR, six off-site car parks for construction workers are being considered (see Chapter 2: Project Description and Chapter 3: Alternatives for more information). Limited baseline information is currently available for these car park locations. Effects associated with these locations are therefore scoped in and have been assessed in our PEIR as significant for all topics as a precautionary measure. We have also proposed relevant mitigation for these effects including:

- A Construction Traffic Management Plan to ensure highways works are safe, planned and co-ordinated to secure expeditious movement of traffic on the road network, and minimise inconvenience to the public;
- A Construction Logistics Plan to detail the logistics of arrangements for worksites to minimise impacts on communities and the environment; and
- A Construction Travel Plan to proactively manage and influence workforce (and visitor) travel to and from worksites to limit traffic movement and reduce disruption in the vicinity of the site.

4.2.3.4 A summary of all potential likely significant and non-significant effects scoped into the assessment is provided in Appendices 6.3 (Air Quality), 7.8 (Biodiversity), 8.1 (Climatic Factors), 9.7 (Cultural Heritage), 10.1 (Flood Risk), 11.3 (Health), 12.2 (Landscape and Visual Amenity), 13.1 (Materials and Waste), 14.2 (Noise and Vibration), 15.3 (Socio-Economics), 16.1 (Soils and Land), 17.3 (Traffic and Transport) and 18.4 (Water Environment).

4.2.4 Effects ‘Scoped Out’ of the Assessment

4.2.4.1 The PINS Scoping Opinion highlights the proposed aspects and matters that they agree can be scoped out of the assessment on the basis of the information provided in the EIA Scoping Report.

4.2.4.2 The PINS Scoping Opinion also states that they are content that the receipt of the scoping opinion should not prevent the applicant from subsequently agreeing with the relevant consultation bodies to scope further aspects and matters out of the assessment where further information is provided to justify the approach. Where this is the case, this will be explained and justified within the ES.

4.2.4.3 Any effects recommended by PINS to be scoped into the assessment have been included within our PEIR, with the exception of those noted in Table 4.1 below. These points are discussed further in the relevant topic chapters. Where appropriate, this PEIR and associated consultation seeks to achieve agreement from key stakeholders on this approach.

Table 4.1: Effects recommended by PINS to be scoped in that are not proposed to be assessed in the PEIR/ES and justification for this

Topic (and PINS Scoping Opinion ID)	Summary of PINS comment	Project response
Biodiversity (3.2.3)	Re: Operational effect: changes to hydromorphological conditions at weirs on protected and notable habitats and species. PINS considered that there is insufficient evidence provided in the Scoping Report to establish the likely scale and nature of these effects and the specific receptors that could be affected by these changes. PINS stated the ES should contain an assessment of potential hydromorphological changes caused by capacity changes at weirs on ecological receptors where significant effects are likely to occur.	Further information in relation to fisheries has enabled us to identify that effects on fish from the capacity improvement works at Molesey, Sunbury and Teddington weirs could occur and will be scoped in and assessed in the Biodiversity chapter of the Environmental Statement. Effects on aquatic habitats and other notable and protected species will be scoped out as there is evidence that changes to the hydromorphology of the River Thames are within the range of variance of existing flood flow conditions. Further detail is provided within Chapter 7 Biodiversity.
Cultural Heritage, Archaeology	PINS noted the potential for buildings and other structures to be demolished as a result of RTS.	We have undertaken an initial assessment of all buildings potentially to be demolished using

Topic (and PINS Scoping Opinion ID)	Summary of PINS comment	Project response
and Built Heritage (3.4.3)	It was not stated in the Scoping Report whether these have any historic interest. It was noted that the ES should determine if demolition of these buildings is likely to impact historic receptors and if so, the ES should assess significant effects where they are likely to occur.	aerial photography, maps and historic records data. These are all modern buildings and are considered to have no historic value. This will be checked on the ground during the next phase of the setting study but is proposed to remain scoped out.
Flood Risk (3.5.7)	Re: Operational effect: negative flood risk downstream during times of flood. PINS noted that the Scoping Report states mitigation will be embedded in the design of RTS to achieve the goal of reducing flood risk impacts. The Scoping Report states that the Flood Risk Assessment (FRA) will assess relevant effects from changes to flood flows downstream of the channels and Scoping Report Table 10-2 states that any increase in flood risk would be an impact of high magnitude suggesting it is possible for an increased flood risk at receptors. As this impact is dependent on the outcomes of the sediment and hydraulic modelling, PINS felt there was not enough information to scope this matter out. They recommended that the ES should assess significant effects from flood risk during operation where they are likely to occur.	Our Flood Modelling Non-Technical Summary (WBi, 2023) demonstrates that for fluvial flooding there is no downstream detriment as a result of RTS. The Flood Risk Assessment (FRA) will address all relevant sources of flooding posed to and from the project for all stages of the intended lifetime of the project and this will be compliant with the National Policy Statement (NPS) for Water Resources Infrastructure, National Planning Policy Framework (NPPF) and Planning Policy Guidance (PPG). The conclusions of the FRA will be reported within the ES which will focus on the significant effects. The FRA will be a technical appendix to the ES and will draw upon modelling outputs.
Socio-economics (3.10.7)	Re: operational effect: Provision of road bridges altering access to communities and businesses.	The provision of new road bridges will not be a significant enhancement to the current road network as it is

Topic (and PINS Scoping Opinion ID)	Summary of PINS comment	Project response
	Scoping Report paragraph 15.5.2.1 states that provision of new road bridges is not likely to be a significant enhancement to the current network. PINS stated that the ES should explain how the provision of new accesses to communities and businesses will affect the operation of the existing road network.	proposed they will reinstate the existing road network over the flood channel thereby reducing potential severance of communities, but not enhancing traffic connections. Any existing accesses to local communities or businesses which would be disrupted by the construction of the project would be reinstated or reconnected to the existing road network. No new vehicular accesses to local communities or businesses are anticipated to be included as part of the project design. See also Chapter 15 Socio-Economics (Section 15.3 Engagement).
Water Environment (3.13.8)	Re: Operational effect – capacity improvement impacts resulting in downstream hydromorphological changes. The Scoping Report identifies that such changes are anticipated to be within the scale of natural changes from major flow events based on historic bathymetric surveys and that measures are embedded to avoid main weir pools and maintain operational flow so that weir structures are appropriately designed. These measures are currently not described therefore the PINS does not agree to scope this matter out. PINS stated that the ES should describe the measures to be employed and secured to reduce the potential effects from weir upgrades on downstream	The new gates at each weir will not be operated until all the existing weir gates have already been fully opened as per the current operational requirements. When they need to be opened, the flood in the River Thames will be well developed and the tailwater level downstream of each weir will be much higher than the normal level in non-flood conditions so the additional water added from opening the new gates will have no impact on non-flood condition levels. The modification of the direction of water flow by the new weir gates when in operation with the new gates, is likely to lead to only subtle changes in the pattern of scour and deposition immediately downstream. These changes are therefore localised and within the scale of changes that already occur

Topic (and PINS Scoping Opinion ID)	Summary of PINS comment	Project response
	hydromorphological change and assess significant effects where they are likely to occur or explain how measures reduce/avoid such effects.	during a particularly large flow event. As such, any changes to hydromorphology are expected to be within the normal range of baseline variance of existing flood flow conditions. The main weir pools at Sunbury and Teddington are upstream of the proposed new structures; therefore, no downstream hydromorphological changes will affect these. Whereas the Molesey main weir pool is approximately 250m downstream of the weir which is beyond the limit of any likely effect. Impacts to hydromorphology at weirs within the section bypassed by the flood channel remains scoped in and will be assessed. In addition, impacts from augmented flow and depleted water level to flow dependent habitats such as weir pools will be assessed.

4.2.4.4 Since EIA Scoping we have been able to confirm that there is sufficient capacity at licenced waste disposal or recovery sites in proximity to the project boundary to receive non-hazardous material generated by the project that is not required or not suitable for re-use or recovery within the project design. The previously scoped in effects from the transportation of non-hazardous materials from the major road network and placement off-site is now proposed to be scoped out of the EIA. This is on the basis that transporting non-hazardous materials to these licenced sites would have been assessed and mitigated as part of their permitting processes. This rationale is now in line with that applied at EIA Scoping for the movement

of hazardous waste from the major road network and placement at licenced sites.

4.2.4.5 Transportation of non-hazardous materials and hazardous waste within the project boundary and to the major road network is still scoped into the EIA.

4.3 Assessment Methodology

4.3.1 Legislation, Policy and Guidance

4.3.1.1 Under Section 5(1) of the Planning Act 2008 (PA2008), National Policy Statements (NPS) are designated by the Secretary of State. These set out national policy in relation to specified descriptions of development. However, as there is no applicable NPS for the RTS Section 105 of PA2008 applies, meaning that in deciding the application the Secretary of State must have regard to: any local impact report; any prescribed matters in relation to the development the application relates to; and any other matters the Secretary of State think are important and relevant to their decision. For the purposes of Section 105(2)(c) PA2008, parts of the NPS for Water Resources Infrastructure (Defra, 2023a) may be important and relevant to the Secretary of State's consideration of the project as it is considered that water resources infrastructure projects are the closest projects in form to the RTS that are covered by an NPS. Notably, elements of Section 3 ('Assessment Principles') and Section 4 ('Generic Impacts') are particularly relevant to the RTS.

4.3.1.2 The EIA Scoping Report referred to the 2018 draft NPS. Since publication of the Scoping Report, the NPS has been updated and finalised. The final NPS retains some important parts of the draft but also makes some significant updates and expansions. Any relevant changes or additions to the NPS since the EIA Scoping Report are summarised within the topic chapters.

4.3.1.3 Compliance of the RTS with relevant policy will be documented in the DCO application is not detailed in this PEIR.

4.3.1.4 The Planning Inspectorate (PINS) 'Advice Note Seven: Environmental Impact Assessment – Preliminary Environmental Information, Screening

and Scoping' and Advice Note Nine: 'Rochdale Envelope' has been used to inform the approach to our PEIR.

4.3.1.5 Any further relevant legislation, policy or guidance (including the relevant sections of the draft NPS for Water Resources Infrastructure) is outlined within Appendix M of the EIA Scoping Report. Where further legislation, policy or guidance has been published since the EIA Scoping Report, including the published NPS for Water Resources Infrastructure, this is documented within the relevant topic chapters of the PEIR.

4.3.1.6 The NPPF was updated on 5th September 2023 (i.e. after the publication of the EIA Scoping Report). These changes are minor and relate to policy on planning for onshore windfarm developments. These changes have no effect upon RTS and therefore are not reported within the individual topic chapters of this PEIR.

4.3.2 Existing Baseline

4.3.2.1 In order to identify the impacts and likely significant environmental effects of the RTS, it is important to understand the environment that would be affected by the project (i.e. 'the baseline'). Understanding the baseline allows the value of the environment (i.e. the sensitivity of receptors) and measurement of changes (i.e. the magnitude of change) that would be caused by the project to be fully appreciated.

4.3.2.2 Each topic chapter within the EIA Scoping Report has used appropriate data to inform the baseline understanding of defined study areas. Where appropriate the topic chapters within our PEIR present additional baseline information to account for comments made within the PINS Scoping Opinion or other information that has become available since the publication of the EIA Scoping Report (e.g. the results of recent surveys).

4.3.2.3 Our PEIR presents the baseline as understood at the time of writing. Chapter 5: Site Description provides a summary of the key baseline elements for each of the topics scoped in to the PEIR.

4.3.2.4 Where applicable each topic outlines further work required to inform the ongoing EIA and ES including the requirement for further baseline surveys, modelling or other studies to further enhance our understanding.

4.3.3 Future Baseline

4.3.3.1 The EIA Scoping Report also considers the likely evolution of the baseline without the implementation of the project (known as the 'future baseline'). The future baseline may differ from the existing baseline as a result of any changes to and arising from local plans or policies, new legal obligations that may drive change or wider changes to the environment, such as changes in population or climate change.

4.3.3.2 Chapter 5: Site Description provides a summary of the future baseline for each of the topics scoped in to the PEIR.

4.3.3.3 Where there have been any changes to the description of the future baseline since EIA Scoping, this is presented within Chapter 5: Site Description.

4.3.4 Study Area

4.3.4.1 The project boundary for the PEIR has been developed to reflect the current project design, whilst following PINS Advice Note Nine: Rochdale Envelope (PINS, 2019a), which states that the assessment of likely significant environmental effects should establish relevant parameters for the purposes of the assessment.

4.3.4.2 Design development is ongoing and therefore parameters "likely to result in the maximum negative effect (the worst-case scenario)" (PINS, 2019a) have been developed to address uncertainties. The design parameters are described in Chapter 2: Project Description.

4.3.4.3 Each environmental topic defined a specific study area or series of study areas within the EIA Scoping Report. These necessarily differ between topics. Chapter 5: Site Description provides further commentary on the topic study areas including any changes as a result of the project boundary for the PEIR or other changes, for example, as a result of the PINS Scoping Opinion.

4.3.4.4 Topic study areas have been defined using professional judgement to include areas within the zone of influence of the project. Where study areas partially include a potential receptor, that receptor has been considered within the preliminary assessment of the relevant topic.

4.3.4.5 The design of the project, EIA and consultation is ongoing, hence the study area for topics may change to accommodate new data. Any changes to topic study areas will be reported further within the ES.

4.3.5 Assessment Methodology and Criteria

4.3.5.1 Chapter 5 of the EIA Scoping Report outlines the approach used to identify likely significant effects. Each topic within the EIA Scoping Report provides further details of the proposed assessment methodology. Where there have been any changes or clarifications to the proposed methodology (e.g. as a result of the PINS Scoping Opinion or any change to relevant guidance) this is outlined within the relevant topic chapters of this PEIR. Where the assessment methodology for the preliminary environmental appraisal reported in the PEIR is different to that which will be used for the final assessment for the ES, this is also set out.

4.3.5.2 The sensitivity of a receptor (a receptor being a feature of the environment that responds to change) and magnitude (i.e. size) of change are both considered in determining the significance of effects. The methodology for doing this varies between environmental topics.

4.3.5.3 Where potential likely significant effects are identified the key project activities associated with the effect are noted within the 'Assessment of Effects' section within each topic chapter. A full list of associated project activities can be found in the potential likely significant effects and non-significant effects tables in the associated appendices (6.3 (Air Quality), 7.8 (Biodiversity), 8.1 (Climatic Factors), 9.7 (Cultural Heritage), 10.1 (Flood Risk), 11.3 (Health), 12.2 (Landscape and Visual Amenity), 13.1 (Materials and Waste), 14.2 (Noise and Vibration), 15.3 (Socio-Economics), 16.1 (Soils and Land), 17.3 (Traffic and Transport) and 18.4 (Water Environment)).

4.3.5.4 The two main categories of effect that are considered within our PEIR are construction effects and operation effects. These are recorded in the potential likely significant and non-significant effects summarised in topic Chapters 6 to 18 and the associated appendices listed in paragraph 4.3.5.3 above. Such effects can be either positive or negative.

4.3.5.5 There is no statutory definition of what constitutes a significant effect. For the purpose of our PEIR a significant effect is defined as any effect that is

likely to be of ‘moderate’ or ‘major’ significance. Any likely effects classed as ‘minor’ or ‘negligible’ are not significant, this approach is based on established EIA practice.

4.3.5.6 The duration of effects have typically been defined as being either temporary (short, medium or long-term) or permanent, unless otherwise defined by specific topic guidance. These are broadly defined as follows:

- Temporary:
  - Short-term: Effect continues during construction and up to one year following construction;
  - Medium-term: Effect continues for one to five years following construction; and
  - Long-term: Effect continues five to ten years following construction.
- Permanent:
  - Due to the subjectivity of human receptors to timeframes, those effects that continue for greater than 10 years following construction can be defined as permanent.

4.3.5.7 The ES may further refine the defined durations, possibly using topic specific approaches.

4.3.5.8 For the ES effects will also be classified as one of the following:

- Direct effects which arise from the impact of activities that form an integral part of the project (e.g. loss of habitat for flood channel construction);
- Indirect effects which result from impacts on the environment that are not a direct result of the project, often produced away from or as a result of a complex pathway (e.g. increased levels of ammonia at designated nature conservation sites in proximity to construction transport routes); and
- Secondary effects which arise as a result of an initial effect of the project (e.g. reduced amenity of a community facility as a result of construction noise).

4.3.5.9 Our ES will comply with Regulation 14 of the EIA Regulations, which sets out the information that an ES accompanying a DCO application must include. Our ES will describe the full assessment of the likely significant

effects that have been scoped in. It will provide the information reasonably required to reach a conclusion on the significant environmental effects of the proposed development, which takes account of current knowledge and assessment methods. See Chapter 21 section 21.2 for a summary of engagement and further work that will be undertaken to inform our ES, plus a summary of the proposed structure of the ES.

4.4 Approach to Limitations and Uncertainties

4.4.1.1 Our PEIR is based on the latest design parameters and the available construction information. As such the findings of the preliminary environmental appraisal presented within our PEIR may be subject to change as the design progresses or information from further studies becomes available. The final assessment of effects undertaken as part of the EIA and reported within the ES will be based on the latest information available at that time.

4.4.1.2 Assessments reported within our PEIR are considered a ‘worst case’ as a precautionary approach has been taken where design, construction or baseline information is incomplete, for example, if further surveys or design are required.

4.4.1.3 When assessing effects associated with ‘use of publicly accessible areas’, the assessment has assumed the worst case ‘use’ relevant to the topic receptor. This is due to the wide variety of facilities that are included within the parameters of the design of the green and blue open spaces and to ensure that a precautionary assessment of their likely significant effects is included in the PEIR.

4.4.1.4 Any gaps in information identified within our PEIR will be considered and addressed as part of the assessment during the production of the ES.

4.5 Approach to Mitigation

4.5.1.1 We are committed to including mitigation measures as necessary to address likely significant negative environmental effects as far as reasonably practicable. Mitigation proposed will follow the mitigation hierarchy to avoid, reduce or remediate/compensate for potential negative likely significant effects on receptors (see Plate 4-1).

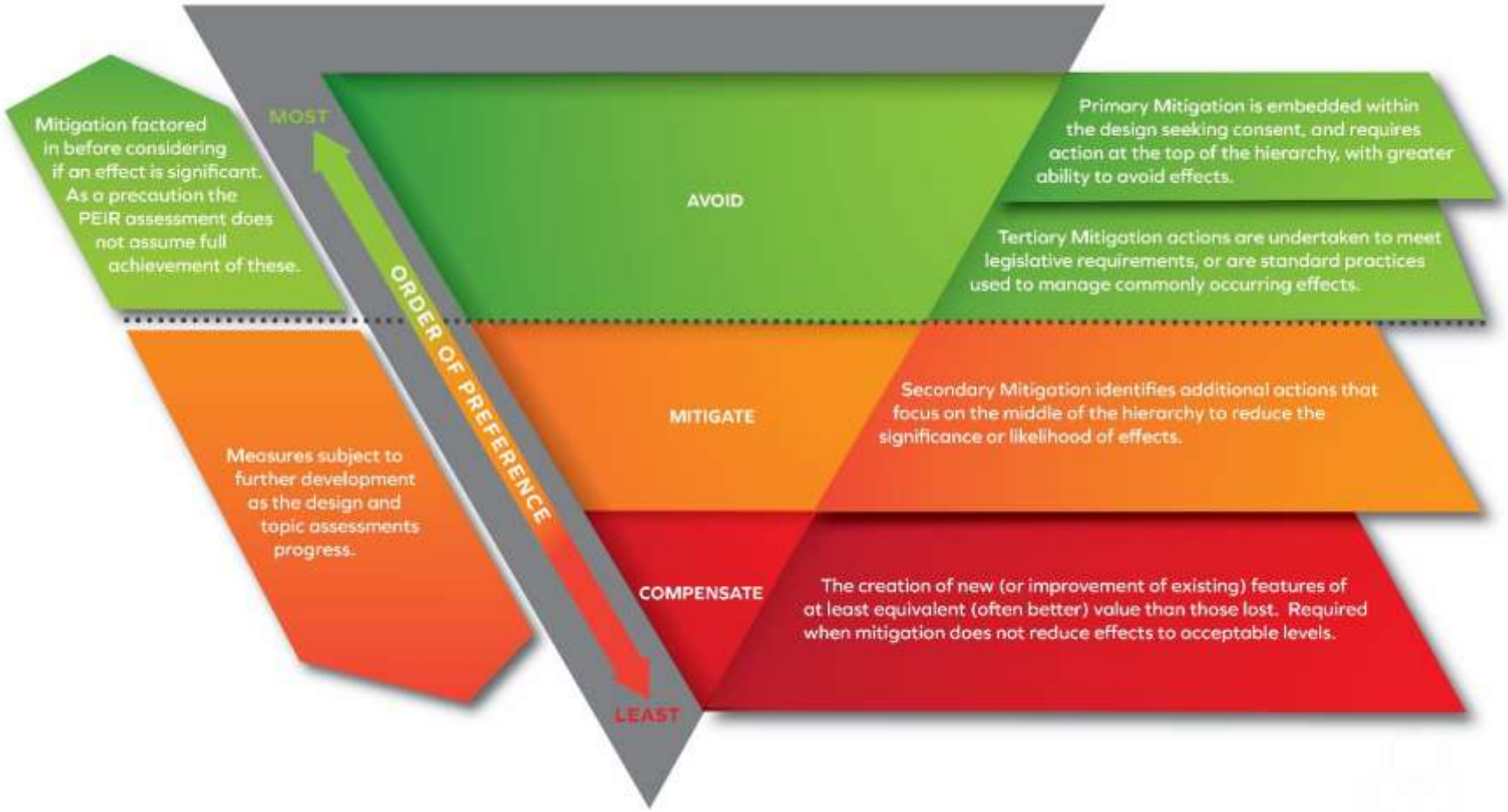

Plate 4-1: Illustration of the mitigation hierarchy and categories of mitigation.

4.5.1.2 Where negative effects are identified, mitigation may be proposed to reduce these. In accordance with IEMA guidance (IEMA, 2016) mitigation is classified into three broad categories:

- Primary mitigation (embedded mitigation): This constitutes modifications to the location or design of the development made during the pre-application phase and that are an inherent part of the project and do not require additional action to be taken. The mitigation is embedded into the design;
- Tertiary mitigation (standard practice): This consists of actions that would occur with or without input from the EIA feeding into the design process. This includes actions that will be taken to meet other legislative requirements, or actions that are considered to be standard practice used to manage commonly occurring environmental effects; and
- Secondary mitigation (additional mitigation): This includes actions that require further activity in order to achieve the anticipated outcome. These may be secured as part of the DCO consenting process or be identified as necessary through the EIA and therefore included within the ES.

4.5.1.3 Both primary and tertiary mitigation are considered to form part of the RTS and have therefore been factored in before considering if a project effect is likely to be significant (see Plate 4-1). Each of the topic Chapters 6 to 18 includes a section titled ‘Primary and Tertiary Mitigation’, this section outlines the topic specific primary and tertiary mitigation measures that have been factored into the topic assessment. Several of these mitigation measures are still being developed, and therefore as a precaution, the preliminary assessment of effects for the PEIR does not assume full achievement of these in considering if a project effect is likely to be significant (Appendix 4.2 identifies the implementation status of each primary and tertiary mitigation for the PEIR assessment).

4.5.1.4 Furthermore, the potential likely significant effects reported within our PEIR have been assessed prior to the implementation of secondary mitigation measures as the precise nature and extent of any secondary mitigation measures is not known at this stage in the process. Each of the topic Chapters 6 to 18 includes a section titled ‘Secondary Mitigation’. This section sets out some suggested types of topic specific secondary

mitigation measures that may be required to address potential likely significant negative effects. These secondary mitigation measures are the subject of further development; and given they are still being developed, are not able to be applied to develop a 'residual' effects assessment.

4.5.1.5 We will continue to develop the primary, tertiary and secondary mitigation measures through ongoing design and assessment. It is therefore possible that the secondary mitigation measures that are currently suggested in the PEIR may form part of the primary or tertiary mitigation measures set out in the ES or may not be required. We consider that the further development of the project design and mitigation measures, which will be reflected in the ES and DCO application, will enable reduction in the scale of identified negative likely significant effects set out in our PEIR.

4.5.1.6 Tertiary mitigation is typically expected to be secured through the receipt of relevant consents and permits (or equivalent provision within the DCO application). For example, any works requiring an environmental permit under the Environmental Permitting (England and Wales) Regulations 2016 will be subject to a range of assessments as part of the permitting process, which will be subject to scrutiny by the relevant regulator to ensure that they are robust. We will also have to propose and put in place suitable measures to mitigate effects on the environment to an acceptable level, which the relevant regulator will review and scrutinise in terms of their adequacy and appropriateness for mitigating the risks and impacts identified. An environmental permit will only be granted if the relevant regulator is satisfied that effects on human health and the environment are acceptable. The environmental permits will include appropriate permit conditions to limit effects on human health and the environment and ensure that the activities are subject to suitable controls.

4.5.1.7 Any works within or affecting landfills or involving waste will be subject to the requirement for an environmental permit. For the purposes of the assessments undertaken in our PEIR, controls set by environmental permits for waste have been included as tertiary mitigation.

4.5.1.8 Tertiary mitigation may also be required to adhere to the contractor’s own Environmental Management System (EMS). Where relevant, mitigation actions will be documented within the Construction Environmental Management Plan (CEMP) or other relevant management plans.

4.5.1.9 At this preliminary stage it is currently envisaged that the following management plans will be included within the CEMP (this is not an exhaustive list):

- Terrestrial Invasive Non Native Species (INNS) Management Plan;
- Materials Management Strategy;
- Site Waste Management Plan;
- Emergency Response Plan;
- Construction Surface Water Management Plan; and
- Soil Resources Plan.

4.5.1.10 Other management plans such as a Traffic Management Plan, Construction Travel Plan, Aquatic INNS Management Plan and Aquatic Pathogen Management Plan are likely to form part of the DCO application and be referred to in the ES.

4.5.1.11 Further detail in relation to mitigation measures and how they might be secured will develop as the project evolves and will be documented in the ES and other documents submitted with the DCO application.

4.5.1.12 Effects that remain after the implementation of all mitigation are referred to as ‘residual effects’. The assessment of significance of residual effects after mitigation is a key outcome of the EIA process and will be reported within the ES.

4.5.1.13 In some cases, EIA professionals and stakeholders involved in the EIA process will also identify or recommend opportunities for the project to achieve environmental outcomes (i.e. enhancements). It is therefore important that the EIA process takes place alongside the development of the RTS design in order to make the most of such opportunities.

4.5.1.14 For the purpose of our PEIR, only secondary mitigation for potential negative likely significant effects has been suggested. Enhancement measures will be considered as part of the ongoing EIA and design process and reported within the ES.

4.6 Consideration of Cumulative Effects

4.6.1.1 Cumulative effects are the result of multiple individual effects on a specific environmental receptor or resource. The Cumulative Effects Assessment

(CEA) (Chapter 19) defines, identifies and characterises the potential for inter-project and intra-project effects.

4.6.1.2 Inter- and intra- project effects result from multiple actions on receptors and resources over time and can be ‘additive’ (i.e. caused by other past, present or reasonably foreseeable actions together with RTS) or ‘interactive’ / ‘synergistic’ (i.e. the reaction between effects of RTS on different aspects of the environment).

4.6.1.3 The approach to assessing inter-project and intra-project effects is outlined in Section 19.3.

4.6.1.4 Consideration of ‘In-Combination Climate Impact’ (ICCI) has been undertaken for our PEIR in accordance with IEMA guidance (IEMA, 2020a). The ICCI assesses a future climate scenario and determines if that has the potential to influence the effects of the project; a statement is made in each topic chapter regarding the potential for influence. The ICCI is different in scope to the assessment of cumulative climate change effects. This is fully explained in Chapter 8: Climatic Factors and will be considered further in the ES.

5 Site Description

5.1 Introduction

5.1.1.1 In this chapter we provide a summary of the key baseline elements for each of the topics scoped into this Preliminary Environmental Information Report (PEIR). It describes each topic's study area and existing and future baseline in relation to the updated design parameters and our project boundary for Environmental Impact Assessment (EIA) PEIR (as described in Section 2.4 of Chapter 2: Project Description) and refers to the River Thames Scheme (RTS) ('the project') EIA Scoping Report (Environment Agency and Surrey County Council, October 2022) ('our EIA Scoping Report') where further detail is provided.

5.1.1.2 A summary of the baseline environmental surveys we have undertaken for the project to date is provided in Appendix 5.1.

5.2 Air Quality

5.2.1 Existing Baseline

5.2.1.1 The air quality study areas largely remain as per our EIA Scoping Report (see Section 6.2.3). Some minor amendments have been made to account for the updated design parameters and our project boundary for EIA PEIR, however the criteria used to determine the study areas have remained the same. The air quality study areas are shown on Figure 5.1.

5.2.1.2 Since our EIA Scoping Report was published, no changes to the size or number of air quality management areas have been made.

5.2.1.3 As detailed in our EIA Scoping Report (Section 6.3), annual mean nitrogen dioxide (NO_2) concentrations within the study areas are generally expected to comply with the annual mean NO_2 Air Quality Objective (AQO). Some isolated hotspots in the vicinity of roads may experience NO_2 concentrations breaching the AQO due to traffic emissions, and numerous Air Quality Management Areas (AQMAs) are in place across the area to address this (see Figure 5.2). Figure 5.3 shows the monitoring locations where the annual mean NO_2 AQO is either within 10 per cent of the AQO (in yellow); or at or above the AQO (in red). The areas where

annual mean NO_2 AQO may be breached will generally be located in the vicinity of major roads or other significant sources of pollution.

5.2.1.4 As per our EIA Scoping Report (Section 6.3), no exceedances (breaches) of the hourly mean NO_2 AQO, annual mean and 24-hour mean PM_{10} (particulate matter) AQO, or annual mean $PM_{2.5}$ AQO and Air Quality Standard (AQS) within the vehicle emissions study area have been identified.

5.2.1.5 Odour complaints records from relevant local authorities have been obtained. One odour complaint was raised during 2020 in Spelthorne Borough due to odorous fish carcasses in lakes and rivers caused by changes in water chemistry or oxygen levels as a result of very dry weather and then heavy rainfall. One relevant complaint being raised in recent years is not considered to indicate a significant number of existing odour sources that can be controlled by the project. If other sources of odour are identified within the study area, we will consider these in the Environmental Statement (ES).

5.2.1.6 Of the seven sites designated for ecological protection within 200 metres of the construction traffic routes (see Chapter 7: Air Quality and Chapter 17: Traffic and Transport of this PEIR), background concentrations of nitrogen or ammonia deposition (based on 2018 – 2020 concentrations from the Air Pollution Information System (APIS) website) did not exceed the critical loads for nitrogen deposition or ammonia. For acid deposition, there was an exceedance of the minimum critical load for nitrogen at grasslands at Thorpe Hay Meadow Site of Special Scientific Interest (SSSI) (which adjoins the project boundary), Dumsey Meadow SSSI and Staines Moor SSSI.

5.2.2 Future Baseline

5.2.2.1 As newer, cleaner vehicles are progressively sold and introduced into vehicle fleets, the traffic derived component of NO_2, PM_{10} and $PM_{2.5}$ concentrations is predicted to progressively decrease, as is evidenced in the UK Air Information Resource (UK-AIR) background maps (Defra, 2020a). In addition, part of the study area also falls within London's Ultra Low Emission Zone (ULEZ), which aims to improve air quality by reducing the most polluting vehicles using the area. It is therefore anticipated that

the future air quality baseline in the study area will largely improve over time.

5.2.2.2 The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 set a legally binding target (LBTs) for fine particulate matter with a diameter of less than 2.5 micrometres ($PM_{2.5}$) of annual mean concentration target (AMCT) of 10µg/m^3, to be met by 2040. To consider this target value, we have reviewed background pollutant mapping data published by the Department for Environment, Food & Rural Affairs (Defra) at worst-case locations within our EIA study area for the latest available year of 2030. The estimated future background $PM_{2.5}$ concentrations at worst-case locations within the study area do not exceed 12 µg/m^3 for 2030.

5.2.2.3 The APIS website does not project changes in background ammonia, nitrogen and acid deposition over time, with the expectation that current deposition rates should be applied in future.

5.3 Biodiversity

5.3.1 Existing Baseline

5.3.1.1 The biodiversity study area largely remains as per our EIA Scoping Report (see Section 7.2.3). Some minor amendments have been made to account for updates to the PEIR design parameters and our project boundary for EIA PEIR, however the criteria used to determine the study area has remained the same. The study area is shown on Figure 5.4.

5.3.1.2 The area within our project boundary for EIA PEIR is heavily disturbed by quarrying activities, which are still ongoing in places. The old quarries have been used for landfill or have been restored to a series of interconnected lakes. River and lake waterbodies contribute to much of the biodiversity of the area and provide important wildlife corridors.

5.3.1.3 In addition to the South West London Waterbodies Special Protection Area (SPA) and Ramsar site, there are three statutory designated sites within our project boundary for EIA PEIR; Dumsey Meadow SSSI; Thorpe Park No1 Gravel Pit SSSI and Ham Lands Local Nature Reserve (LNR). There are 17 non-statutory designated sites for nature conservation within our project boundary for EIA PEIR. Within the remainder of the study area there are 19 statutory (SSSI, Special Area of Conservation (SAC), SPA,

National Nature Reserve (NNR) and LNR) and 77 non-statutory designated sites for nature conservation.

5.3.1.4 Most of the study area falls within the Thames Valley Biodiversity Opportunity Area (Area TV04: Thorpe & Shepperton) identified for its potential to create 'bigger, better, more and more joined-up' nature-rich areas.

Habitats and Flora

5.3.1.5 A Preliminary Ecological Appraisal (PEA) was undertaken in 2022 which provides a full description of all habitats and flora within our project boundary for EIA PEIR. The PEA is appended in Appendix 7.2 and includes a UK Habitat Classification Map. A summary of the key habitats and flora within the study area is provided below:

- Lakes: All waterbodies are likely to support a diversity of aquatic life with margins supporting broadleaved semi-natural woodland with tall herb vegetation where there are breaks in the woodland.
- Watercourses: The majority of watercourses are in poor and fairly poor condition due to lack of riparian and marginal vegetation.
- Woodland and trees: There are a variety of woodland types and tree species present in the study area.
- Open mosaic on previously developed land: This habitat has high ecological value and areas are present across the study area.
- Modified grassland: Present in several locations, notably close to the proposed alignment of the Runnymede Channel.
- Neutral grassland: Areas of semi-improved and unimproved neutral grassland are located close to the proposed alignment of the Runnymede Channel.
- Other habitats of ecological value: Including ephemeral/short perennial vegetation, hedgerows, scrub and existing built structures, which provide suitable habitats for protected or notable species.

Protected and Notable Species

5.3.1.6 The following protected and notable species are known to be present or are likely to be present within the study area. They are detailed in the PEA and summarised here:

- Badgers: One potential main badger sett and several outlier setts are expected to be present.
- Bats: Suitable habitat for roosting, foraging and commuting bats is present, and we have found evidence of eight species of bat.
- Otters: Otter activity has been confirmed through our surveys, with potential holt areas identified and habitats present for commuting, foraging and resting.
- Water voles: We have not identified evidence of water voles from desk studies and site surveys, although suitable habitat is present. Presence of mink is likely to be a contributory factor to the absence of water vole.
- Amphibians: Great Crested Newt (GCN) has not been found from desk studies and surveys completed. Smooth newt and frogs are confirmed to be present.
- Reptiles: Breeding grass snakes are present, along with slow worms.
- Birds: There are numerous suitable habitats for breeding and wintering/non-breeding birds. Schedule 1 species and Birds of Conservation Concern (BoCC) have been recorded.
- Terrestrial invertebrates: There is an extensive array of terrestrial invertebrates, including notable species such as brown hairstreak butterfly.
- Terrestrial Invasive Non-Native Species (INNS): Plant and animal INNS are abundant within the study area. Eight terrestrial plant INNS have been recorded.
- Fish: Surveys have found a relatively low number of common species within the study area. Fish pathogens and INNS are known to be present.
- Aquatic macroinvertebrates and macrophytes: Notable charophyte (green algae) species are present within some lakes. Eight notable macroinvertebrate species have been recorded within some lakes. Nine notable macroinvertebrate species have been recorded in rivers, including one nationally rare mayfly.
- Aquatic invertebrate, macrophyte and fish INNS: In total, 38 aquatic INNS have been identified across many waterbodies within the study area. See 7.3.1.41 - 42 of the Scoping Report.

5.3.2 Future Baseline

5.3.2.1 Changes to the ecological baseline, in the absence of the project, have been considered and the predicted change is summarised within Section 7.3.2 of our EIA Scoping Report. As noted, there is anticipated to be overall improvement in biodiversity driven by various legislation and policies in place. In addition, there will be changes to the ecological baseline over time due to the effects of climate change. The ranges of migratory species are likely to change at a global scale as temperate and climatic patterns alter. River levels will increase as sea levels rise leading to changes in the distribution of marginal habitats and the spread of INNS as a result of increased flooding.

5.4 Climatic Factors

5.4.1 Existing Baseline

Climate Change Mitigation

5.4.1.1 The study area for both climate change mitigation and climate change resilience and adaption largely remains as described in paragraph 8.2.3.1 of our EIA Scoping Report. Some minor amendments have been made to account for updates to the PEIR design parameters and our project boundary for EIA PEIR, however the criteria used to determine the study area has remained the same. This is illustrated in Figure 5.5.

5.4.1.2 The existing baseline for this assessment considers any land uses or activities within the study area that currently lead to material greenhouse gas (GHG) emissions, plus any ecosystem services and biogenic carbon sequestration that contribute to GHG removal. As the information on the maintenance activities of existing buildings and energy consumption data for the site are unknown, the baseline emissions are assumed to be zero for the purposes of this PEIR as a conservative assessment.

Climate Change Resilience and Adaptation

5.4.1.3 The project is located in the Met Office climate profile of Southern England, which is characterised as having a climate influenced by continental Europe which can be subject to continental weather influences that bring cold spells in winter and hot, humid weather in summer. Most of

Southern England is less than 100 metres (m) Above Ordnance Datum (mAOD), however, it contains hills and downland landscapes over 100 mAOD. The River Thames drains the northern half of Southern England and flows eastward.

5.4.1.4 Mean annual temperatures vary from about 11.5°C in central London and along the south coast to about 9.5°C over higher ground well inland. Much of Southern England is relatively distant from the route of many Atlantic depressions and towards the north-east of the region there is increasing shelter from rain-bearing southwest winds.

5.4.2 Future baseline

Climate Change Mitigation

5.4.2.1 To reflect the ongoing decarbonisation of grid energy and traffic, we will consider a future year of 2035 (to reflect targets associated with the sixth Carbon Budget where the recommended pathway requires a 78 per cent reduction in UK territorial emissions between 1990 and 2035), and will apply assumptions as to what this future baseline might look like in terms of GHG emissions during the operational phase.

Climate Change Resilience and Adaptation

5.4.2.2 Using a future assessment timeframe of 2081-2100 (the latest that projections currently extend to), over land there will be a move towards warmer, wetter winters and hotter, drier summers. However, natural variations mean that some cold winters, some dry winters, some cool summers and some wet summers will still occur (UK Climate Projections, 2018 (UKCP18)).

5.4.2.3 UK Climate Projections (UKCP) uses Representative Concentration Pathways (RCPs), which are named according to the concentration of GHG modelled to occur in the atmosphere in 2100. RCP 8.5 is the most conservative, highest-impact scenario and is therefore considered in this assessment. The detailed future baseline environment is quantified in Chapter 8: Climatic Factors (paragraphs 8.3.2.16 – 8.3.4.22).

5.5 Cultural Heritage, Archaeology and Built Heritage

5.5.1 Existing Baseline

5.5.1.1 For the PEIR assessment of Cultural Heritage, Archaeology and Built Heritage, the study areas remain largely as described in Section 9.2.3 of our EIA Scoping Report apart from the study area for effects on setting. This was updated in 2022 and is based on an additional one kilometre from the desk based assessment (DBA) study area. The study areas are shown on Figure 5.6.

5.5.1.2 The cultural heritage resource comprises archaeological remains, historic buildings and historic landscapes. The River Thames catchment is an area of high archaeological importance and has been the focus for human activity from the earliest humans to the present day. Archaeological excavations have confirmed the density and complexity of human occupation of the Thames gravels.

5.5.1.3 The earliest evidence of human activity recovered from the area dates back to the Palaeolithic and includes prehistoric remains such as flint scatters. The River Thames itself has produced numerous objects which have been deposited in the past and recovered as chance finds or by dredging to improve navigation. These range in date from the Palaeolithic to the Modern era. Such finds include weapons and human remains.

5.5.1.4 A significant multi-period site at Kingsmead Quarry near Wraysbury Reservoir (see Figure 5.6 (sheet 1)) uncovered evidence of Upper Palaeolithic and Mesolithic activity, Neolithic structures, a Bronze Age settlement, field system and cemetery, and evidence of Iron Age and Roman activity. Mesolithic and Bronze Age activity was also found during fieldwork at Abbey Meads along with wooden structures dated to the Iron Age and the late Medieval/early post-Medieval period. The surviving remains (after quarrying) of a late Roman or early medieval timber fish weir is located at Ferry Lane Lake (also known as Ferris Meadow Lake) in Spelthorne (see Figure 5.6 (sheet 2)).

5.5.1.5 Significant assets dating to the Medieval period include the Chertsey Abbey Scheduled Monument (SM), set within the Chertsey Conservation Area. Chertsey also contains several listed buildings. The surrounding

lands hold archaeological evidence of livestock and water management connected with the Abbey. The SM Earthworks on the former Laleham Golf Course may represent a stock enclosure associated with the Abbey. Designated heritage assets are illustrated on Figure 5.7.

5.5.1.6 Due to the long history of land use in the River Thames valley, areas of undisturbed ground could hold potential for archaeological and palaeoenvironmental remains stretching back to the Palaeolithic and covering all periods up to the present day. Areas where gravel extraction has removed archaeological deposits will have a negligible archaeological potential.

5.5.1.7 As well as archaeological remains, the study area also contains designated assets including SMs, Registered Parks & Gardens, Listed Buildings and Conservation Areas. Changes to the setting of assets can affect their significance, where setting contributes towards the value of an asset or an appreciation of that value. A full list of designated and non-designated heritage assets is included in Appendix G of our EIA Scoping Report.

5.5.2 Future Baseline

5.5.2.1 The future baseline for cultural heritage, archaeology and built heritage is likely to be broadly similar to the current baseline. Designated assets are protected through planning policy such that significant changes are unlikely to occur. Non-designated heritage assets are more likely to be subject to change, with some assets being altered or removed and new assets identified as a result of new development and/or any new mineral extraction within the study area. Environmental changes leading to more frequent inundation could negatively affect heritage assets through changes in hydrological conditions and potentially accelerated degradation.

5.6 Flood Risk

5.6.1 Existing Baseline

5.6.1.1 The study area for Flood Risk largely remains as described in Section 10.2.3 of our EIA Scoping Report. Some minor amendments have been made to account for the updated design parameters and our project boundary for EIA PEIR, however the criteria used to determine the study

area has remained the same. The Flood Risk study area is shown on Figure 5.8.

5.6.1.2 The project is located within the floodplain of the River Thames and its tributaries. The sources of flooding include fluvial, tidal, surface water (pluvial), groundwater, sewers and drainage and artificial sources, including reservoirs and canals. The inter-connectedness of flood sources, pathways and receptors, together with the specific hydraulic nature of the River Thames, results in a baseline of flood events that are slow to generate a peak amount of water and that remain for a long duration. Recent flood events, such as in 2013-14, have demonstrated that areas can remain inundated for several days or weeks.

5.6.1.3 The severity of surface water flooding varies greatly across the study area due to the complexity of existing infrastructure, topography, changes in permeability between areas and the interaction with watercourses and other drainage features. It is widespread within urban areas and can also contribute to additional flooding during fluvial events.

5.6.1.4 The potential for groundwater flooding in the study area is greatest in areas adjacent to the River Thames, particularly in Egham, Thorpe, Staines-upon-Thames and land to the north of Desborough Cut. This is attributed to the geology and low lying topography of these areas.

5.6.1.5 Within the study area, sewer flooding occurs where rainfall exceeds the capacity of the sewer / drainage system or drains get blocked and the system surcharges due to high water levels in receiving waterbodies.

5.6.1.6 There are a large number of reservoirs located within the study area, several of which were formed following gravel extraction. The operation and maintenance of the reservoirs is regulated by the Reservoirs Act (1975), which stipulates regular maintenance and frequent inspections by trained individuals. As a result, the chance of reservoir embankments breaching and giving rise to flooding is extremely unlikely.

5.6.1.7 The control of flow in canals via weirs and locks means that the levels should not be overtopped from a fluvial flood event. If there were to be a breach of the canal structures, the water would likely make its way into the fluvial network, eventually reaching the River Thames. Similar to reservoir flood risk, the probability of a breach is very small as there is a regime of

regular maintenance and inspections. In addition, the regular interval of locks along canals means a failure can be confined to localised sections.

5.6.1.8 In terms of the National Planning Policy Framework (NPPF) flood risk vulnerability classifications, within the study area there are approximately 45,000 "More Vulnerable" residential dwellings (with potential for some being “Highly Vulnerable” basement dwellings), numerous non-residential institutions including hotels, hostels and nurseries along with a wide array of social infrastructure including approximately 50 educational establishments (also "More Vulnerable"), 60 places of worship ("Less Vulnerable") and over 100 recreational facilities (mix of “Less Vulnerable” and “Water Compatible” uses). Sand and gravel workings cover a large area and are “Water Compatible” along with water based recreation uses.

5.6.1.9 There are also many landfill sites and sewage treatment works which are classed as “More Vulnerable” and a large quantum of commercial and retail areas which are “Less Vulnerable” uses. There are “Highly Vulnerable” uses including mobile home parks, Police / Fire Stations and telecommunication installations. There are a few uses that would be classified as “Essential Infrastructure” in the study area, including water treatment works and various utility installations.”

5.6.1.10 Figures 5.9 to 5.13 illustrate different baseline flood risk scenarios, including an allowance for future climate change.

5.6.2 Future Baseline

5.6.2.1 The flood risk in the study area principally from fluvial / tidal, surface water and groundwater sources is predicted to increase as a result of climate change scenarios, irrespective of development, given the nature of the predicted increased frequency and severity of inputs to the system. The Environment Agency's UK climate change projections for peak rainfall intensity predict it will increase in the future, with wetter winters and more intense periods of rainfall resulting in increased surface water runoff.

5.6.2.2 The future baseline will also be influenced by developments that would alter the hydraulic pattern, general drainage routes and potentially modify surface water flow paths. There could also be a localised reduction in surface water flooding with the increase in Sustainable Drainage Systems.

5.7 Health

5.7.1.1 The study area for health largely remains as described in Section 11.2.3 of our EIA Scoping Report. Some minor amendments have been made to account for the updated design parameters and our project boundary for EIA PEIR.

5.7.1.2 Based on advice received from PINS in its EIA Scoping Opinion (dated 15 November 2022) ('the PINS Scoping Opinion'), we have undertaken the collection of baseline health information for the PEIR at Middle Layer Super Output Area (MSOA). The health study area is spread across parts of 23 MSOAs, over five relevant local planning authority areas. The study area is shown on Figure 5.14. The English Census wards covered by the study area are shown on Figure 5.15.

5.7.2 Existing Baseline

5.7.2.1 Existing baseline health conditions are derived from the 2021 Census, unless otherwise stated. Within the health study area, they are as follows:

- 19 per cent of residents were aged 65 or over, compared with 16 per cent in London and the Southeast and 18 per cent in England;
- 3.3 per cent of residents were reported as experiencing bad or very bad health, compared with 4.3 per cent in London and the Southeast and 5.2 per cent in England;
- 13.1 per cent of residents were classified as having disabilities which limited their day-to-day activities, compared with 14.7 per cent in London and the Southeast and 17.3 per cent in England;
- 25 per cent of households had one or more member classified as disabled, compared with 28 per cent in London and the Southeast and 32 per cent in England;
- 2.3 per cent of residents were reported as economically inactive due to long-term sickness or disability, compared with 3.3 per cent in London and the South East and 4.1 per cent in England;
- There were 19.6 per cent fewer cases of premature deaths (from all causes) compared with the general population in England; and
- Based on evidence from the English Indices of Deprivation 2019, the health study area is not deprived by national standards. The study area contains 23 MSOAs; 13 of these are in the least deprived 20 per cent of MSOAs in England.

5.7.3 Future Baseline

5.7.3.1 Based on the key themes emerging from the health-related policy documents considered in paragraphs 11.3.2.3 to 11.3.2.17 of our EIA Scoping Report, the future health baseline will reflect the following potential changes:

- Increased in-migration to the study area which could potentially increase demand for local healthcare services;
- Increase in the number of families and older residents within the study area could lead to an increase in the demand for local social care services (such as care homes and hospices);
- Increased demand in social infrastructure associated with health and wellbeing such as open space, access to nature, recreational and community facilities; and
- Increase in the number of people within the study area suffering from mental health issues could lead to increased demand for mental healthcare services.

5.8 Landscape and Visual Amenity

5.8.1 Existing Baseline

5.8.1.1 The study area for landscape character and visual amenity largely remains as described in Section 12.2.3 of our EIA Scoping Report. Some minor amendments have been made to account for the updated design parameters and our project boundary for EIA PEIR, however the criteria used to determine the study area has remained the same. It is shown on Figure 5.16.

5.8.1.2 There are no national landscape designations within the study area; although much of it lies within the Green Belt and Metropolitan Open Land. The Colne Valley Regional Park intercepts the study area just north of Staines and Egham. Part of Windsor Home Park and the Royal Estate are located to the west and Hampton Court Park to the northeast.

5.8.1.3 The underlying landscape of the Thames Valley National Character Area is an open floodplain of flat grazing lands with scattered historic parklands on the higher ground and distinctive urban influences alongside lakes left after mineral extraction, raised landfills and large-scale raised reservoirs

with steep embankments. The landscape has been heavily shaped by major infrastructure and extensive mineral workings leaving it fragmented, visually constrained and with existing open space not being used to its full potential. The River Thames' character is wide and meandering, with a mix of semi natural edges and the hard-edges of plotland development and moorings, and with areas of more intense activity at the weirs, locks and marinas (see Figures 5.18 and 5.19). There are many Public Rights of Way (PRoW) crossing the study area including the Colne Valley Way which is of regional significance, and the Thames Path National Trail that follows the route of the River Thames (see Figure 5.20). The study area contains several areas of open access land including Hurst Park and Desborough Island in addition to areas designated as Local Green Space (see Figure 5.17).

5.8.2 Future Baseline

5.8.2.1 As much of the study area is within the Green Belt, major changes due to built development are considered unlikely. Additionally, current landscape planning policies, strategies and restoration schemes are designed to protect and enhance the landscape.

5.8.2.2 There will likely be an increase in green infrastructure, in particular to meet the targets of Surrey County Council's New Tree Strategy (Surrey County Council, 2020c) for increased tree planting and to mitigate for issues such as tree disease and climate change. Much of this would likely be delivered through large-scale landscape focussed developments, much like the RTS.

5.8.2.3 Studies including the Elmbridge Borough Council Local Green Space Study (EBC, 2022a) and Runnymede 2035 Open Space Study 2016 (RBC, 2016, republished 2017) suggest provision for public amenity is also likely to improve with potentially more areas being opened up for public access, or areas of importance to the local community provided with increased protection e.g. designated as Local Green Space. As with tree planting, new public areas would likely be delivered as part of major landscape-focussed developments, much like the RTS.

5.9 Materials and Waste

5.9.1 Existing Baseline

5.9.1.1 The study area for minerals and waste largely remains as described in Section 13.2.3 of our EIA Scoping Report. Some minor amendments have been made to account for the updated design parameters and project boundary for our EIA PEIR, however the criteria used to determine the study areas has remained the same. It is shown on Figure 5.21.

5.9.1.2 The River Thames floodplain has valuable reserves of aggregates and non-aggregates (such as silica sand and clay). Mineral extraction of sand and gravel is one of the primary industries in the study area, with several designated Mineral Safeguarding Areas present (see Figure 5.22).

5.9.1.3 The predominant minerals worked in Surrey are sands and gravels (Surrey County Council, 2011). The general trend between 2012 and 2019 has shown that sales are increasing (Surrey County Council, 2020b).

5.9.1.4 There are many voids created from the extraction of aggregates within the study area. The project crosses several of these voids, some of which are now filled with water including Fleet Lake, Abbey lakes, Littleton lakes, Sheepwalk lakes, and Ferry Lane lake (see Figure 2.1). Many further voids have been infilled with authorised and historic landfill (Figure 5.28). They contain a range of materials, some of which are likely to be sources of contamination and hazardous waste (see Chapter 16: Soils and Land).

5.9.1.5 We recently undertook a broad-scale review of landfill capacity, based on publicly available information, which has found sufficient landfill capacity in the region for the estimated types and volumes of waste that could be generated by the RTS during construction.

5.9.2 Future Baseline

5.9.2.1 The future demand for aggregates in the UK will depend upon construction expenditure in the future. We expect demand from the commercial construction sector will boost demand for stone over the next five years (IBIS, 2022). As with aggregates, we expect the future demand for steel and timber will directly link to construction sector demand (see Section 13.3.2 of our EIA Scoping Report for further details).

5.9.2.2 The Surrey Waste Local Plan (Surrey County Council, 2020a) outlines forecast total waste arisings in Surrey to increase from circa 3.7 million tonnes in 2017 to 4.1 million tonnes in 2035. There is not sufficient existing landfill capacity to meet the forecast future demand. This is due to there being a limited number of non-inert landfill facilities in the southeast of England (Surrey County Council, 2020b).

5.9.2.3 The Surrey Waste Local Plan has identified capacity for recovery of waste to land up to 2025. About six million tonnes of extra inert landfill / recovery to land capacity may be available from future mineral extraction. The mineral extractions would be from the preferred areas in the Surrey Minerals Plan (Surrey County Council, 2011). Currently there are no preferred areas within the study area.

5.10 Noise and Vibration

5.10.1 Existing Baseline

5.10.1.1 The study area for noise and vibration largely remains as described in Section 14.2.3 of our EIA Scoping Report. Some minor amendments have been made to account for the updated design parameters and our project boundary for EIA PEIR, however the criteria used to determine the study areas has remained the same.

5.10.1.2 Noise and vibration sensitive receptors relevant to the RTS are considered to be either residential receptors (i.e. dwellings) or non-residential receptors (including e.g. schools, hospitals, hotels or offices).

5.10.1.3 An overview of the noise and vibration study area and receptors is shown in Figure 5.23.

5.10.1.4 The noise climate within the study area is characterised by road noise from the surrounding major roads, railways and air traffic (primarily associated with Heathrow Airport).

5.10.1.5 The vibration baseline is generally assumed to be negligible at receptors due to their distance to sources which would have the potential to generate significant levels of vibration. There may however be noticeable vibration at some receptors that are particularly close to railway lines or roads.

5.10.2 Future Baseline

5.10.2.1 In general, it is assumed that environmental noise conditions determined during the noise surveys are representative of conditions in future baseline years, as set out in Section 14.3.2 of our EIA Scoping Report, as this is likely to be worst case for the assessment. However, there may be localised changes considered where, for example, changes in traffic flows or the introduction of committed developments would lead to significant changes in future baseline noise levels.

5.11 Socio-economics

5.11.1 Existing Baseline

5.11.1.1 The study area for socio-economics largely remains as described in Section 15.2.3 of our EIA Scoping Report. Some minor amendments have been made to account for the updated design parameters and our project boundary for EIA PEIR, however the criteria used to determine the study areas has remained the same. The socio-economics study area is shown on Figure 5.24.

5.11.1.2 The River Thames between Datchet and Teddington runs through the largest area of populated but undefended floodplain in England. The greatest risk of flooding to human populations (i.e. socio-economic receptors) is in the urban areas of Staines, Egham, Chertsey, Shepperton, Walton-on-Thames, East Molesey, Teddington and Kingston upon Thames, which have the greatest population densities, see Figure 15.25.

5.11.1.3 Most of the socio-economic study area is located in Surrey. The 2021 Census reports that 85.5 percent of the population of Surrey regard their ethnicity as White, 7.7 percent as Asian, Asian British or Asian, 3.4 percent as Mixed or Multiple ethnic groups, 1.7 percent as Black, Back British, Black Welsh, Caribbean or African and 1.7 percent as Other ethnic group. For further details of the ethnic composition of the study area and differences between boroughs see Section 15.3.1 of our EIA Scoping Report. We will fully update the baseline set out in our EIA Scoping Report for the ES using 2021 Census data.

5.11.1.4 Surrey is generally regarded as a wealthy county with a strong economy and low levels of deprivation and this is also reflected more broadly across the study area as a whole, however small pockets of more

deprived areas do exist. For further details of measures of relative deprivation, including differences between boroughs, see Section 15.3.1 of our EIA Scoping Report and Figure 5.27.

5.11.1.5 Within the study area there are approximately 45,000 residential dwellings and over 2,000 commercial/industrial properties. Commercial developments comprise of, for example, offices, hotels, retail and recreational businesses, including those associated with the lakes and the River Thames. Industrial development comprise of, for example, manufacturing, storage and wholesale distribution. Furthermore, there is a wide array of social infrastructure including educational establishments, places of worship and formal and informal community and recreational facilities.

5.11.1.6 The lakes within the project boundary are generally privately owned and many of them host various recreational activities including sailing (Littleton East, Sheepwalk lakes and Ferry Lane Lake), fishing (Littleton East and Sheepwalk lakes), open water swimming (Ferry Lane Lake) and water skiing (Littleton North) (see Figure 5.26).

5.11.1.7 Informal recreational facilities within the study area include a complex footpath network consisting of various PRoW, the Thames Path National Trail and National and Local Cycle Network routes, a variety of Public Open Spaces and amenity areas. Formal recreational facilities within the study area include Thorpe Park, Hampton Court and numerous water sport activities (fishing, open water swimming, sailing, canoeing and other water sports) (see Figure 5.26).

5.11.1.8 For further detail on land uses throughout the study area see Appendix 15.1.

5.11.2 Future Baseline

5.11.2.1 The population within the study area is anticipated to grow over time and will be an increasingly aging population (ONS 2020; ONS, 2022). Population growth is likely to increase demand for housing and social infrastructure in the area. See Section 15.3.2 of our EIA Scoping Report for further information on how populations and demographics are anticipated to change over time.

5.11.2.2 Future land use change is likely to occur in line with local and regional planning policy. Such policies have broad objectives to ensure that the management of development and infrastructure meets identified social, environmental and economic challenges.

5.11.2.3 Residential, commercial, industrial and recreational assets will remain at risk of flooding (in the absence of the RTS or any other flood relief scheme), and this risk will gradually increase over time as the effects of climate change become more significant. See Chapter 10 (Flood Risk) for further information.

5.12 Soils and Land

5.12.1 Existing Baseline

5.12.1.1 The soils and land study area largely remains as per Section 16.2.3 of our EIA Scoping Report. Some minor amendments have been made to account for the updated design parameters and our project boundary for EIA PEIR, however the criteria used to determine the study areas has remained the same. The soils and land study areas are shown on Figure 5.28.

5.12.1.2 The shallow geology below the study area is a combination of Alluvium (clay and silt), and the Shepperton Gravel Member (sandy gravel) (see Figure 5.29). The bedrock geology comprises London Clay, the London Claygate Member (sandy clay), and the Bagshot Formation (sand) (see Figure 5.30). The land does not suffer from any significant instability issues.

5.12.1.3 Made ground is soil or other materials (such as building demolition waste materials) that have been placed or altered by human activity. Made ground and landfill materials are known to be present throughout the soils and land study area based on publicly available Environment Agency historic and authorised landfill records and ground investigation information (see Scoping Report Sections 16.3.1.11 to 16.3.1.17 for further details). There are a total of 44 historic and authorised landfill sites in the study area containing:

- Undifferentiated material (reworked natural soils containing little to no human-derived waste);
- Construction and demolition waste; and

- Domestic waste.

5.12.1.4 There are three landfill sites within the study area that were detailed to receive special or hazardous waste, and a further eight landfills detailed to receive commercial or industrial waste (see Appendix I of our EIA Scoping Report). The RTS ground investigation surveys identified a further two landfill sites that contained elevated concentrations of contaminants. These landfills may contain hazardous materials that could pose a risk to humans and the environment. Contamination from sources such as the landfills, made ground, farming activities, or industrial land use has the potential to spread through the ground and groundwater. The contamination could cause significant effects to sensitive land and waters in the study area, as well as to humans.

5.12.1.5 Whilst much of the land use in the study area is urban, the relatively small areas of agricultural land are generally of high quality. The quality is determined by the approved Agricultural Land Classification (ALC) system (Natural England, 2012), which grades agricultural land between 1 and 5 (where 1 is excellent, and 5 is very poor). Figure 5.32 illustrates the ALC in the study area, with the majority classified as good to moderate (Grade 3) or very good (Grade 2). Soilscapes are illustrated in Figure 5.31.

5.12.2 Future Baseline

5.12.2.1 Future developments or activities may affect areas within the study area. This could have an effect on the soils, geology, or agricultural land use.

5.12.2.2 Agricultural land and soils as well as unsealed landfill and made ground will remain at the current risk of flooding in the short term. This risk will increase with time as the effects of climate change become more significant.

5.13 Traffic and Transport

5.13.1 Existing Baseline

5.13.1.1 The traffic and transport study area for the PEIR remains the same as that described in Section 17.2.4. of our EIA Scoping Report. This is due to the rationale of applying a 600 metre buffer from the main roads that are required to reach the Strategic Road Network (main ‘A’ roads, M3, M4, M25) from: the main RTS compounds; priority areas for habitat creation,

enhancement or mitigation; and new green open spaces (NGOS). The study area is shown on Figure 5.33.

5.13.1.2 There are 18 railway stations located within the study area that provide connections to important transport hubs such as London Waterloo and Reading.

5.13.1.3 The bus services within the study area provide links between the communities of Datchet, Wraysbury, Staines upon Thames, Chertsey, Shepperton, Walton-on-Thames, Surbiton and Kingston upon Thames.

5.13.1.4 Throughout the study area, there are footways and pedestrian crossings to support journeys by foot, as well as several signed cycle routes and routes used by equestrians.

5.13.1.5 Within the study area are nationally significant motorways, such as the M3, M4 and M25, and significant trunk roads and B roads.

5.13.1.6 The River Thames is a popular commercial navigation route from upstream Lechlade in Gloucestershire, through the study area to central London and downstream beyond Canvey Island to the North Sea.

5.13.2 Future Baseline

5.13.2.1 Traffic and transport use is anticipated to increase in the future in response to likely population growth and new infrastructure including:

- New residential development;
- Employment growth; and
- Planned infrastructure, including new roads and active travel improvements.

5.13.2.2 We will use Surrey County Council's existing Strategic Transport Model to inform the future baseline for the ES, discussions with Surrey County Council are ongoing regarding progress on Model updates.

5.14 Water Environment

5.14.1 Existing Baseline

5.14.1.1 The water environment study area largely remains as described in Section 18.2.3 of our EIA Scoping Report. Some minor amendments have been made to account for the updated design parameters and our project boundary for EIA PEIR, however the criteria used to determine the study areas has remained the same. The surface water study area is shown on Figure 5.34. Water bodies designated under the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (hereafter referred to as the WFD Regulations) are shown on Figure 5.35. The groundwater study area is shown on Figure 5.36.

5.14.1.2 The main water body is the River Thames, however there are numerous tributaries of varying size and man-made lakes that are fed by a combination of surface water and groundwater. Approximately 14 per cent of the study area is made up of lakes or reservoirs. These water body types and specific receptors are detailed in Section 18.3.1 of our EIA Scoping Report and summarised in the following sections.

5.14.1.3 The tidal limit of the River Thames is located at Teddington Weir. However, the tidal influence can often be observed up to seven kilometres upstream of this. There are 29 named watercourses within the study area and numerous ordinary watercourses and land drains that feed into the named watercourses. There are also 72 lakes and reservoirs in the study area.

5.14.1.4 A total of 36 surface water WFD waterbodies (18 rivers and 18 lakes) are present within the study area. Five of the WFD river waterbodies lie upstream of the proposed flood channel and the other 13 river waterbodies would either intersect or are located near the proposed location of the flood channel, or close to Sunbury, Molesey and Teddington Weirs. In total, 15 of the 18 WFD river waterbodies are classified as artificial or heavily modified waterbodies, whilst all 18 WFD lake waterbodies are classified as artificial.

5.14.1.5 The River Thames displays characteristics of the lower reaches of a highly regulated and modified, mature, lowland river. Increased sediment supply has occurred because of urban development, agricultural drainage

and runoff, channel modification and boat wash erosion. Historically, weirs and locks have caused a build-up of coarse materials behind weirs and within deeper pool areas immediately downstream. Sediment supply in the River Thames also comes from all of its tributaries, which are affected by use for land drainage, water abstractions, flood control and navigation.

5.14.1.6 The study area includes a series of man-made lakes created from former gravel pits, some have islands while others are wide areas of open water allowing unhindered surface water movement.

5.14.1.7 The hydrogeology across the study area is varied as a result of the geology in the area. Overall, groundwater contributes only a relatively small proportion of the surface water flow due to a generally shallow hydraulic gradient and numerous flow barriers. However, our monitoring has identified seasonal responses to rainfall in groundwater levels, which is indicative of good hydraulic connection between the superficial aquifer and surface waters. At a regional scale, groundwater flow is generally from north-west to south-east, mostly parallel to the River Thames flow. Most of the study area is underlain by bedrock of the London Clay Formation which has low permeability and separates the principal Lower Thames Gravel aquifer from the minor aquifer below.

5.14.1.8 The Lower Thames Gravel aquifer is formed by river terrace sand/gravel deposits and is largely unconfined. The aquifer acts as a single aquifer unit and is a principal aquifer that supports water supplies at a strategic scale.

5.14.1.9 Sections of the flood channel are within a groundwater source protection zone (GSPZ), the Abbey Meads area of the Runnymede Channel is within a Source Protection Zone 1 (the highest level of protection).

5.14.1.10 There are two WFD groundwater bodies within the study area, both have a ‘Poor Overall Status’.

5.14.1.11 There are multiple licensed abstractions from surface waters and groundwater in the study area, including 22 surface water abstraction points from the River Thames and its tributaries. Abstraction is managed under the Thames Catchment Abstraction Management Strategy (TCAMS) (Environment Agency, 2019a). The majority of surface water abstraction within the study area is used for potable water supply, with five sites used for irrigation and three used for heat pump supply.

Groundwater abstractions are predominately from the Lower Thames Gravels aquifer. There are 52 abstraction points, 18 of which are for public water supply. There is no capacity for additional consumptive licences without restrictions.

5.14.2 Future Baseline

5.14.2.1 Improvements to the local water environment may occur in the near future through the implementation of the Environment Agency's River Basin Management Plans, and from requirements placed on water companies through the Water Industry National Environment Programme.

5.14.2.2 River flows and groundwater levels are anticipated to be more variable in the long term as a result of more extreme weather conditions caused by climate change. Furthermore, baseline water supplies are forecast to decrease between present day and 2100 due to climate change.

5.14.2.3 Ground conditions and drainage pathways are not expected to change in the near future. However, there is the potential for changes if any mineral restoration or construction works are undertaken in the area. Similarly, new developments may alter existing surface and groundwater flow pathways, water quality, water quantity and hydromorphology.

6 Air Quality

6.1 Introduction

6.1.1.1 This chapter of our Preliminary Environmental Information Report (PEIR) considers the effects from construction and operation of the River Thames Scheme (RTS) ('the project') in relation to air quality. Within this chapter we have included topic specific sections on:

- Legislation, policy and guidance (noting any changes since Environmental Impact Assessment (EIA) scoping);
- Engagement with consultees, including responses to comments received on the RTS EIA Scoping Report;
- The assessment methodology for this topic (again noting any changes or updates since EIA scoping);
- Key environmental considerations and opportunities;
- Primary and tertiary mitigation;
- Our preliminary assessment of effects;
- Secondary mitigation; and
- Future work for this topic of the EIA.

6.1.1.2 For a summary of the key baseline elements associated with air quality see Section 5.2.

6.1.1.3 The criteria used to determine the air quality study areas remain unchanged from those proposed in the Air Quality chapter of our RTS EIA Scoping Report (Environment Agency and Surrey County Council, October 2022) (‘the EIA Scoping Report’). We have included slight changes to the study areas to accommodate minor revisions made for the project boundary for PEIR, which are described in Section 2.4 of Chapter 2: Project Description. The topic study areas are broken down into the following:

- Air quality – vehicle emissions;
- Air quality – dust emissions; and
- Air quality – odour emissions.

6.1.1.4 This chapter considers potential effects associated with the release of dust; emissions from vehicles and plant; and the release of odour, from the construction and operation of the project.

6.1.1.5 Potential effects are considered in respect to receptors including local residents, schools, hospitals and care homes; public areas; businesses; and ecological receptors.

6.1.1.6 The effects of traffic, plant and inland water vessels on local air quality will be assessed at sensitive human and ecological receptor locations, with the latter informing the Habitats Regulations Assessment (HRA) and the Ecological Impact Assessment (EcIA).

6.1.1.7 This chapter should be read in conjunction with Chapter 7: Biodiversity, Chapter 11: Health, Chapter 13: Materials and Waste, Chapter 15: Socio-Economics, Chapter 16: Soils and Land, Chapter 17: Traffic and Transport and Chapter 18: Water Environment.

6.2 Legislation, Policy and Guidance

6.2.1.1 Much of the legislation, policy and guidance, including the Air Quality Objectives (AQOs) and Air Quality Standards (AQSs), and the types of human receptors that are sensitive to emissions and thus where the AQOs apply, remains unchanged from our EIA Scoping Report (Section 6.2.1.2). Key changes since our EIA Scoping Report are described here. Changes have also been made where the request to consider additional legislation, policy or guidance was made in the Planning Inspectorate (PINS) EIA Scoping Opinion (dated 15 November 2022) ('the PINS Scoping Opinion').

6.2.1.2 Since the publication of our EIA Scoping Report in October 2022, the National Policy Statement (NPS) for Water Resources Infrastructure (Department for Environment, Food and Rural Affairs (Defra), 2023a) ('the 2023 NPS') has been updated and finalised. Changes to the NPS relevant to air quality (Section 4.2 of the NPS) since the draft version was released in 2018 are that:

- Paragraph 4.2.3 additionally states that: "*Applicants should seek through the design of any proposed scheme to minimise the emission of air pollutants as far as reasonably practicable;"*
- Paragraph 4.2.3 now also clarifies that air quality assessments should consider the potential for significant effects against *"relevant statutory air quality limits or statutory air quality targets or impede the attainment of statutory targets".* Statutory targets are discussed in Section 6.2.1.7;

- Paragraph 4.2.4 expands the range of locations at which "*air quality considerations are likely to be particularly relevant" and states that "Consideration should also be given to disparity of exposure and whether any air pollution generated by a proposed scheme will exacerbate already-high levels of exposure".* Changes to paragraph 4.2.6 also reflects the requirement to prevent exceedance of statutory targets; and
- Paragraph 4.2.5 expands the expected contents of an Environmental Statement to request "*existing (background) and baseline air quality levels*" and to describe "*how the scheme has been designed so as to prevent air pollutant emissions*".

6.2.1.3 Section 4.2.7 to Section 4.2.9 of the 2023 NPS substantially rewrites the 2018 Draft NPS (Section 4.2.13). It principally requires that "*Where a proposed development is likely to lead to a breach of any relevant statutory air quality limits or statutory air quality objectives or affect the ability of a non-compliant area to achieve compliance or impede meeting national statutory targets, the applicant should work with the relevant authorities to secure appropriate mitigation measures to ensure that any statutory air quality limits and statutory air quality objectives are not breached and sufficient consideration of targets is made."*

6.2.1.4 It also outlines the locations where air quality is likely to be particularly relevant, including air quality management areas (AQMAs); and expands upon the range of mitigation measures which should be considered within the assessment.

6.2.1.5 Changes were also made in Section 4.2.10 to Section 4.2.14 of the 2023 NPS, relating to the "Decision Making" criteria regulators should consider.

6.2.1.6 The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 were published in January 2023, as required in the Environment Act 2021 (described in Section 4.2.1.1 of Appendix M of our EIA Scoping Report). They set the following legally binding targets (LBTs) for fine particulate matter with a diameter of less than 2.5 micrometres ($PM_{2.5}$) to be met by 2040:

- Annual mean concentration target (AMCT) of 10µg/m3; and
- Population exposure reduction target (PERT) of 35 per cent compared to 2018 exposure.

6.2.1.7 The Environmental Improvement Plan 2023 (Defra, 2023c) sets interim targets (ITs) to be met by the end of January 2028:

- AMCT of 12µg/m3; and
- PERT of 22 per cent compared to 2018 exposure.

6.2.1.8 The Royal Borough of Kingston Upon Thames (RBKUT) and London Borough of Richmond Upon Thames (LBRUT) are committed to achieving annual mean $PM_{2.5}$ concentrations of less than 10µg/m^3 across their administrative areas by 2030, in line with the World Health Organisation (WHO, 2005) guidelines. This target is referenced in the London Environment Strategy (Greater London Authority (GLA), 2018), the London Local Air Quality Management Policy Guidance (Mayor of London, 2019) and the Elmbridge Borough Council (EBC) 2021 – 2026 Air Quality Action Plan (EBC, 2021b).

6.2.1.9 To account for this target and the 2023 NPS, annual mean $PM_{2.5}$ concentrations will be considered against both the 10µg/m^3 LBT and 20µg/m^3 AQS.

6.2.1.10 The Clean Air Strategy 2023 (Defra, 2023b) has also been published since our EIA Scoping Report was finalised. Whilst not establishing an AQO or AQS for ambient ammonia (NH_3) concentrations, it describes NH_3 as a *"reactive gas which impacts biodiversity"*. Along with nitrogen oxides (NO_x), NH_3 should therefore also be considered in environmental assessments.

6.2.1.11 Whilst not regulated by AQSs or AQOs, guidance issued by the Institute of Air Quality Management (IAQM, 2020) ('the IAQM 2020 guidance') specifies critical levels for concentrations of NH_3 in ambient air against which vehicle and Non-Road Mobile Machinery (NRMM) emissions from the project should be assessed, below which significant harmful effects are *"not thought to occur".* They have been adopted by the European Union and are cited in the Defra and Environment Agency (Defra and Environment Agency 2023) guidance, which applicants for Environmental Permits would be expected to use when assessing risks to air.

6.2.1.12 The IAQM 2020 guidance also indicates that critical loads can be found on the Air Pollution Information System (APIS) website (Centre of Ecology and Hydrology, 2023) and defines critical loads as "*Deposition flux of an air pollutant below which significant harmful effects on sensitive*

ecosystems do not occur, according to present knowledge. Usually measured in units of kilograms per hectare per year (kg/ha/yr)".

6.2.1.13 Our EIA Scoping Report referenced the London Plan Guidance: Air Quality Neutral (AQN) Consultation Draft (GLA, 2021a) and the London Plan Guidance: Air Quality Positive, consultation draft (GLA, 2021b). Modified versions of both documents were adopted during February 2023.

6.2.1.14 The 2021 Consultation Draft of the AQN guidance screened out the requirement to undertake an assessment for *"Developments with emission sources that are not covered by the Air Quality Neutral benchmarks"*. The 2023 *"Air Quality Neutral London Plan Guidance"* (Mayor of London, 2023a; 'the 2023 AQN guidance') omits this text.

6.2.1.15 The 2023 AQN guidance requires for the gross number of trips (once complete and operational), and emissions from any proposed sources of combustion to be considered in an air quality neutral assessment. The guidance requires that they are calculated for proposed schemes in London as trips per annum and grams of NO_x per square metre of floorspace per annum respectively.

6.2.1.16 Despite changes in wording proposed in the guidance, it is not proposed that an air quality neutral assessment is undertaken for three reasons. Firstly, it is anticipated that most vehicle movements attributable to the project once operational will be associated with the use of the new green and blue open spaces, which are predominantly anticipated to be proposed outside of London. The number of vehicle movements proposed within London is therefore expected to be relatively limited. Secondly, no equivalent guidance has been published by the Surrey Local Authorities or within the 2023 NPS. There is therefore no policy basis for schemes outside of London to follow the 2023 AQN guidance or to demonstrate air quality neutrality. Thirdly, no sources of combustion, including mains gas, are proposed at the weirs; therefore, there are no emissions against which air quality neutrality would require determining within Greater London.

6.2.1.17 The Air Quality Positive London Plan Guidance (Mayor of London, 2023b) continues not to apply to developments which are not referrable to the Mayor under the Town and Country Planning (Mayor of London) Order 2008.

6.2.1.18 Reference to the ‘Guidance on the Assessment of Minerals Dust Impacts for Planning’ (IAQM, 2016) (‘the IAQM 2016 guidance’) was not made in the list of legislation, policy and guidance in the EIA Scoping Report. This is because it was discounted from the proposed assessment method for assessing fugitive dust and emissions generated from construction related activities. However, following scoping feedback, a hybrid version of the methods utilising both the IAQM 2016 guidance and the methodologically similar ‘Guidance on the assessment of dust from demolition & construction’ (IAQM, 2023; ‘the IAQM 2023 guidance’) is instead proposed. It should be noted that the IAQM 2023 guidance is the latest version (version 2.1) of the IAQM ‘Guidance on the assessment of dust from demolition and construction’ (2014) referenced throughout our EIA Scoping Report. This guidance was updated in August 2023 with minor amendments to the construction dust assessment methodology. The method used to assess construction dust effects is described in Appendix 6.2.

6.2.1.19 The ‘Technical guidance on detailed modelling approach for an appropriate assessment for emissions to air’ (Environment Agency, 2014) will also be used to calculate the amount of nitrogen and NH_3 deposited in relation to its effects on ecosystem eutrophication and acidification.

6.3 Engagement

6.3.1 Responses to EIA Scoping

6.3.1.1 Table 6-1 summarises the responses to comments received on our Scoping Report following formal submission to the Planning Inspectorate (PINS) including the PINS EIA Scoping Opinion (dated 15 November 2022) (‘the PINS Scoping Opinion’) and any key comments received from statutory consultees. Full consultee comments on our EIA Scoping Report and our responses to these comments are provided in Appendix 4.1.

Table 6-1: Responses to comments received on our EIA Scoping Report

Consultee or Organisation	Summary of Comment	Project Response
PINS	Limited information has been provided in the Scoping Report regarding NRMM therefore the Inspectorate does not agree that this matter can be scoped out. The Environmental Statement (ES) should determine the type, number, location (including proximity to receptors) and operational hours of NRMM and quantify emissions; significant effects should be assessed where they are likely to occur.	An assessment of NRMM emissions will be undertaken for the ES. Impacts will initially be screened and then quantified using dispersion modelling where necessary. Regardless of whether screened out or included in modelling, the ES will determine the type, number, location (including proximity to receptors) and operational hours of NRMM; and quantify emissions.
PINS	The Inspectorate does not agree that impacts to air quality from vehicle movements transporting hazardous waste and materials can be scoped out; these movements should be considered as part of the construction traffic vehicle movements and emissions.	Vehicles transporting hazardous waste on roads from site will be considered within the construction vehicles emissions assessment within our PEIR and ES.
PINS	Effects from use of the recreational areas is not included in the potential effects on air quality. As multiple options remain for these areas, the potential air quality impact is unknown during operation and a worst-case scenario is not proposed. The ES should describe a worst-case scenario during operation of the recreational areas and include any potential impacts to air quality in the operational assessment where effects are likely to be significant.	Screening of an operational worst case will be undertaken for the design to be assessed for the ES (and dispersion modelling will be undertaken where necessary). The screening procedure is described in Sections 6.4.3.6 to 6.4.3.18.
PINS	The Inspectorate disagrees with the proposed screening process set out in Scoping Report	Impacts on designated ecological sites (defined in Section 6.4.3.16) from dust and particulate matter

Consultee or Organisation	Summary of Comment	Project Response
	paragraph 6.2.3.19. Focus should not be solely on Special Areas of Conservation (SAC), Special Protection Areas (SPA) and Ramsar sites and sites such as (but not limited to) Sites of Special Scientific Interest (SSSI), Local Wildlife Sites (LWS) and National Nature Reserves (NNR) should be included as receptors. Habitats known to not be sensitive to NO_x or nitrogen deposition are proposed to be screened out of assessment, however, there are multiple other emissions that have potential to impact habitats such as dust, particulates and ammonia, therefore, sites with potential to be impacted by any changes in air quality should be included in the ES assessment. The exceedance of 1,000 Annual Average Daily Traffic (AADT) does not take into account the vehicle type, speed or cumulative traffic. The ES should use multiple applicable variables (in line with relevant guidance) to inform an assessment of impacts on ecological receptors.	generated from construction related activities will be assessed using the hybrid construction dust method outlined in Appendix 6.2. This assessment will consider multiple applicable variables in line with relevant guidance (such as meteorological conditions, receptor sensitivity) to inform an assessment of impacts on those designated sites. Potential impacts on ecological receptors (defined in Section 6.4.3.16) in terms of annual mean NO_x concentrations, nitrogen deposition, acid deposition and concentrations of ammonia resulting from vehicle exhaust emissions associated with construction or operation of the project will be assessed, in relation to emissions from vehicles and, for construction, project-derived NRMM (subject to reliable emissions data being available for the NRMM). At the ES stage, designated ecological sites will be screened; and if necessary, ecological receptors will be included within the dispersion modelling assessment. Where the impact of the project on air quality (both alone and, where applicable, in-combination with live plans and projects), caused either the critical load or critical level to exceed 1% at ecological receptors, the impacts and effect caused to the qualifying features within the designated ecological site will be

Consultee or Organisation	Summary of Comment	Project Response
		determined. Depending on the type of habitat, this will be used to inform the ES Chapter and HRA.
PINS	Ammonia is not considered as a potential pollutant in the EIA Scoping Report. The ES should assess impacts from this pollutant or demonstrate that the vehicle traffic associated with the Proposed Development is unlikely to give rise to significant effects from ammonia emissions.	Assessment of potential impacts on designated ecological sites will be undertaken in terms of annual mean ammonia concentrations resulting from vehicle exhaust emissions from construction and operation of the RTS. It will also be considered in the assessment of impacts generated as a result of nitrogen and acid deposition.
PINS	EIA Scoping Report paragraph 6.4.1.1 only mentions human receptors in relation to demolition of buildings. For clarity, this should also include impacts on ecological receptors.	The impacts on designated ecological sites will be considered within the qualitative dust risk assessment for the construction phase of the RTS (in relation to fugitive dust from construction activities) in accordance with the appropriate IAQM guidance (see Appendix 6.2). This has been reported in the PEIR and will be included in the ES.
PINS	The EIA Scoping Report states use of electric or low-emission fleet vehicles could be prioritised as secondary mitigation for effects arising from air quality changes. The ES should explain any assumptions made in the assessment about use of such vehicles for the purposes of establishing residual effects.	The ES will explain any assumptions made in the assessment about use of such vehicles for the purposes of establishing residual effects.
PINS	Effort should be made to agree the final monitoring sites to be used for model verification and sensitive receptor locations with relevant consultation bodies, including the local authorities. The ES should include plan(s) showing the location of human and ecological	Further consultation will be undertaken with the local authorities at the ES stage to agree which monitoring sites will be used for model verification and sensitive receptor locations; as well as regarding emissions factors and background pollutant concentrations.

Consultee or Organisation	Summary of Comment	Project Response
	receptors within the air quality study area.	These cannot yet be selected as the air quality model study areas (for construction and operation) is presently unknown. The ES will include plans showing the location of human and ecological receptors within the air quality model study area.
PINS	The EIA Scoping Report describes potential changes in air quality from movements on the road network but does not include emissions from boats although the potential for use of the river/ barges during construction is described in Chapter 17. Should boats be used during construction and/or operation, the ES should describe the number and routing of movements and vehicle type and assess potential air quality effects from these vessels where they are likely to be significant. Any associated mitigation should be described and secured through the Development Consent Order (DCO) i.e. reducing waiting times at locks.	Further detail will be provided in the ES on the number of river transport movements predicted as a result of the RTS and the class of vessels to be used. Their potential for air quality effects will be screened, and where required a detailed air quality assessment may be undertaken using the ADMS-Roads dispersion model (ADMS being the commercial name for the Atmospheric Dispersion Modelling System). If required, appropriate mitigation will be proposed in the ES, describing how this will be secured.
Local Planning Authority (LPA) Project Group	In addition to European designated sites, SSSIs, NNRs, Local Nature Reserves (LNRs), Ancient Woodland and LWS should also be considered in the assessment of air quality impacts on ecological receptors, in accordance with the IAQM's 'A guide to the assessment of air quality impacts on designated nature conservation sites' (2020).	We will consider SACs, SPAs, Ramsar Sites, SSSIs, NNRs, LNRs, Ancient Woodland, LWSs and Sites of Nature Conservation Interest (SNCIs).
LPA Project Group	Whilst impacts from river transport emissions resulting from the RTS, such as those associated with construction material movement by	Further detail will be provided in the ES on the number of river transport movements predicted as a result of the RTS and the class of vessels to

Consultee or Organisation	Summary of Comment	Project Response
	use of barge, particularly during capacity improvement construction works, are unlikely to be significant, further detail should be provided in the Air Quality Chapter of ES on the number of river transport movements predicted as a result of the RTS and the class of vehicles to be used.	be used. Their potential for air quality impacts will be screened, and where required a detailed air quality assessment may be undertaken using the ADMS-Roads dispersion model.
LPA Project Group	The IAQM 2014 guidance is accepted as appropriate as a basis for the construction dust assessment. However, should excavation and / or processing exceed 200,000 tonnes per annum (tpa), the IAQM 2016 'Guidance on the Assessment of Minerals Dust Impacts' would be more suitable.	Our Scoping Report provided justification in 6.2.2.3 to 6.2.2.6 explaining why this guidance is not appropriate and the IAQM 2014 (now IAQM 2023) guidance should be used. However, an assessment will be undertaken in the ES using a hybrid approach making use of both documents (which were developed in accordance with the same broad principles). The method used is described in Appendix 6.2.
LPA Project Group	Acid deposition and concentrations of ammonia resulting from road traffic emissions and their contribution to nitrogen deposition should also be considered in relation to impacts on ecological receptors.	Assessment of potential impacts on designated ecological sites in terms of annual mean ammonia concentrations resulting from vehicle exhaust emissions associated construction of the project will be undertaken in the ES.

6.3.2 Other Engagement since EIA Scoping

6.3.2.1 Section 6.2.2 of our EIA Scoping Report summarises the stakeholder engagement relevant to Air Quality that was undertaken prior to submission of the EIA Scoping Report.

6.3.2.2 We have since engaged with the LBRUT, Spelthorne Borough Council (SBC), EBC, Runnymede Borough Council (RBC) and the RBKUT during May 2023 in order to agree the methodology and proposed locations for diffusion tube monitoring sites. Once these sites had been agreed, a final methodology was provided later that month and permissions were

obtained prior to commencing the monitoring work. Appendix 6.1 provides further detail on the diffusion tube monitoring survey.

6.3.2.3 Further engagement (commencing in March 2023) also took place with these authorities, as well as the Royal Borough of Windsor and Maidenhead (RBWM) to propose the ES assessment methodology (see Section 6.4) and to obtain copies of any odour complaints the authorities held within the odour study area (see Section 5.2). Collectively, we agreed the following for the ES:

- The types of receptors that should be considered as sensitive to dust within the construction dust assessment (see Appendix 6.2);
- We will provide further detail regarding the method used to generate traffic data used in the air quality assessment;
- Mitigation measures to consider;
- The screening criteria used to determine the model study areas will account for new bridges and roads;
- A diurnal profile will be used in modelling (where possible); and
- the odour assessment will account for dewatering operations (among other potential causes of fish death).

6.4 Methodology

6.4.1 Introduction

6.4.1.1 This section should be read in conjunction with Chapter 4 ‘Approach to the Environmental Assessment’ which sets out relevant information on the design parameters and information that have informed our PEIR assessment, and how we have approached various aspects of the assessment including:

- The scope of the assessment;
- The methodology (including the approach to defining the baseline environment, topic study areas, and assessment methodology and criteria);
- The approach to mitigation; and
- The approach to cumulative effects.

6.4.1.2 The assessment methodology used for the air quality assessment in our PEIR and to be used in the ES is presented in Section 6.7 of our EIA Scoping Report and updated below in Sections 6.4.2 to 6.4.6.

6.4.1.3 For our PEIR, detailed information related to the construction of the project is not yet available. The assessment of air quality effects presented in our PEIR is therefore approximate and preliminary and will be updated when further detail is known for the ES.

6.4.2 Baseline

Assessment Method for the PEIR

6.4.2.1 'Baseline' air quality refers to the concentrations of relevant substances that are already present in ambient air.

6.4.2.2 The method used in the PEIR to assess baseline air quality remains unchanged from Section 6.2 of our EIA Scoping Report, except as follows:

- the number of thresholds against which air pollutant concentrations has been compared has increased. This is described in Section 6.4.2.3;
- baseline conditions at ecological receptors have been outlined. This is explained in Sections 6.4.2.4 to 6.4.2.6;
- the sources of information underlying the baseline description of air pollutants has been updated to account for new information. This is explained in Section 6.4.2.7; and
- the odour complaints history available at the time of writing has been reviewed and summarised in Section 5.2.1.5 of Chapter 5: Site Description.

<u>Thresholds that air pollutant emissions have been compared against</u>

6.4.2.3 Due to updates in legislation and feedback received in the PINS Scoping Opinion, as described in Sections 6.2 and 6.3, the number of AQOs, AQSs, critical levels and LBTs against which baseline air quality is characterised has been extended. These 'thresholds' are shown in Table 6-2: Air Quality Standards to be Applied for this Assessment.

Table 6-2: Air Quality Standards to be Applied for this Assessment

Pollutant	Threshold level	Type of threshold	Measured as	Receptors to which threshold level applies
NH_3	1 µg/m^3 (for lichens and bryophytes) 3 µg/m^3 elsewhere	Critical level	Annual mean	Ecological receptors (if sensitive)
NO_x	30µg/m^3	AQS	Annual mean	Ecological receptors (if sensitive)
Nitrogen dioxide (NO_2)	200µg/m^3, not to be exceeded more than 18 times per year	AQO	One-hour mean	Anywhere where a member of the public may spend one hour or longer
NO_2	40µg/m^3	AQO	Annual mean	Human residences, schools and hospitals
Particles with a diameter of less than 10 micrometres (PM_{10})	50µg/m^3, not to be exceeded more than 35 times per year	AQO	24-hour mean	Human residences, schools and hospitals and private gardens
PM_{10}	40µg/m^3	AQO	Annual mean	Human residences, schools and hospitals
$PM_{2.5}$	20µg/m^3	AQS	Annual mean	Human residences, schools and hospitals
$PM_{2.5}$	10µg/m^3	LBT	Annual mean	Human residences, schools and hospitals

Baseline Conditions at Ecological Receptors

6.4.2.4 The APIS website has been used to obtain, for selected habitats:

- Background rates of nitrogen deposition, which identify the rate at which nitrogen is deposited from air on soils, from where it can lead to eutrophication;
- Nitrogen (eutrophication) critical loads;
- Background rates of nitrogen and sulphur deposition which can lead to acidification (i.e. acid deposition);
- Critical loads relating to nitrogen and sulphur due to the impacts of acidification on ecosystems; and
- Background annual mean NH3 concentrations.

6.4.2.5 In Section 5.2.1.6 of Chapter 5: Site Description, we have considered whether:

- Background rates of nitrogen deposition exceed the nitrogen (eutrophication) critical loads;
- Background rates of nitrogen deposition exceed the minimum nitrogen critical load (above which significant effects cannot be ruled out) relating to acid deposition; and
- Background ammonia concentrations exceed the annual mean ammonia critical load.

6.4.2.6 This has been considered at the seven designated ecological sites (defined in Section 6.4.3.16) that are located within 200 metres of the currently known construction traffic routes. The significance of this distance is discussed in Section 6.4.3.17 to Section 6.4.3.19.

New Sources of Information

6.4.2.7 Newer versions of the Air Quality Annual Status Reports (ASRs) cited in Section 6.2.1.4 of the EIA Scoping Report have been published. They are:

- EBC 2022b Air Quality Annual Status Report;
- LBRUT Air Quality ASR for 2021;
- RBWM 2022 Air Quality ASR; and
- RBC 2022 Air Quality ASR.

Assessment Method for the ES

6.4.2.8 The method used to report baseline conditions will generally not change, except to:

- account for new legislation, policy and guidance since the PEIR is published, if applicable;
- account for new data released by third parties, such as new odour complaints or air quality monitoring data, if applicable;
- describe the results of the project NO_2 monitoring survey; and
- expand upon the summary provided in Section 5.2 of Chapter 5: Site Description.

6.4.3 Construction Effects

Assessment Method for the PEIR

Assessment of Dust and Odour from Construction Related Activities

6.4.3.1 A high-level assessment of dust impacts was undertaken for the PEIR, using a modified approach of the method outlined in Appendix 6.2, and as described in 6.4.3.2.

6.4.3.2 The dust assessment undertaken for our PEIR considered at least the worst-case receptors for each of the construction related activity (in terms of receptor sensitivity, downwind direction and proximity to the site) to inform the overall likely effect for each construction activity. The effects associated with the generation of PM_{10} on human health were assumed to be no greater than the effect of dust generation on amenity, as primary and tertiary mitigation (see also Section 6.6) is expected to dampen down PM_{10} and dust emissions and result in a similar dust emissions magnitude. The odour assessment used the source-pathway-receptor approach outlined in Section 6.4.3.25. Pathway effectiveness considered downwind direction and proximity to the site.

Assessment of Vehicle Emissions from Construction Traffic and NRMM

6.4.3.3 Our PEIR assessment considered effects on human and ecological receptors within 200 metres of routes likely to be used by Heavy Goods Vehicles transporting some of the excavated material from construction of the flood channel (see Figure 17.1 and Appendix 17.2) in relation to the

criteria described in Section 6.2.3.13 of our EIA Scoping Report to determine the magnitude of potential change. Other criteria from TG22 and professional judgement (with reference to baseline air quality conditions and the presence of receptors) have been respectively used to determine the magnitude of change in air quality from NRMM and other road traffic.

6.4.3.4 Human receptor sensitivity considered the definitions provided in Section 6.4.3.20. Ecologically sensitive receptors were either considered low (where not sensitive to the effects of nitrogen, acid or ammonia deposition) or high sensitivity. High sensitivity receptors were considered as sensitive to the effects of nitrogen, acid or ammonia deposition and were located within 200 metres of locations where vessels or NRMM are expected to be used.

Assessment Method for the ES

Assessment of Dust from Construction Related Activities

6.4.3.5 Following feedback from the PINS Scoping Opinion and subsequently with the local authorities, we will undertake a qualitative dust risk assessment for the construction phase using an approach considering the IAQM 2023 and IAQM 2016 guidance documents within the ES. The revised method is described in Appendix 6.2.

Assessment of Vehicle Emissions from Construction Traffic and NRMM

6.4.3.6 Following feedback from the PINS Scoping Opinion, emissions from vehicles, inland water vessels and plant that will be used in connection with construction related activities (including vehicles transporting hazardous waste on roads from site up to the major road network) will be assessed. The plant and inland water vessels are NRMM. NRMM not being used by the project are assumed to be accounted for in baseline/ background.

6.4.3.7 Impacts will initially be screened and then quantified using dispersion modelling where necessary.

6.4.3.8 Regardless of whether NRMM are modelled or screened out, the air quality chapter of the ES will determine the indicative type, number, location (including proximity to receptors) and operational hours of NRMM

and quantify emissions, contextualised relative to emissions from other sources and baseline pollutant concentrations.

Screening of Road Traffic and Plant

6.4.3.9 The need to model vehicle or plant movements on roads or routes for which traffic data are made available will be screened.

6.4.3.10 Changes in traffic along a road or route which would trigger one or more of the screening criteria described in Section 6.2.3.13 of our EIA Scoping Report will be used. Additional relevant screening criteria, following PINS Scoping Opinion feedback and consultation with the local authorities, are as follows:

- Where the project would result in road realignment (where the road path is more than five metres from its original path at any point) or would introduce new roads, haul routes or construction compounds, etc., where the road is within or near an AQMA; or
- Where the project introduces a new junction or removes an existing junction near to either relevant receptors, or junctions which would cause traffic to significantly accelerate or decelerate (such as at traffic lights or near roundabouts).

6.4.3.11 For screening, the interpretation of AQMA described in Section 6.2.3.15 of our EIA Scoping Report will be applied to the criteria above.

6.4.3.12 Plant emissions will also be screened against the criteria specified in Section 6.2.3.13 of our EIA Scoping Report and those listed above. Plant will be treated similarly to Heavy Duty Vehicle (HDV) movements.

Screening of Inland Water Vessels

6.4.3.13 This will take place using two stages. First, where inland water vessels are located more than 200 metres from receptors, they will be screened out from further assessment. Adoption of the 200 metre screening criteria is likely to screen out emissions at receptors that would not be materially affected. This reflects research reported by the Port of London Authority (2018) which demonstrated that the steepest fall in pollutant concentrations occurred within the first 20 metres from the source.

6.4.3.14 Second, professional judgement will be used to review the potential for emissions to have a potentially perceptible impact. This will consider the

number of, and emissions from, the additional vessel movements expected and the period over which emissions from these vessels will be generated. It will also account for the background annual mean NO_x, PM_{10} and $PM_{2.5}$ concentrations relative to the AQOs and LBT; and the relative contribution of existing vessel movements to annual mean pollutant concentrations.

Screening of Human Receptors

6.4.3.15 The method used to screen receptors remains unchanged from Section 6.3.2.16 of our EIA Scoping Report. For additional clarity, this will include any road where the project leads to a reduction in traffic volumes if it would otherwise need modelling to ensure the baseline contribution is adequately accounted for at nearby receptors where traffic volume increases are significant.

Screening of Ecological Receptors

6.4.3.16 Ecological receptors refer to the assessed pollutant-sensitive features within 'designated ecological sites', namely SACs, SPAs, Ramsar sites, SSSIs, NNRs, LNRs, Ancient Woodland, Local LWSs and SNCIs.

6.4.3.17 Similar to Section 6.2.3.19 of our EIA Scoping Report, ecological receptors will be included in the dispersion model where they cannot be screened out. The criteria are based on those from guidance (Natural England, 2018; IAQM, 2020) but have been modified to account for comments raised in the PINS Scoping Opinion. These criteria are as follows:

- Distance screen: Designated ecological sites more than 200 metres from any roads, routes or other significant sources of air pollutants for which traffic data etc. are available will be excluded.
- Feature sensitivity screen: Features within designated ecological sites known not to be sensitive to eutrophication or acidification etc. because of changes to NO_x or NH_3 will be excluded. Features refer to 'qualifying features' of designated ecological sites which either directly contain or support the habitats or species that the site was designated to protect. Reference will be made to the MAGIC (Defra, n.d.) and APIS websites to determine whether features can be screened in or out of assessment.

- Spatial distribution of features screen: Unless features which are sensitive to pollution are located within 200 metres of any road, routes or other sources, the designated ecological site will be excluded.
- Effects of the project: Designated ecological sites will only be considered where the project leads to one or more of the screening criteria referenced in Section 6.2.3.13 of our EIA Scoping Report and Section 6.4.3.9 above to be breached in relation to roads, routes or other sources within 200 metres of screened in sources (as described in Section 6.4.3.6 to 6.4.3.15). Impacts will also be screened in where the project would lead to an increase in traffic of 1,000 vehicle movements (expressed as AADT flow) “in-combination” with other plans and projects.

6.4.3.18 All ecological receptors that are screened into the assessment will be considered ‘high sensitivity’, due to receptors not sensitive to the effects of air pollution being screened out.

Modelling Setup

6.4.3.19 The dispersion modelling method (relating to model setup and interpretation of impacts at human receptor locations) remains unchanged from Section 6.7.1.21 to Section 6.7.1.32 of our EIA Scoping Report, except as follows:

- We will also model a ‘Do Nothing’ scenario (future baseline traffic without in-combination schemes) where at least one ecological receptor is modelled;
- Where screened in, NRMM and inland water vessels will be modelled in the ‘Do-Something’ construction scenario;
- Road vehicle speeds will be reduced at junctions;
- Emissions factors for plant are likely to be calculated based on emissions data for Heavy Goods Vehicles or Articulated Dump Trucks (accounting for speed and loading) obtained from the National Atmospheric Emissions Inventory website;
- Houseboats will be considered as high sensitivity human receptors;
- We will request information on traffic data variation for each hour of a typical week for each modelled road to enable a diurnal profile to be produced. Where data are not available for a specific road link, we will apply a profile based on the ‘average distribution by day of the

week' for Great Britain during 2019 (Department for Transport, 2020) or apply another appropriate approach to capturing diurnal variation;
- Further consultation will be undertaken with Surrey County Council, EBC, LBRUT, RBWM, RBC and SBC to agree which monitoring sites will be used for model verification, sensitive receptor locations, emissions factors and background pollutant concentrations to be used in the assessment (although the latter two will match the assessed year); and
- The ES will explain any assumptions made in the assessment about use of electric vehicles for the purposes of establishing residual effects.

Further ES methodology clarifications

6.4.3.20 Human receptors will be considered within the assessment at locations where the annual mean AQOs should be applied in accordance with the definitions provided in the Local Air Quality Management Technical Guidance (Defra, 2022) ('TG22') (see also Section 6.2.1.2 of our EIA Scoping Report). They will therefore include:

- Residences, schools and hospitals. These receptors will typically be considered high sensitivity;
- Impacts on human receptors may also be assessed at locations where exposure may be more chronic, where only the hourly or 24-hour mean AQOs should be applied. Chronic exposure may also affect locations where members of the public may spend one hour or longer. These receptors will be considered as medium sensitivity; and
- Low sensitivity receptors are unlikely to be modelled.

6.4.3.21 Model verification will be undertaken using appropriate diffusion tube monitors and/ or automatic monitoring sites located within or near the project boundary for PEIR. Different adjustment factors may be produced for different modelled areas, depending on local characteristics.

6.4.3.22 Some additional or different areas will also be modelled for the baseline (model verification) scenario, including roads within 200 metres of the monitoring locations. The monitoring locations will be determined once the model study area has been finalised (which is ongoing) and their suitability for use in model verification has been checked.

6.4.3.23 Additional monitoring for NO_2 using diffusion tubes commenced in June 2023 to inform the ES in areas where both traffic attributable to the project is expected to be introduced; and sufficient local authority monitoring is not currently available. Some of these points may be used for model verification. The method used to undertake the air quality monitoring programme is described in Appendix 6.1.

6.4.3.24 To assess effects at ecological receptor locations, assessments will be undertaken involving six steps, noted below (wherever required, critical loads, critical levels and background nitrogen, acid or NH_3 concentrations will be obtained from the United Kingdom Air Information Resource (Defra, 2020) background maps, monitoring data or APIS website):

- First, the verified modelled road NO_x will be added to background NO_x concentrations for comparison against the annual mean NO_x AQO. Where the process contribution (PC), i.e. contribution from the project, exceeds one per cent of the critical level, the data will be passed to the project ecologists for further determination as significant or insignificant.
- Second, the NH_3 total concentration will be compared to the critical load of 3µg/m3, applicable in habitats or ecosystems when there are no lichens or bryophytes present; or 1µg/m3 where they are present. Where the PC exceeds one per cent of the critical level, the data will be passed to the project ecologists for further determination as significant or insignificant.
- Third, the annual mean nitrogen deposition concentration will be converted from the annual mean NO_x PC using the method outlined in Environment Agency (2014) guidance, in relation to its potential to cause eutrophication. The nitrogen deposition concentration will be compared to the nitrogen critical load. Where the PC exceeds one per cent of the critical load, the data will be passed to the project ecologists for further determination as significant or insignificant, using the process (and criterion) outlined in Natural England guidance (Natural England, 2018).
- Fourth, the latest version of the National Highways NO_x to NH_3 calculator will be used to convert the NO_x road traffic PC to NH_3 at each receptor and converted to deposited NH_3 using the Environment Agency 2014 guidance (Environment Agency, 2014). Deposited NH_3 from NRMM will also be calculated. This deposited NH_3 will be added

to the deposited nitrogen PC for comparison against the one per cent criterion.

- Fifth, the annual mean nitrogen deposition concentration will be converted from the annual mean NO_x PC using the method outlined in the Environment Agency 2014 guidance, in relation to its potential to cause acidification, and compared to the critical load function. Where the PC exceeds one per cent of the critical load function and the predicted environmental concentration exceeds 70 per cent of the critical load function, the data will be passed to the project ecologists for further determination as significant or insignificant. The contribution from road traffic to sulphur concentrations is expected to be negligible and will not be modelled.
- Sixth, the NH_3 PC will be added to the acidifying nitrogen deposition PC for comparison against the acid deposition criteria outlined in the fifth stage.

ES Assessment of Odour Arising from Channel Excavation

6.4.3.25 The method that will be used within the ES to qualitatively assess and describe impacts arising from odours associated with channel excavation remain unchanged from Section 6.7.1.14 of our EIA Scoping Report. Dewatering will be included in the assessment.

6.4.3.26 Table 6-3 below replicates the criteria from the 'Guidance on the assessment of odour for planning' (IAQM, 2018) ('the IAQM 2018 guidance'), which are proposed to be used to assess source strength, pathway effectiveness and receptor sensitivity (named as steps 1, 2 and 4 in Sections 6.7.1.14 to 6.7.1.18 of the EIA Scoping Report).

Table 6-3: Source-Pathway-Receptor (S-P-R) Risk Factors (IAQM 2018 Guidance)

Source odour potential	Pathway effectiveness	Receptor
Large source odour potential Large scale odour source Materials usage: >100,000 tonnes/ m^3 / year Area sources >1,000 m^2 Highly odorous release	**Highly effective pathway for odour flux to receptor** Receptor adjacent to source/ site Distance well below official set-back distances	**High sensitivity receptor** Surrounding land where users can expect to enjoy a high level of amenity and where people would reasonably be expected to be present continuously, or

Source odour potential	Pathway effectiveness	Receptor
Low odour detection thresholds Offensiveness: “most offensive” Hedonic tone score = -2 to -4 No mitigation (open air operation, no containment)	Wind direction: high frequency (%) of winds from source to receptor or downwind, from source, of prevailing wind direction Effectiveness of dispersion/ dilution: open processes with low-level releases, e.g. lagoons, uncovered effluent treatment plant, landfilling of putrescible wastes.	at least regularly for extended periods, as part of the normal intended use of the land, e.g. residential dwellings, schools/ educational facilities, hospitals, tourist/ cultural areas/ attractions.
Medium source odour potential Medium scale odour source Materials usage: 1,000 – 100,000 tonnes/ m^3/ year Area sources 100 – 1,000 m^2 Moderately odorous release Offensiveness: “moderately offensive” Hedonic tone score = 0 to -2 Some mitigation, but significant residual odour remains	**Moderately effective pathway for odour flux to receptor** Receptor is local to the source Where mitigation relies on dispersion/ dilution – releases are elevated but compromised by building effects.	**Medium sensitivity receptor** Surrounding land where users would expect to enjoy a reasonable level of amenity but would not reasonably expect to enjoy the same level of amenity as in their home or people would not reasonably be expected to be present here continuously or regularly for extended periods as part of the normal intended use of the land e.g. places of work, commercial/ retail premises, playing/ recreation fields.
Small source odour potential Small scale odour source Materials usage: <1,000 tonnes/ m^3/ year Area sources <10 m^2 High odour detection thresholds Offensiveness: “less offensive” Hedonic tone score = 0 to +4	**Ineffective pathway for odour flux to receptor** Receptor is remote from source/ site Distance exceeds any official set-back distances Wind direction: low frequency (%) of winds from source to receptor or upwind, from source, of prevailing wind direction	**Low sensitivity receptor** Surrounding land where the enjoyment of amenity would not reasonably be expected or where there is transient exposure, where the people would reasonably be expected to be present only for limited periods of time as part of the normal intended land use e.g. industrial

Source odour potential	Pathway effectiveness	Receptor
Effective, tangible mitigation measures in place	Where mitigation relies on dispersion/ dilution – releases are from high level (e.g. stacks or roof vents > 3 metre above roof/ ridge height) and are not compromised by building effects.	areas, farms, footpaths, roads.

6.4.3.27 As per step 3 of the method in our EIA Scoping Report (Section 6.7.1.17), when the source odour potential and pathway effectiveness for each receptor have been defined using Table 6-3, these are considered together to predict the risk of odour exposure (impact) at the receptor location, using the matrix shown in Table 6-4.

Table 6-4: Risk of Odour Exposure (Impact) at the Specific Receptor Location.

	Source Odour Potential: Small	Source Odour Potential: Medium	Source Odour Potential: Large
Highly Effective Pathway	Low Risk	Medium Risk	High Risk
Moderately Effective Pathway	Negligible Risk	Low Risk	Medium Risk
Ineffective Pathway	Negligible Risk	Negligible Risk	Low Risk

6.4.3.28 As per step 5 of the method from our EIA Scoping Report (Section 6.7.1.19), the effect of the odour impact on the specific receptor location is then estimated by taking into consideration its sensitivity. This can be estimated using the matrix shown in Table 6-5.

Table 6-5: Magnitude of Odour Effect at Receptor Location

	Receptor Sensitivity: Low	Receptor Sensitivity: Medium	Receptor Sensitivity: High
High Risk of Odour Exposure	Slight Adverse Effect	Moderate Adverse Effect	Substantial Adverse Effect
Medium Risk of Odour Exposure	Negligible Effect	Slight Adverse Effect	Moderate Adverse Effect
Low Risk of Odour Exposure	Negligible Effect	Negligible Effect	Slight Adverse Effect
Negligible Risk of Odour Exposure	Negligible Effect	Negligible Effect	Negligible Effect

6.4.3.29 Where moderate or substantial odour impacts are predicted at multiple receptors in the qualitative assessment, a detailed dispersion modelling assessment of odour effects of exposed or stockpiled soils will be undertaken using ADMS-Roads. It is anticipated that “library” odour emissions rates would be used (such as in relation to ‘green’ waste collected historically at waste transfer stations).

6.4.3.30 Where dispersion modelling is undertaken:

- Professional judgement and project information will be used to determine the length, width and height of sources modelled and settings appropriately representing the temperature and velocity at which odour would be passively released.
- Three years of meteorological monitoring data from the London Heathrow Airport monitoring station (including 2019) will be used in the dispersion modelling assessment.
- The impacts and effects of odour will be determined at both discrete and hypothetical receptor locations (within a contour plot). The contour plots will delineate areas where the 98th percentile of hourly mean odour concentrations exceed 3 European odour units per metre cubed of air (ouE/m3). This odour threshold is equivalent to the ‘H4 Benchmark Odour criteria’ for ‘moderately offensive’ odours defined in the IAQM 2018 guidance.

- At the discrete receptors, the potential odour impacts at each individual receptor will be determined with reference to the impact assessment criteria in the IAQM 2018 guidance.

6.4.4 Operational Effects

Assessment Method for the PEIR

6.4.4.1 The method used to assess impacts from operation for our PEIR followed the same approach adopted to assess construction impacts for our PEIR (see also Sections 6.4.3.1 to 6.4.3.4).

Assessment Method for the ES

Assessment of Vehicle Emissions from Operational Traffic

6.4.4.2 The methodology for the assessment of effects from operation on air quality due to emissions from traffic will be identical to the construction phase emissions assessment, except that:

- the model study area and scenarios modelled will differ; and
- construction plant and inland water vessels will not be modelled as, once operational, the project is not anticipated to generate enough inland water vessel movements to result in significant effects.

6.4.4.3 Further consultation proposed to address construction air dispersion modelling, as discussed in Section 6.4.3.19, will provide the same information to cover operational air dispersion modelling.

6.4.4.4 Traffic data used will include a worst-case scenario from operation of the recreational areas.

6.4.4.5 The assessment of effects on ecological receptors from the operation of the project will follow the same methodology as that described in Sections 6.4.3.16 to 6.4.3.18.

Assessment of Odour Arising from Channel Operation

6.4.4.6 For the ES, we will undertake a qualitative assessment of odour emissions associated with potential fish mortality from all causes associated with the project, including the introduction of nutrient rich water

to lakes and operation of the weir gates following high precipitation and flood events.

6.4.4.7 The methodology for the assessment is expected to follow the qualitative method as outlined in Section 6.4.3.25 for the construction phase odour assessment. The air quality assessment will focus on the potential that fish death may generate odour whereas Chapter 7: Biodiversity and Chapter 18: Water Environment will assess impacts from fish death on the species and the water environment, respectively.

6.4.4.8 Odour from these sources is expected to be transient and generally insignificant. Dispersion modelling of odour effects is therefore not expected to be undertaken.

6.4.5 Cumulative Effects

6.4.5.1 The method used to consider cumulative effects has not been amended since the EIA Scoping Report (Section 6.7.3). However, the following clarifications are made as more potential air quality effects have been scoped in.

6.4.5.2 It is not initially proposed to model baseline air quality effects from inland water vessels or plant from nearby committed and consented schemes. This is because emissions from sailing boats, workboats or motorboats, personal watercraft and inland goods carrying vessels (based on projected 2008 surveyed data) are each accounted for in the estimated Defra (2020b) ambient air pollutant concentrations (Tsagatakis, 2019). They would also contribute to pollutants detected at any representative air quality monitoring sites.

6.4.5.3 In relation to plant, TG22 also indicates that *"Experience of assessing the exhaust emissions from on-site plant and site traffic suggests that, with suitable controls and site management, they are unlikely to make a significant impact on local air quality. In the vast majority of cases they will not need to be quantitatively assessed – qualitative consideration [to best practice mitigation] will likely provide sufficient screening."* It is anticipated that standard practice mitigation measures will be employed at any sites adjacent to the project; or plant emissions will not be of a sufficient nature and scale as to generate significant cumulative effects.

6.4.6 Assumptions and Limitations

Assessment Method for the PEIR

6.4.6.1 The assumptions made regarding the assessment of impacts for our PEIR are described in Section 6.7.1.1.

Assessment Method for the ES

6.4.6.2 The following assumptions and limitations have been identified in addition to those reported in Section 6.8 our EIA Scoping Report.

6.4.6.3 Assumptions may need to be made regarding the volume of traffic, maximum pollutant emissions rates (based on engine size and classification parameters), assumed worst-case load, diurnal variation throughout the day, speed and path length and/or location of inland water vessels, vehicles and/or plant used in connection with the project. The traffic data will also be used as received. Information will be obtained from the traffic and transport assessment or publicly available records in the absence of vehicle or NRMM-specific information where available.

6.4.6.4 The output of any tools or data made available by third parties in connection with the assessment will be assumed to be accurate.

6.4.6.5 Any data obtained from monitoring sites, managed either by Local Authorities or temporarily installed in connection with the project, will have uncertainties. Unless reported by Local Authorities, assumptions about the location and height at which monitors are installed may be estimated with reference to publicly available street level photographs, as is usual practice.

6.4.6.6 There are inherent uncertainties with using diffusion tubes, associated with the analysis method itself, as well as the methods used to process diffusion tube data, and inherent uncertainty associated with assessing the effects of accuracy and seasonality on the monitoring results (AEA Energy and Environment, 2008; TG22). Care has been taken to ensure any monitoring locations installed in connection with the project are installed at representative locations in accordance with this prevailing guidance as far as is practicable.

6.4.6.7 There are inherent uncertainties in selecting emissions rates for odour modelling. Efforts will be made to select odour emissions rates which best represent conditions expected.

6.4.6.8 The odour emissions model will use hourly sequential meteorological data to predict dispersion within different conditions. It is possible that short-term exposure could lead to elevated odour concentrations but which then do not exceed the odour assessment criterion after being averaged over an hour. In this case, the situation could arise where, over the year, the 3ouE/m^3 criterion may be complied with but, over the period for which the odour is emitted, it may be exceeded.

6.4.6.9 The IAQM 2018 guidance advises that calm wind conditions tend to lead to worst-case conditions for odour dispersion. Due to constraints of the model used, calm conditions will not specifically be accounted for.

6.4.6.10 The odour assessment criteria upon which the IAQM 2018 guidance criteria were based are derived from a dose-response relationship, which was carried out based on a limited number of processes using older-generation dispersion models. It is therefore possible that odours at concentrations below 3ouE/m^3, where odours would be predicted to exert a ‘slight’ or ‘negligible’ effect, may still lead to the generation of complaints or affect amenity, or vice versa.

6.5 Key Environmental Considerations and Opportunities

6.5.1.1 The key considerations with respect to air quality are:

- Human health and ecological receptors within the study area which are sensitive to fugitive dust generated by demolition, earthworks, construction and trackout activities.
- Human health and ecological receptors within the study area which are sensitive to increase in ambient concentrations of air pollutants, which could affect human health or lead to acidification or eutrophication at ecological receptors.
- There are numerous historical and authorised landfill sites and other areas of potentially contaminated land within the study area. The disruption of contaminants from these sites could generate odour, affecting amenity.
- The introduction of nutrient rich water to lakes and the flood channel, operation of the weir gates following high precipitation and flood

events, and other operational uses of the project could lead to fish mortality. This could generate odour and affect amenity.

6.5.1.2 The key opportunity with respect to air quality is:

- The project could lead to a reduction in vehicle traffic, which could have a temporary or permanent positive effect on air quality, in at least some locations around site.

6.6 Primary and Tertiary Mitigation

6.6.1 Primary Mitigation

6.6.1.1 The following primary mitigation is proposed in relation to air quality effects:

- The provision of augmented flow;
- Apply mitigation hierarchy for habitats and species; and
- Habitat creation, mitigation or enhancement for other effects on habitats or species.

6.6.1.2 The provision of the augmented flow will reduce nutrient residence times and allow for fish movement through the flood channel and existing lakes. This will therefore reduce the risk of water quality deterioration, and subsequently reduce the potential for fish death and related odour.

6.6.1.3 Measures to mitigate effects that air pollution may have on sensitive features within ecologically designated sites, or on habitats and species, may be required to ensure that the project will not cause a likely significant effect. For the purposes of the Habitats Regulations Assessment, it will also need to ensure that where likely significant effects cannot be discounted, the project has no adverse effect on the integrity of European sites.

6.6.2 Tertiary Mitigation

6.6.2.1 The following tertiary mitigation is proposed in relation to air quality effects.

6.6.2.2 Standard construction practices to manage air quality will be followed. For example, mitigation measures in accordance with the following IAQM guidance documents: ‘Guidance on the Assessment of Dust from

Demolition and Construction' (2023) and 'Guidance on the Assessment of Minerals Dust Impacts' (2016). This is likely to include measures such as (this is not an exhaustive list):

- Storage of stockpiled material under cover, protected from the wind;
- Dust and acoustic barriers along traffic routes and working areas;
- Ensure effective water suppression is used during demolition and earthworks operations; and
- Set appropriate site speed limits for construction vehicles, with regular clearing, grading and maintenance of haul routes.

6.6.2.3 Mitigation measures for air quality will be recommended in accordance with the above documents plus the Mayor of London Supplementary Planning Guidance (SPG) (Mayor of London, 2014).

6.6.2.4 NRMM with low emissions will be used to reduce emissions of pollutants.

6.6.2.5 For works in London boroughs, the project will comply with emissions standards listed at www.nrmm.london and register NRMM to demonstrate compliance. Emissions standards for works in London boroughs will be implemented under the London Plan (GLA, 2021c). Not all operators will have plant compliant with the standards set and would therefore be required to upgrade or retrofit plant as appropriate.

6.6.2.6 The Materials Management Strategy will be further developed in parallel to the DCO process. Importing or disposing of materials closer to the project area will likely reduce the length and number of trips that vehicles need to make to off-site disposal facilities, thereby reducing the emissions of air pollutants generated. The Materials Management Strategy will also:

- Detail efficient management proposals for processing, recovery, or re-use of materials and waste generated by the project, reducing the need to import materials from off-site, and minimise the volume of unsuitable materials requiring off-site disposal;
- Be implemented in line with relevant permitting requirements and CL:AIRE Definition of Waste Code of Practice; and
- Inform design development and the development of appropriate primary, tertiary, and secondary mitigation.

6.6.2.7 An Air Quality Management Plan to include measures associated with managing dust emissions and air quality during earthworks, demolition,

construction activities, vehicle movements, odour and monitoring. This is likely to include measures such as (this is not an exhaustive list):

- Dampening of material using sprays, mists, microfoam or foam;
- Soft stripping inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust);
- Ensuring bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems;
- Regular clearing, grading and maintenance of haul routes. Recording of all inspections of haul routes and any subsequent action in a site log book;
- Ensuring that odorous materials are prioritised when removing materials from the worksites; and
- Implementing an appropriate monitoring scheme. This can range from visual inspections, dust deposition/flux monitoring, to real-time PM_{10}/$PM_{2.5}$ continuous monitoring locations (to be agreed upon with the Local Authority).

6.6.2.8 A Construction Travel Plan that aims to proactively manage and influence workforce (and visitor) travel to and from worksites to limit traffic movement and thereby reduce emissions of air pollutants. This could include measures such as (this is not an exhaustive list):

- Setting out details of access arrangements to worksites to facilitate convenient and safe access for pedestrians, cyclists and drivers;
- Providing current information on the local transport network (pedestrian, cycle, bus, rail) to enable workers and visitors to make informed decisions on their travel behaviour; and
- Setting, monitoring and reporting against objectives to limit and reduce car travel.

6.6.2.9 An Operational Travel Plan that aims to proactively manage and influence employee (and visitor) travel to and from facilities being provided at the New Green and Blue Open Spaces, to encourage the use of sustainable travel methods and thereby reduce emissions of air pollutants. This could include measures such as (this is not an exhaustive list):

- Setting out details of access arrangements, vehicle/electric vehicle/bicycle parking availability and information on the local transport network (pedestrian, cycle, bus, rail) to enable employees and visitors to make informed decisions on their travel behaviour;
- Providing secure and convenient cycle storage and facilities such as changing facilities and lockers; and
- Setting, monitoring and reporting against objectives to limit and reduce car travel.

6.6.2.10 Managing and influencing travel patterns (in both the construction and operational phases) will reduce effects on air quality by reducing the likelihood that individuals will travel to the project site via private car and increase the likelihood that individuals will walk, cycle or use public transport to travel.

6.6.2.11 A Construction Logistics Plan that aims to detail the logistics management arrangements for worksites to minimise impacts on communities and the environment including on air quality from transportation of construction materials/waste. This could include measures such as (this is not an exhaustive list):

- Details on standard working hours and any requirements to restrict vehicle movements during certain sensitive periods of the day/month/year;
- Any commitments on construction vehicle routing e.g. any requirements to avoid certain junctions/routes/air pollution hotspots (e.g. AQMAs); and
- Co-ordination with local stakeholders (Local Highway Authority and developers) to minimise collective disruption to operation of the highway from construction works.

6.6.2.12 A Construction Traffic Management Plan that aims to ensure all highways works are safe, planned and co-ordinated in order to secure the expeditious movement of traffic on the road network and associated effects on air quality, and to minimise inconvenience to the public. This could include measures such as (this is not an exhaustive list):

- Necessary modification to parking restrictions or suspensions (amending existing or implementing new);
- Necessary bus stop suspensions or relocations;

- Details on off-site lorry holding arrangements (site management); and
- How stakeholder and community liaison and co-ordination will be managed.

6.7 Preliminary Assessment of Likely Significant Effects

6.7.1 Introduction

6.7.1.1 Our PEIR adopts a precautionary approach. Assessments reported within this chapter are a preliminary assessment of potential likely significant environmental effects based on the design parameters set out in Chapter 2. This precautionary approach has been taken for the PEIR as there is some information on the project that is currently incomplete and the parameters within Chapter 2 are high level and account for a range of uses and allowance for design development within a boundary that could possibly be refined once this work has been completed. For example, some designs, construction and mitigation details (and therefore also land requirements) or baseline information is still required from further surveys, assessments and/or consultation feedback. In making a determination of likely significant effects, we have considered the sensitivity of receptors (a receptor being a feature of the environment that responds to change) and the potential magnitude (i.e. size) of change caused by the RTS. The methodology for defining sensitivity and magnitude varies by topic and are defined in the topic sections of our Scoping Report and in Section 6.3.2.3 of this chapter.

6.7.1.2 We are committed to including mitigation measures as necessary to address likely significant negative environmental effects as far as reasonably practicable. Both primary and tertiary mitigation are considered to form part of the RTS; those applicable to this topic are set out in Section 6.6. Several of these mitigation measures are still being developed, and therefore as a precaution, the preliminary assessment of effects for our PEIR does not assume full achievement of these in considering if a project effect is likely to be significant (Appendix 4.2 identifies the implementation status of primary and tertiary mitigation for the PEIR assessment). Furthermore, the potential likely significant effects reported within our PEIR have been assessed prior to the implementation of secondary mitigation measures, those applicable to this topic are set out in Section 6.7.5. These secondary mitigation measures are the subject

of further development; and given they are still being developed, are not able to be applied to develop a 'residual' effects assessment.

6.7.1.3 Our PEIR is based on the latest design and construction parameters and baseline information. As such the findings of the preliminary environmental appraisal presented within our PEIR may be subject to change as the design progresses, as mitigation is further developed or information from further studies becomes available, such as our work to develop the Materials Management Strategy and Traffic Management Plan. The final assessment of effects undertaken as part of the EIA and reported within the ES will be based on the latest information available at that time.

6.7.2 Potential Likely Significant Effects

6.7.2.1 Our preliminary assessment of likely significant environmental effects has identified the potential for the following significant effect from construction in relation to air quality:

- Temporary negative effects of NO_x and NH_3 on high sensitivity ecological receptors less than 200 metres of transport routes. Significant effects may occur as a result of the total construction-related vehicle movements (i.e. movement of construction vehicles, equipment and operatives on and off site).

6.7.2.2 Our preliminary assessment of likely significant environmental effects has identified the potential for the following significant effect from operation in relation to air quality:

- Permanent negative effects of NO_x and NH_3 on sensitive ecological receptors less than 200 metres of transport routes, with particular consideration of receptors within an AQMA. Significant effects may occur as a result of vehicle movements accessing priority areas for habitat creation, enhancement or mitigation, new green and blue open spaces and areas of enhanced public connection.

6.7.2.3 Further details of the potential likely significant effects from construction and operation with respect to receptors, project components and project activities, on air quality can be found in Table 1 and 2 in Appendix 6.3.

6.7.3 Potential Likely Non-Significant Effects

6.7.3.1 Further details of the non-significant effects from construction and operation with respect to receptors, project components and project activities, on air quality can be found in Table 3 and 4 in Appendix 6.3.

6.7.3.2 Some examples of non-significant air quality effects include (this is not an exhaustive list):

- Generation of dust, PM10 and PM2.5 from construction related activities on amenity and human health. This effect would be temporary through construction and negative. The effect of dust is not considered likely to be significant as the IAQM 2023 guidance indicates that “experience shows that [it] is normally possible” to implement mitigation, hence the residual effect will normally be ‘not significant’; and
- NO_2 emissions from vehicle movements for haulage of material for processing/ placement (including waste/ hazardous material). These emissions could impact on high-sensitivity human receptors <200 metres of these routes, with particular consideration of receptors within an AQMA. This effect would be temporary through construction and negative. Its impact was not considered significant as it is considered likely that the increase in NO_2 generated by the project would not result in adverse impacts across much of the dispersion model study area. This is because the contribution from the project is likely to be relatively small and NO_2 concentrations generally compliant with the AQO.

6.7.4 In-Combination Climate Impact

6.7.4.1 Consideration of ‘In-Combination Climate Impact’ (ICCI) has been undertaken. The preliminary environmental assessment has considered a future climate scenario and has identified certain potential likely significant environmental effects for this topic which may be exacerbated further by predicted climate change. Further consideration of ICCI will be included in the ES.

6.7.5 Secondary Mitigation

6.7.5.1 In order to reduce the magnitude of effects, the following secondary mitigation is currently under consideration:

- SPA / Ramsar mitigation, with precise mitigation to be determined by the HRA but might include measures such as seasonal restrictions; buffers; lake edge shallowing; habitat enhancement; construction noise barriers/screens; timed sheet piling; restricted lighting; avoidance of direct impacts (refer also to Chapter 7: Biodiversity). This secondary mitigation will work to reduce likely significant effects from construction and operation of the project on high sensitivity ecological receptors that are less than 200 metres away from transport routes.

6.7.5.2 Further mitigation may be proposed if considered necessary at the ES stage. Primary and tertiary mitigation measures will be further developed through ongoing design and assessment; additional secondary mitigation measures may therefore not be required.

6.8 Further Work for the EIA

6.8.1.1 A detailed assessment of air quality effects from construction and operation of the project will be undertaken in accordance with the methodology set out in Section 6.4.

6.8.1.2 The assessment will be based on the effects scoped into the assessment and as per those included within this PEIR. It will take into account any relevant aspects of PINS EIA Scoping Opinion, be informed by any further information received during the statutory consultation process, as well as additional baseline information that may become available. It will also account for further consultation to be undertaken at ES Stage in relation to localised comments on dispersion modelling and locations in which particulate matter monitoring is recommended to monitor residual fugitive dust generated from construction related activities.

6.8.1.3 Additional baseline information could include updated odour complaints history provided by the local authorities, updated Defra background pollutant mapping data, and any updates to the APIS website database. In addition, NO_2 diffusion tube monitoring is currently taking place in areas where traffic attributable to the project is expected to be; this monitoring data will be used to inform the ES assessments.

6.8.1.4 The assessment will state the predicted significance of effects, provide further detail of relevant mitigation and document the subsequent residual

effects. The assessment of ecological effects will also be used to inform the HRA and the biodiversity impact assessment.

6.8.1.5 We consider that the further development of the project design and mitigation measures which will be reflected in the ES and DCO application, will enable a reduction in the scale of identified negative likely significant effects set out in this chapter.

7 Biodiversity

7.1 Introduction

7.1.1.1 This chapter of our Preliminary Environmental Information Report (PEIR) considers the effects from construction and operation of the River Thames Scheme (RTS) ('the project') in relation to biodiversity. Within this chapter we have included topic-specific sections on:

- Legislation, policy and guidance (noting any changes since Environmental Impact Assessment (EIA) scoping);
- Engagement with consultees, including responses to comments received on our RTS EIA Scoping Report;
- The assessment methodology for this topic (again noting any changes or updates since EIA scoping);
- Key environmental considerations and opportunities;
- Primary and tertiary mitigation;
- Our preliminary assessment of effects;
- Secondary mitigation; and
- Future work for this topic of our EIA.

7.1.1.2 For a summary of the key baseline elements associated with biodiversity see Section 5.3.

7.1.1.3 An explanation of the topic study area can be found in Section 7.2.3 of our RTS EIA Scoping Report (Environment Agency and Surrey County Council, October 2022) ('our EIA Scoping Report'). The study area incorporates all habitats and flora that lie within the project boundary for EIA PEIR. The study area includes fauna species and statutory and non-statutory designated nature conservation sites within the project boundary for EIA PEIR and up to a two kilometres buffer or the area within the 1:100 year floodplain (i.e. the area with a one per cent chance of flooding in any given year), whichever is the greater. Where the study area boundary partially covers a potential receptor, that receptor as a whole has been included in the assessment. The study area for biodiversity represents the zone of influence (ZOI) of the project for different ecological receptors likely to experience effects from construction and operation from the RTS.

7.1.1.4 There will be interrelationships related to the potential effects on the biodiversity receptors and other topics. Reference should also be made in particular to the following PEIR chapters: Chapter 6: Air Quality, Chapter 11: Health, Chapter 12: Landscape and Visual Amenity, Chapter 14: Noise and Vibration, Chapter 16: Soils and Land and Chapter 18: Water Environment (in particular the assessment of water dependent habitats under the Water Framework Directive (WFD) Compliance Assessment process).

7.2 Legislation, Policy and Guidance

7.2.1 Legislation

7.2.1.1 A summary of the key legislation, policy and guidance relevant to biodiversity is provided in Appendix M of our RTS EIA Scoping Report. Since the publication of our EIA Scoping Report in October 2022, the National Policy Statement for Water Resources Infrastructure (NPS) has been finalised and was designated in September 2023 (Defra, 2023a). No notable changes to the NPS from the draft NPS (published in 2018) have been identified as relevant to this chapter. Much of the other legislation remains unchanged from our EIA Scoping Report; key changes are described here.

7.2.1.2 The Environment Act 2021 required for legally binding targets in priority areas including biodiversity to be set in Regulations and met in England over a 25-year period. The Act requires for Environmental Improvement Plans to be produced by the Department for Environment, Food and Rural Affairs (Defra) to monitor progress and commit the Government to greater compliance with those targets if insufficient progress is made.

7.2.1.3 The Environmental Targets (Biodiversity) (England) Regulations 2023 were published, as required in the Environment Act 2021. They set the following legally binding target (LBTs) with regard to species abundance and extinction:

- The long-term biodiversity target for species' extinction risk is to reduce the risk of species' extinction by 2042, when compared to the risk of species' extinction in 2022.

- The long-term biodiversity target for the restoration or creation of wildlife-rich habitat is that in excess of 500,000 hectares of a range of wildlife-rich habitats are to be restored or created by 31 December 2042.
- The 2030 species abundance target is that the overall relative species abundance index on the specified date indicates that the decline in the abundance of species has been halted.
- The long-term biodiversity target to reverse the decline of species abundance is that the overall relative species abundance index by 31 December 2042 is;
    - Higher than the overall relative species abundance index for 31 December 2022; and
    - At least 10 per cent higher than the overall relative species abundance index for 31 December 2030 (the specified date for the 2030 species abundance target).

7.3 Engagement

7.3.1 Responses to EIA Scoping

7.3.1.1 Table 7.1 summarises the responses to comments received on our EIA Scoping Report following formal submission to the Planning Inspectorate (PINS) including the PINS EIA Scoping Opinion (dated 15 November 2022) (‘the PINS Scoping Opinion’) and any key comments received from statutory consultees. Full responses to consultee comments on the EIA Scoping Report and our responses to these comments are provided in Appendix 4.1.

Table 7-1: Responses to comment received on our EIA Scoping Report

Consultee or Organisation	Summary of Comment	Project Response
PINS	The Inspectorate considers that there is insufficient evidence provided in the EIA Scoping Report to establish the likely scale and nature of these effects and the specific receptors that could be affected by these changes. The ES should contain an assessment of potential hydromorphological changes caused by capacity changes at weirs on ecological receptors where significant effects are likely to occur.	This comment was made in reference to scoping out the effects from operation on River Thames weir pools associated with capacity improvement works to weirs - paragraph 7.5.2.1 in the EIA Scoping Report, bullet point 1. Since the scoping opinion the Environment Agency Fisheries Technical Specialists have provided further baseline information regarding migratory fish and their supporting habitats in areas adjacent to the gates. Therefore, effects on fish from the proposed capacity improvement works at Molesley, Sunbury and Teddington weirs could occur and will be assessed in the Environmental Statement (ES). Further consultation with Environmental Agency Technical Specialists will be held. We consider that effects on aquatic habitats and other notable and protected species (other than migratory fish) should remain scoped out of the assessment as there is evidence to support that changes to the hydromorphology of the River Thames as a result of the operation of the capacity improvements are within the range of variance of existing flood flow conditions. This evidence is provided within the report Capacity Improvement Works Thames Weirs' (GBV, 2018). Further information on hydromorphological effects of the capacity improvement works is

Consultee or Organisation	Summary of Comment	Project Response
		provided in Chapter 18: Water Environment.
PINS	Ancient woodland and veteran trees are not described in the baseline in Scoping Report Section 7.3 and have limited reference in the future baseline section although they are known to be located in the study area. They are also not scoped into the assessment in Scoping Report paragraph 7.4.3.2. The ES should establish the baseline for veteran trees and ancient woodland, including locating these and other Habitats of Principal Importance on a figure, and assess significant effects on these receptors where they are likely to occur.	Description of the known baseline data for ancient woodland is included in our Preliminary Ecological Appraisal (PEA). No veteran trees have been identified in historical surveys for the RTS, however, further tree surveys are proposed for the RTS and there is potential for them to be present. They were not included in the features list in our Scoping Report however, have now been specifically noted in the PEIR as part of the woodland and trees receptors, respectively. Ancient woodland and veteran trees will be included in the scope of the assessment for the ES.
PINS	The Inspectorate disagrees with the proposed screening process set out in EIA Scoping Report paragraph 6.2.3.19 Focus should not be solely on Special Areas of Conservation, Special Protection Areas (SPA) and Ramsar sites and sites such as (but not limited to) Sites of Special Scientific Interest, Local Wildlife Sites and National Nature Reserves should be included as receptors. Habitats known to not be sensitive to NOx or nitrogen deposition are proposed to be	The assessment of effects on air quality will look at ecologically sensitive sites within 200m of roads which vehicles connected to the project will use during construction and operation of the RTS. These sites include statutory and non-statutory sites with national and local designations; further details on how we will conduct this assessment are provided in Chapter 6: Air Quality.

Consultee or Organisation	Summary of Comment	Project Response
	screened out of assessment, however, there are multiple other emissions that have potential to impact habitats such as dust, particulates and ammonia, therefore, sites with potential to be impacted by any changes in air quality should be included in the ES assessment. The exceedance of 1,000 Annual Average Daily Traffic (AADT) does not take into account the vehicle type, speed or cumulative traffic. The ES should use multiple applicable variables (in line with relevant guidance) to inform an assessment of impacts on ecological receptors.	
PINS	The Inspectorate notes that Windsor Great Park is within the 2km buffer from the project boundary, but the designations covering this site have been omitted from the list of sites considered in the assessment. The SAC is also identified within the 2km buffer from the project boundary shown within the HRA Screening Assessment in Appendix N of the Scoping Report. The ES should include these sites in the list of designated sites considered in the assessment, where significant effects are likely to occur.	Great Windsor Park is not within the 2km buffer of the RTS however, it is partially within the extent of the 1 in 100-year flood extent so is within the study area for our PEIR. It has been added to the list of designated sites in Appendix 7.1 and is shown on Figure 5.4. It is considered that any operational effect on Great Windsor Park SAC will be non-significant as described in Table 1.4.

Consultee or Organisation	Summary of Comment	Project Response
PINS	The ES should differentiate between measures required to address significant environmental effects and those proposed to deliver biodiversity net gain. Where biodiversity net gain is relied upon as mitigation, this should be stated in the ES.	These will be clearly distinguished in the ES and supporting Development Consent Order (DCO) documents.
Local Planning Authority (LPA) Project Group	As mentioned in the EIA Scoping Report, the project presents an opportunity to deliver net gains in biodiversity. It is advised that the Applicant differentiates clearly in the ES between design elements/mitigation required to mitigate significant effects to biodiversity receptors, and those required to deliver net gains in biodiversity.	These will be clearly distinguished in the ES and supporting DCO documents.
LPA Project Group	The Future Baseline used to inform the ES should take into account changes brought about through climate change.	This is being considered in our PEIR and ES. The biodiversity baseline text in Chapter 5 of our PEIR has been updated to add climate change to the future baseline and further details on climatic factors are presented within Chapter 9.
LPA Project Group	In reference to Section 7.7 of our EIA Scoping Report: This section suggests that the CIEEM Ecological Impact Assessment (EcIA) methodology will be used alongside the assessment methodology used in the wider ES. If this approach is taken, it	EcIA methods are set out in Section 7.7 of the Scoping Report. The methods are in line with the Guidelines for Ecological Impact Assessment CIEEM (2018) and only one method will be used. When describing the assessed effect, the significance will be determined as significant (major or moderate effects)

Consultee or Organisation	Summary of Comment	Project Response
	is recommended that the assessment presents the conclusions from both, stating whether effects are significant or not significant at the relevant geographical level of importance.	or not significant (minor or negligible effects) so that effects are comparable with the other topics in the ES. The effect will be characterised within the ES and this will include details of what geographic level of importance the effect will be experienced for that receptor.
Environment Agency Sustainable Places	The environmental impact of the long-term maintenance regime for this scheme needs to be scoped in. Section 7.4.2.1 recognises that dredging or other possible management activities to reinstate the design profile of the flood channel have the potential for adverse effects on water quality due to the mobilisation of sediment and pollutants. However, it is unclear what mitigation has been factored in for this.	The EIA Scoping Report paragraph 7.5.2.1 states that operational general maintenance activities would be scoped out of the assessment due to good practice measures (tertiary mitigation) that would be implemented. In paragraph 7.4.2.1 of the EIA Scoping Report it is confirmed that sediment management activities required to reinstate the design profile of the new channels is within the scope of the assessment. Therefore, there will be no change to the assessment of effects in our ES. In our ES the distinction between what is considered general maintenance and what are management measures of the RTS will be set out so it is clear what effects will be assessed in the EcIA.
Environment Agency Sustainable Places	Whilst we understand that the Spelthorne channel is proposed to flow through a significant length of historic landfill, there needs to be justification for the hard engineering as proposed, detailing why other options were ruled out. For example, puddle clay lining instead, setting back the sheet piling, lowering the	Design of in-channel and riparian habitat is ongoing and details will be provided within the project design. Effects from construction on fish are scoped into our EcIA and we are currently developing mitigation (including seasonality of construction activities).

Consultee or Organisation	Summary of Comment	Project Response
	concrete bed to enable a natural channel shape and substrate to be achieved. Any sheet piling that is in the vicinity of the river will need to consider the construction impacts of piling on fish spawning and migration, although we welcome the use of non-percussive methods wherever practical. Timing constraints (both for coarse and salmonid species depending on the location) may be required. There is a risk that the current channel designs (both the proposed 'natural' channel, and sheet piled sections) will provide unfavourable habitat owing to its trapezoidal, uniform shape. This may create a legacy of slow flowing, aggrading channels, with limited opportunities for healthy habitats to develop over time.	
Marine Management Organisation (MMO)	The MMO recommends that the ES chapters such as "biodiversity" are separated into subchapters relating to specific receptor groups, for example a section relating specifically to aquatic fauna.	We have taken this advice on board and there will be sub-sections in our ES as per the sub-sections set out in Section 7.6 of our PEIR.
MMO	The MMO acknowledges the planned biodiversity survey for white clawed crayfish *Austropotamobius pallipes* which are native and protected and agrees with this approach.	Surveys in 2022 found that white clawed crayfish are likely absent from the study area, so there will be no effect on this species from the RTS (GBV, 2022).

Consultee or Organisation	Summary of Comment	Project Response
MMO	The MMO would expect further detailed information on the proposed construction works to be included in the Preliminary Environmental Impact Report (PEIR)/ES, including any in-river piling works and other noise-generating activities. The effects of underwater noise and vibration on sensitive marine receptors (including migratory fish species) should be appropriately considered.	When detailed information on construction is available this will be provided in the ES. It is considered likely that in most cases airborne noise will have a greater impact on human receptors than waterborne noise so will be the focus of the noise and vibration assessment (Chapter 14). An assessment of waterborne noise or vibration on aquatic receptors will be carried out within the biodiversity topic.
Natural England	Consideration for functionally linked land (FLL) impacts in relation to the lakes not designated under the South West London Waterbodies SPA & Ramsar but which are utilised by the same bird populations.	The HRA will consider impacts to functionally linked land (FLL) to the South West London Waterbodies SPA & Ramsar. This is set out in the Habitat Regulations Screening Assessment to Support EIA Scoping and in the Habitat Regulations Hazards Identification and Assessment Scope provided in Appendix 7.7 of the PEIR.
Natural England	Evidence of no potential for (or greatly reduced likelihood of) nutrients entering the designated sites or their FLL (the lakes not in the designation). This is to determine impacts on plant growth or composition in regards to food resources for the Gadwall and Shoveler.	The HRA will consider the potential impacts of increased nutrients entering the South West London Waterbodies SPA & Ramsar sites and their FLL. The assessment proposed will be informed by modelling carried out for WFD assessment and evidence from comparable sites/projects. The Habitat Regulations Hazards Identification and Assessment Scope provided in Appendix 7.7 of this PEIR identifies changes in water quality resulting in habitat change as an operational hazard that will need to be considered.

7.3.2 Other Engagement since EIA Scoping

7.3.2.1 Section 7.2.2 of our EIA Scoping Report summarises the stakeholder engagement relevant to the biodiversity topic that was undertaken prior to submission of the EIA Scoping Report.

7.3.2.2 Since EIA Scoping, we have held regular meetings with Natural England throughout the compilation of our PEIR to provide updates on the RTS and to provide an opportunity for discussion on matters; principally South West London Waterbodies SPA, Ramsar and Site of Special Scientific Interest (SSSI); Biodiversity Net Gain, Invasive Non-Native Species and pathogens and species licensing matters.

7.3.2.3 We have continued to hold briefings with the LPA Project Group, the Marine Management Organisation, National Infrastructure Team (NIT), National Permitting Service and Surrey Wildlife Trust to discuss the PEIR findings, our biodiversity surveys and other biodiversity related matters throughout the DCO process.

7.4 Methodology

7.4.1 Introduction

7.4.1.1 This section should be read in conjunction with Chapter 4 ‘Approach to the Environmental Assessment’ which sets out relevant information on the design parameters and information that have informed our PEIR assessment, and how we have approached various aspects of the assessment including:

- The scope of the assessment;
- The methodology (including the approach to defining the baseline environment, topic study areas, and assessment methodology and criteria);
- The approach to mitigation; and
- The approach to cumulative effects.

7.4.1.2 The assessment methodology used for the biodiversity assessment in our PEIR and to be used in our Environmental Statement (ES) is presented in Section 7.7 of our EIA Scoping Report and Chapter 4 of our PEIR.

7.4.2 Ecological Impact Assessment

7.4.2.1 For the PEIR, we have competed an initial, high level Ecological Impact Assessment (EcIA) to assess the likely significant effects of the project on statutory and non-statutory nature conservation sites, important habitats and legally or notable species of flora and fauna (both aquatic and terrestrial), arising from the construction and operation of the project which forms the basis for this chapter. For the ES, we will expand this into a full EcIA, which will be used to produce the biodiversity chapter of the ES for our EIA.

7.4.2.2 The methodology for the full EcIA which will form the biodiversity chapter of the ES is provided in our EIA Scoping Report and Chapter 4 of our PEIR.

7.4.3 Habitats Regulations Assessment (HRA)

7.4.3.1 We are undertaking an HRA in accordance with Planning Inspectorate (PINS) Advice Note Ten (PINS, 2022b) to assess whether the RTS will have a likely significant effect (LSE) on any European sites, and where there is an LSE to assess whether the RTS will have an Adverse Effect on Integrity (AEoI) on any European sites. The HRA will be completed alongside the ES and will inform our EcIA.

7.4.3.2 ‘European sites’ is the collective term for Special Areas of Conservation (SACs) and SPAs designated under the Habitats Regulations for the protection of certain species and habitats. They form part of a network of protected sites across the UK known as the ‘UK national site network’. It is a matter of UK Government policy that wetlands of international importance designated under the Ramsar Convention (Ramsar sites) are considered in the same way as European sites.

7.4.3.3 We completed an HRA Screening assessment to determine whether the RTS will have an LSE on a European site in support of our EIA Scoping Report and used this to support our consultation with Natural England. The Screening assessment concluded that the RTS will have an LSE on the South West London Waterbodies (SWLW) SPA and Ramsar site.

7.4.3.4 The SWLW SPA and Ramsar sites are spatially identical and are both designated for gadwall *Mareca strepera* over winter and for northern shoveler *Anas clypeata* over winter and when on spring and autumn

migration. Gadwall and shoveler also use other waterbodies within the project boundary for EIA PEIR which support the designated site populations. Those 'supporting' waterbodies have a functional linkage to the SWLW SPA and Ramsar sites and as such need to be considered by the HRA.

7.4.3.5 We will carry out a Statement to inform the Appropriate Assessment to assess whether the RTS will have an AEoI on the SWLW designations. As an initial step in this process, alongside the PEIR, we have identified the hazards associated with the construction and operation of the RTS that could affect the SWLW designations and described these in the Habitats Regulations Hazard Identification and Assessment Scope in Appendix 7.7. A table that identifies which hazards are applicable to each waterbody that will need to be considered in the HRA documentation is presented in Appendix 7.7.

7.4.3.6 Whilst the HRA is a separate standalone process, we will co-ordinate it with the production of the ES.

7.5 Key Environmental Considerations and Opportunities

7.5.1.1 The key considerations with respect to biodiversity are:

- Major development will likely require the delivery of offsite mitigation for biodiversity effects and for delivery of biodiversity net gain. The availability and suitability of land for priority areas for habitat creation, mitigation or enhancement, will be a consideration for developers;
- There are numerous stakeholders within the study area who have biodiversity objectives. These stakeholders and their interests will be a consideration of any major development;
- There is a broad range of protected species and habitats covering a large proportion of the study area. These are sensitive to loss and fragmentation of habitat from land use changes and development:
- The lakes within the study area are stable environments and likely to support a diversity of aquatic life. Influx of water from other waterbodies and other changes to lake processes will affect aquatic species;
- The presence of numerous invasive non-native species (INNS) (and likely aquatic pathogens) within the study area. These are susceptible to further spreading; and

- There is a range of non-designated habitats and species within the study area. These are sensitive to loss and fragmentation of habitat from land use changes and development.

7.5.1.2 The key opportunities with respect to biodiversity are:

- Provision of quality (biodiverse) habitats, contribution to Local nature recovery priorities and the generation of net gain for biodiversity;
- Improvement of connectivity, networks and corridors for biodiversity;
- Enhancement of existing habitats (including low-quality habitats) and provision of new habitats;
- Planting opportunities; native species planting including marginal planting along the water bodies associated with the project;
- Management and removal of INNS; and
- Health and wellbeing benefits to people being able to enjoy nature and have opportunities to interact with local biodiversity as well as other natural capital benefits.

7.6 Primary and Tertiary Mitigation

7.6.1 Primary Mitigation

7.6.1.1 We propose the following primary mitigation in relation to biodiversity effects.

- Apply mitigation hierarchy for habitat and species, for example firstly avoiding negative project activities on biodiversity receptors through design or minimising them e.g. selecting areas of lower ecological value for construction over those with higher ecological value, allowing the more ecologically valuable sites to be available for enhancement – the last step in the mitigation hierarchy and which is additional to those measures to address effects of the project;
- Habitat creation, mitigation or enhancement for other effects on habitats or species to mitigate for a range of potential effects, such as disturbance, severance or loss of existing habitats;
- Provision of fish passes on water level control structures on the flood channel to allow for fish passage and reduce negative effects upon populations;
- The provision and management of an augmented flow along the flood channel when not in operation during flooding to prevent water stagnation in the flood channel (including lakes), provide continued

sediment and nutrient transport, reduce the risk of algal blooms and eutrophication and assist in the movement of fish through the system;

- Enhancement of habitats immediately downstream of three weirs on the River Thames (at Penton Hook, Chertsey and Shepperton). Implementation of these enhancements will be subject to the EIA confirming effects on these habitats from diverting water along the flood channel and will be able to be delivered within the Project Boundary for EIA PEIR;
- Infill of connection between Manor Lake and Fleet Lake to limit nutrient inputs to Manor Lake from the flood channel that may otherwise affect the ecology of Manor Lake;
- Alteration of water level control structure from St Ann's Lake to Abbey Lake to divert floodwater and limit nutrient inputs from the flood channel that may otherwise affect the ecology of St Ann's Lake;
- Avoidance of work within Thorpe Hay Meadow Site SSSI to prevent disturbance to protected unimproved grassland habitat at this site; and
- Undertake ongoing silt monitoring and maintenance of the flood channel to restore the design profile and therefore reduce effects upon hydromorphology and associated effects on aquatic biodiversity.

7.6.2 Tertiary Mitigation

7.6.2.1 We propose the following tertiary mitigation in relation to biodiversity effects.

7.6.2.2 Standard construction practices in relation to ecology, for example, mitigation measures in accordance with CIRIA C762 environmental good practice on site. This is likely to include measures such as (this is not an exhaustive list):

- Fencing off of protected habitats and/or species that are present on site to prevent access and exclude direct construction effects;
- Buffer zones around certain habitats/species to ensure suitable protection zones are observed;
- Appointing an Ecological Clerk of Works (EcCoW) to provide advice and perform compliance checks and watching briefs throughout construction;

- Clearance of site vegetation should be carried out between September and February, where possible, to avoid disruption to nesting birds. If this is not possible, clearance of vegetation could be permitted after the EcCoW confirms that no nesting birds are present. If reptile hibernation habitat is identified, clearance of site vegetation and removal of the habitat will be completed outside of the winter months, where possible; and
- If protected habitats or species are discovered, work to cease and the EcCoW to be contacted to agree next steps.

7.6.2.3 Standard construction practices and management plans in line with legislation and guidance:

- Air Quality standard practice techniques and Air Quality Management Plan (see Chapter 6); this will reduce the quantity of dust and emissions from construction thereby reducing effects on ecological receptors.
- Handling of Soils (see Chapter 16); this will control the amount of silts generated by construction; reducing run-off to aquatic habitats.
- Construction Travel Plan, Operational Travel Plan, Traffic Management Plan and Construction Logistics Plan (see Chapter 17). The management of traffic and travel corridors will limit the emissions generated from vehicles and ensure they are located away from sensitive habitats and species.
- Construction Surface Water Management Plan (see Chapter 18); this will outline the measures necessary to control the movement of surface water across the construction areas reducing the likelihood of contamination (i.e. from fuel oils) or localised flooding onto sensitive habitats.
- Application of the Waste Hierarchy and Waste & Materials Management (see Chapter 13); reducing waste and controlling materials used will lead to less risk of contamination and degradation of ecological receptors.
- Best Practicable Means Noise and Vibration mitigation (see Chapter 14); noise and vibration risk affecting species (i.e. bats) so control of these will reduce the magnitude of effect on those receptors.
- Hydro(geo)logical Risk Assessment (see Chapter 18); this will identify risks to aquatic ecological receptors so that appropriate avoidance or mitigation measures can be identified.

- Site Waste Management Plan (SWMP) (see Chapter 13), including measures for example to avoid placement in sensitive ecological areas where feasible.
- Standard construction practices in relation to waste and materials management: for further details see the tertiary mitigation section of Chapter 13: Materials and Waste. In particular, for the purposes of this PEIR assessment, environmental permits for waste have been relied upon as mitigation in relation to potential spread of contaminants, with the assumption that these are in place and will address any risk of effects to ecological receptors such as protected sites.

7.6.2.4 A Terrestrial INNS Management Plan to limit negative effects upon native habitats and species (note that Aquatic INNS Management will be bespoke to the RTS and is therefore listed as secondary mitigation). Measures within this plan could include (this is not an exhaustive list):

- Eradicate and/or control INNS before commencement of construction;
- Marking out areas of terrestrial INNS with a buffer to avoid access and spread;
- Strict biosecurity measures for all contractors (e.g. Check-Clean-Dry procedure), equipment and PPE to avoid spread of INNS and pathogens (both terrestrial and aquatic); and
- Periodic monitoring for spread of INNS and implementation of ongoing treatment to avoid colonisation or spread.

7.6.2.5 Artificial lighting to be restricted and positioned to control light spill onto ecological receptors (see Chapter 12).

7.7 Preliminary Assessment of Likely Significant Effects

7.7.1 Introduction

7.7.1.1 Our PEIR adopts a precautionary approach. Assessments reported within this chapter are a preliminary assessment of potential likely significant environmental effects based on the design parameters set out in Chapter 2. This precautionary approach has been taken for our PEIR as there is some information on the project that is currently incomplete and the parameters within Chapter 2 are high level and account for a range of

uses and allowance for design development within a boundary that could possibly be refined once this work has been completed. For example, some designs, construction and mitigation details (and therefore also land requirements) or baseline information is still required from further surveys, assessments and/or consultation feedback.

7.7.1.2 In making a determination of likely significant effects, we have considered the sensitivity of receptors (a receptor being a feature of the environment that responds to change) and the potential magnitude (i.e. size) of change caused by the RTS. The methodology for defining sensitivity and magnitude varies by topic and is defined in the topic sections of our Scoping Report.

7.7.1.3 We are committed to including mitigation measures as necessary to address likely significant negative environmental effects as far as reasonably practicable. Both primary and tertiary mitigation are considered to form part of the RTS; those applicable to this topic are set out in Section 7.6. Several of these mitigation measures are still being developed, and therefore as a precaution, the preliminary assessment of effects for our PEIR does not assume full achievement of these in considering if a project effect is likely to be significant (Appendix 4.2 identifies the implementation status of primary and tertiary mitigation for the PEIR assessment). Furthermore, the potential likely significant effects reported within our PEIR have been assessed prior to the implementation of secondary mitigation measures, those applicable to this topic are set out in Section 7.7.2. These secondary mitigation measures are the subject of further development; and given they are still being developed, are not able to be applied to develop a ‘residual’ effects assessment.

7.7.1.4 Our PEIR is based on the latest design and construction parameters and baseline information. As such the findings of the preliminary environmental appraisal presented within our PEIR will be subject to change as the design progresses, as mitigation is further developed or information from further studies becomes available, such as ongoing species surveys to identify species present and their distribution across the site and what mitigation will be appropriate to mitigate loss and fragmentation of habitats. The final assessment of effects undertaken as part of our EIA and reported within the ES will be based on the latest information available at that time.

7.7.2 Potential Likely Significant Effects

Construction

7.7.2.1 Our preliminary assessment of likely significant environmental effects has identified the potential for the following significant effects from construction in relation to biodiversity:

Designated Nature Conservation Sites

7.7.2.2 A summary of statutory and non-statutory designated sites for nature conservation is provided in Appendix 7.1.

7.7.2.3 Temporary and/or permanent negative effects on the South West London Waterbodies SPA and Ramsar site resulting from:

- the creation of flow control structures, priority areas for habitat creation, mitigation or enhancement, and areas of enhanced public connection potentially causing the spread of INNS and a reduction in water quality from sediment mobilisation. This would affect the habitat quality of qualifying species.
- the loss and fragmentation of habitat, noise, vibration and changes in air quality causing displacement of species resulting from construction activities.
- nutrient deposition from road traffic due to construction.

7.7.2.4 Temporary negative effects to the terrestrial and aquatic habitats and/or species associated with Wraysbury Reservoir SSSI (part of SWLW SPA and Ramsar site) resulting from noise, vibration, lighting and changes in air quality from construction traffic as a result of the creation of priority areas for habitat creation, mitigation or enhancement adjacent to the site.

7.7.2.5 Temporary and/or permanent negative effects to habitats and/or species of Thorpe Park No. 1 Gravel Pit SSSI (part of SWLW SPA and Ramsar) resulting from habitat loss, INNS spread and changes in water quality as a result of creation of the Runnymede Channel and flow control structures. Potential temporary negative effects to the SSSI habitats and species from changes in air quality, noise, vibration, and lighting from construction activities. Potential temporary negative effects of nutrient deposition from construction road traffic.

7.7.2.6 Temporary negative effects to Thorpe Hay Meadow SSSI and Dumsey Meadows SSSI habitats and/or species resulting from disturbance or displacement from noise, vibration, lighting, increased nutrient deposition and changes in air quality resulting from construction activities. These effects are likely to result from the construction activities needed to create the green open spaces and the Runnymede Channel which are adjacent to Thorpe Hay Meadow SSSI and from the construction access route around Dumsey Meadow SSSI.

7.7.2.7 Temporary negative effects to Wraysbury & Hythe End Gravel Pits SSSI (part of SWLW SPA and Ramsar site) habitats and/or species from disturbance or displacement from noise, vibration, lighting and changes in air quality from construction activities from areas of habitat creation, enhancement or mitigation.

7.7.2.8 Temporary negative effects to Bushy Park and Home Park SSSIs habitats and species resulting from the works at Moseley Weir potentially causing changes in air quality from construction activities.

7.7.2.9 Temporary negative effects to Ham Lands LNR habitats and/or species as a result of compounds and construction works at Teddington Weir through habitat loss, spread of INNS, lighting, noise and vibration, and changes in air quality from construction activities.

Non-Statutory Designated Nature Conservation Sites

7.7.2.10 Temporary and/or permanent negative effects to the River Thames (and towpath) – Spelthorne Local Wildlife Site (LWS) and the River Thames and the Tidal Tributaries LWS resulting from creation of the new channels, the fish passes at Beasley's Ait and Chertsey weirs, and fish passes and capacity improvement works at the Sunbury, Molesey and Teddington weirs, and bed lowering downstream of Desborough Cut.

7.7.2.11 Potential permanent and/or temporary negative effects are likely on habitats and/or species of the above LWSs as a result of vegetation clearance, the spread of INNS and changes in water quality, hydromorphology, and flow regime/sediment processes within the LWSs. Potential temporary negative effects from noise and vibration and changes in air quality are also likely to occur to LWS habitats and species as a result of the construction activities.

7.7.2.12 Temporary and/or permanent negative effects to Ham Lands LWS habitats and/or species as a result of compounds and construction works at Teddington Weir through spread of INNS, lighting, noise and vibration and air quality changes from construction activities for the weir.

7.7.2.13 Temporary and/or permanent negative effects to the following Sites of Nature Conservation Interest (SNCI) (which are supporting waterbodies to SWLW SPA and Ramsar) as a result of construction of the Runnymede Channel, flow control structures, creation of blue and green open spaces, and areas for enhanced public connection, resulting in vegetation clearance, spread of INNS, changes in water quality, hydromorphology, residence time or sediment processes. Also, potential temporary negative effects to SNCI habitats and species resulting from lighting, noise and vibration, changes in air quality from increased traffic movements and nutrient deposition from road traffic resulting from compounds and materials storage sites:

- Abbey Lake Complex;
- Chertsey Bourne at Abbey Lake Complex;
- Ferris Meadows;
- Littleton Lake;
- Sheepwalk Lake;
- Shepperton Quarry; and
- Wraysbury Reservoir.

7.7.2.14 The Spelthorne Channel that will run through the corner of the Charlton Quarry SNCI and creation of green open spaces and areas of enhanced public connection could result in temporary and/or permanent negative effects to the habitats and/or species from flow changes, sediment distribution, change in flooding regime, water quality changes and INNS/pathogen spread, habitat loss and direct injury/death of species.

7.7.2.15 Temporary negative effects to the Charlton Quarry SNCI habitats and species from construction, compounds and materials processing sites, including disturbance and displacement resulting from noise, vibration, lighting, changes in air quality and nutrient deposition from construction road traffic.

7.7.2.16 Temporary and/or permanent negative effects on the habitats and/or species of Desborough Island SNCI and Laleham Burway Golf Course

SNCI due to creation of priority areas for habitat creation, mitigation or enhancement, areas of enhanced public connection, new landforms and, at Desborough Island SNCI, new pedestrian/cycle bridges crossing the River Thames at Chertsey and Desborough potentially resulting in habitat loss, and severance and fragmentation of habitats. Temporary negative likely effects include disturbance and displacement of SNCI species resulting from noise, vibration, lighting and changes in air quality from those construction activities. In addition, there is potential temporary negative effect to Laleham Burway Golf Course SNCI from nutrient deposition from road traffic due to construction.

7.7.2.17 Temporary and/or permanent negative effects from all project components to the River Thames – Runnymede SNCI and the construction of Molesey and Sunbury weirs and bed lowering to the River Thames – Elmbridge SNCI potentially causing spread of INNS, changes in water quality, hydromorphology, flow regime or sediment processes, disturbance to riverbed/banks and damage to/loss of riparian habitats. Potential temporary negative effects to SNCI habitats and species are likely to result from noise, vibration, lighting, and changes in air quality from those construction activities.

Notable Habitats

7.7.2.18 Notable habitats locations are provided in the Preliminary Ecological Appraisal (PEA) provided in Appendix 7.2. The PEA covers the areas within the project boundary for EIA PEIR.

7.7.2.19 Temporary and/or permanent negative effects from construction to lakes and watercourses (including Mead Lake Ditch) are likely as a result of all project components including dewatering, potentially causing INNS spread, changes to water quality, hydromorphology, flow regime or sediment processes, and damage to/loss of riparian habitats including sections of the River Thames bypassed by the RTS.

7.7.2.20 Temporary and/or permanent negative effects on open mosaic habitat on previously developed land, hedgerows, ponds and reedbeds as a result of all project components due to the vegetation clearance, habitat severance/fragmentation/loss, changes in water quality and INNS spread.

7.7.2.21 Temporary and/or permanent negative effects on woodlands, trees and neutral grassland habitat as a result of all project components including

required vegetation clearance, leading to habitat severance/fragmentation/loss.

Protected and Notable Species

7.7.2.22 Protected and notable species surveys have taken place since our EIA Scoping Report, the results of which are provided in the following appendices: Appendix 7.3: Terrestrial and Aquatics Invasive and Non-Native Species (INNS) Report; Appendix 7.4: Great Crested Newt Survey Report 2023; Appendix 7.5: Macrophyte and Macroinvertebrate 2021 and 2022 Surveys Report; Appendix 7.6: Non-breeding Bird Survey Baseline Report 2022/23 and Appendix 7.8: Reptile Survey Report.

7.7.2.23 Temporary and/or permanent negative effects as a result of all project components to the following species, including direct injury/death, loss of roosts and abandonment of young, reduction in availability of suitable sheltering, foraging or commuting habitat, and habitat severance/fragmentation. Potential temporary negative effects from construction include disturbance and displacement due to noise, vibration, lighting, and the movement of vessels:

- Otter *Lutra lutra*;
- Bats;
- Badger *Meles meles*;
- Schedule 1 birds;
- Non-Schedule 1 birds;
- Amphibians;
- Invertebrates (aquatic and terrestrial species);
- Reptiles (grass snake *Natrix helvetica*, slow worm *Anguis fragilis* and common lizard *Zootoca vivipara*);
- Water vole *Arvicola amphibius* (if found to be present); and
- Notable plant species.

7.7.2.24 Temporary and/or permanent negative effects on fish and eel *Anguilla anguilla,* as a result of bed lowering downstream of Desborough cut, the construction of flow control structures and fish passes at Sunbury, Teddington, Beasley Ait, Molesey and Chertsey weirs, the creation of blue open space, bridges, temporary wharfs and pedestrian/cycle bridges. Potential likely significant effects identified result from disturbance (e.g. disruption of spawning/migration), injury/death from pathogen exposure

and treatment, spread/treatment of INNS, impingement and entrainment, changes in water quality, hydromorphology, flow regime, sediment and habitat damage/severance/loss. Temporary negative effects from construction are likely from noise, vibration, lighting and movement of vessels.

Operation

7.7.2.25 Our preliminary assessment of likely significant environmental effects has identified the potential for the following significant effects from operation in relation to biodiversity:

Statutory Designated Nature Conservation Sites

7.7.2.26 Providing enhanced public connection along the embankment that borders St Ann's Lake could result in increased permanent sensory disturbance and displacement to the qualifying bird species of the South West London Waterbodies SPA and Ramsar Site (excluding supporting sites) and therefore have a negative effect. The habitats and species of the SPA and Ramsar Site may also be negatively affected by nutrient deposition from increased road traffic travelling to the new green open spaces.

7.7.2.27 Potential permanent negative effects to Thorpe Park No.1 Gravel Pit SSSI (part of SWLW SPA and Ramsar site) from disturbance to sites and species due to increased public access. There are potential permanent positive effects of reduced flood risk to the nearby contaminated sites which could benefit the SSSI through reduced exposure to contaminants. The habitats and species of the SSSI may also be negatively affected by nutrient deposition from road traffic due to the enhanced public connection.

7.7.2.28 At Thorpe Hay Meadow SSSI, nutrient deposition from road traffic due to the operational project components of the RTS may lead to potential negative effects on the SSSI. The RTS is expected to lower groundwater levels at Thorpe Hay Meadow SSSI, this has the potential to improve drainage in spring and reduce the incidence of flooding from the Mead Lake Ditch and the River Thames but it also has the potential for permanent loss in groundwater supply to the SSSI. There is also the potential for a permanent positive effects on the SSSI from the reduced flood risk to nearby contaminated sites which could benefit the SSSI

through reduced exposure to contaminants. While the biggest effect on the site's condition is currently thought to be management, all potential significant effects will be assessed in the EcIA.

7.7.2.29 Change in frequency, groundwater levels and the depth of flooding from the operation of RTS could lead to permanent changes in habitat quality of Dumsey Meadow SSSI, Staines Moor SSSI, Wraysbury & Hythe End Gravel Pits SSSI (part of SWLW SPA and Ramsar site), and Langham Pond SSSI. There is potential for permanent positive effects of reduced flood risk to contaminated sites, which could benefit the SSSIs through reduced exposure to contaminants. Potential permanent effects could result from increased nutrient deposition from road traffic due to operational project components.

Non-Statutory Designated Nature Conservation Sites

7.7.2.30 Potential permanent negative effects on Ferris Meadows SNCI, Littleton Lake SNCI, Sheepwalk Lake SNCI and Shepperton Quarry SNCI (supporting waterbodies to SWLW SPA and Ramsar site) from the operation of the Spelthorne Channel, which will run through these SNCIs, including flow changes, sediment distribution, the spread of INNS/pathogens, disturbance and water quality changes. There will be a permanent positive effect from the design due to habitat enhancement, for example through provision of marginal habitat.

7.7.2.31 Potential negative permanent effects on the above SNCIs plus Wraysbury Reservoir SNCI, Abbey Lake SNCI, Chertsey Bourne SNCI, Laleham Burway Golf Course SNCI and Charlton Quarry SNCI could result from increased nutrient deposition from increased vehicle movements to operational project components, in particular to the new green open spaces.

7.7.2.32 Permanent positive effects from net gain in biodiversity via provision of enhanced or new habitats at Wraysbury Reservoir SNCI (part of SWLW SPA and Ramsar site). Permanent negative effects from changes in flooding patterns altering the habitats present. Negative permanent effects could result from increased nutrient deposition from increased vehicle movements in operation.

7.7.2.33 Permanent negative effects from the Runnymede Channel running through Abbey Lake Complex SNCI and Chertsey Bourne at Abbey Lake

Complex SNCI, which are supporting waterbodies to SWLW SPA and Ramsar site. These could include flow changes, sediment distribution, the spread of INNS/pathogens, increased disturbance and water quality changes. Negative permanent effects could result from increased nutrient deposition from increased vehicle movements in operation. There will be a permanent positive effect from the design due to habitat enhancement, for example through provision of marginal habitat.

7.7.2.34 Permanent negative effects Penton Hook Island SNCI, Chertsey Water Works Well Field SNCI and Ham Lands LWS could result from changes in the extent of flooding once the project is in operation. Potential permanent effects will result from increased nutrient deposition from road traffic due to operational project components.

7.7.2.35 Permanent negative effects on Laleham Burway Golf Course SNCI, Charlton Quarry SNCI and Desborough Island SNCI could occur from changes in flooding patterns altering the habitats which are present, increased disturbance to habitats through increased public access and nutrient deposition from road traffic due to the provision of operational project components. There would be permanent positive effects from habitat creation and enhancement to achieve biodiversity net gain.

7.7.2.36 Permanent negative effects from all project components leading to changes in flooding patterns altering the habitats present in 43 SNCIs, 35 LWSs and six LNRs that are outside our PEIR Boundary, but within the study area. These are shown in Figure 5.4.

Notable Habitats

7.7.2.37 Permanent negative effects on lakes (some part of/supporting SWLW SPA and Ramsar site) and watercourses from the operation of the new channels and flow control structures and blue open space potentially resulting in changes to the flow, nutrient levels and hydromorphology, residence times and INNS/pathogen spread due to flow and navigation in flood channel. Permanent positive effects from improvements to lake and watercourse habitats from reprofiling and from the habitat creation, mitigation or enhancement within the design.

7.7.2.38 Permanent positive effects on hedgerows, woodland, neutral grassland, ponds and reedbeds; due to habitat creation and enhancement to achieve biodiversity net gain proposed.

Protected and Notable Species

7.7.2.39 Permanent positive effects on otter, badger, bats, reptiles, amphibians, invertebrates (terrestrial and aquatic), water vole (if present), notable plant species and trees (including veteran trees) from habitat creation, mitigation or enhancement within the design.

7.7.2.40 Temporary and/or permanent negative effects on Schedule 1 and non-Schedule 1 bird habitats from all project components due to changes in the frequency and depth of floods to supporting habitats, and potential effects resulting from changing lake levels on habitats. It is noted that species present are likely to be able to respond to fluctuations, which will be further considered in the EcIA. There is potential for permanent positive effects from habitat improvements for these species through improvements to supporting habitat.

7.7.2.41 Permanent negative effects on fish and eel could result from the operation of the new channel and associated infrastructure (including capacity improvements proposed on the downstream weirs: Molesey, Sunbury and Teddington). Effects could result from water quality and flow changes; habitat damage/disturbance and the downstream displacement of species from operational activities; fish mortality within the flood channel and higher levels of predation; diversions/delays/prevention to fish passage; changes in sediment processes within the existing lakes and the River Thames (including the potential for habitat changes in the sections of the River Thames between the intakes and outtakes of the new channels i.e. the depleted reach); the spread/escape of INNS/pathogens and changes in floodplain connectivity. Permanent positive effects on fish and eel from improved fish passage due to installation of fish passes and habitat creation.

7.7.2.42 Further details of the potential likely significant effects from construction and operation with respect to receptors, project components and project activities, in relation to biodiversity can be found in Table 1 and 2 in Appendix 7.9.

7.7.3 Potential Likely Non-Significant Effects

7.7.3.1 Further details of the effects from construction and operation that are considered to be non-significant, in relation to biodiversity can be found in Table 3 and 4 in Appendix 7.9. Effects that are considered unlikely to be

significant have been identified based on the likely magnitude of the resulting change and the sensitivity of the receptor.

7.7.3.2 Some examples of biodiversity non-significant effects include (this is not an exhaustive list):

- For the receptor 'other terrestrial habitats', the effect from changing terrestrial to aquatic habitats is not considered a significant effect as these are not Habitats of Principal Importance so have a low sensitivity to change.
- Potential permanent positive effects on 'other terrestrial habitats' due to habitat enhancement and net gain in biodiversity proposed within the design of the project. This is not likely to be significant as these habitats are not Habitats of Principal Importance so have a low sensitivity to change.

7.7.4 In-Combination Climate Impact

7.7.4.1 Consideration of 'In-Combination Climate Impact' (ICCI) has been undertaken. The preliminary environmental assessment has considered a future climate scenario and has identified certain potential likely significant environmental effects for this topic which will be exacerbated further by predicted climate change. Further consideration of ICCI will be included in the ES.

7.7.5 Secondary Mitigation

7.7.5.1 In order to reduce the likely significance of effects, the following secondary mitigation is under consideration:

Aquatic INNS Management Plan

7.7.5.2 Measures to reduce negative effects on native aquatic habitats and species could include (this is not an exhaustive list):

- Eradicate and/or control INNS before commencement of construction;
- Strict biosecurity measures for all contractors (e.g., Check-Clean-Dry procedure), equipment and PPE to avoid or limit the spread of INNS and pathogens (both terrestrial and aquatic); and

- Periodic monitoring for spread of INNS and implementation of ongoing treatment to avoid colonisation or spread.

Aquatic Pathogen Management Plan

7.7.5.3 Measures to reduce negative effects on aquatic species could include (this is not an exhaustive list):

- Strict biosecurity measures for all contractors and equipment (e.g. Check-Clean-Dry procedure) to avoid or limit the spread of INNS and pathogens both terrestrial and aquatic; and
- Periodic monitoring for spread of pathogens (via health checks of fish) and implementation of ongoing treatment to avoid colonisation or spread.

SPA / Ramsar mitigation

7.7.5.4 Precise mitigation to reduce negative effects on gadwall and shoveler will be determined by the HRA but might include measures such as seasonal restrictions; buffers; habitat enhancement; construction noise barriers/screens; timed sheet piling; restricted lighting; avoidance of direct impacts.

Investigate Use of Alternative Piling Methods that Reduce Noise and Vibration Where Practicable

7.7.5.5 Further Noise Assessment will identify whether alternative piling methods should be investigated to reduce species disturbance. If considered necessary and practicable, they will form part of the construction design (embedded mitigation). Alternative piling methods could include consideration of:

- Hydraulic jack piling;
- Rotary piling; and
- Hydraulic push piling.

Bat Mitigation

7.7.5.6 Protected Species Licences are likely to be required, and a mitigation method statement will be produced for bats. Measures that are likely to be required to reduce negative effects to bat species could include: restricted

artificial light; piling methods with minimal vibration and noise; timing of works outside key periods; habitat creation/enhancement; compensatory new roosts.

Bird Mitigation

7.7.5.7 We will prepare a mitigation method statement for birds. Measures to reduce negative effects could include: restrictions within buffers; timing of works outside of key periods; pre-construction checks; piling methods with minimal vibration/noise; noise barriers/screens; bird nest boxes; habitat creation/enhancement.

Otter Mitigation

7.7.5.8 Protected Species Licences are likely to be required, and a mitigation method statement will be produced for otters. Measures that may be required to reduce negative effects could include: artificial holts; restricted artificial light; woodland and dense scrub planting; new road underpasses and dry pipes where access through culverts is severed.

Badger Mitigation

7.7.5.9 Protected Species Licences are likely to be required, and a mitigation method statement will be produced for badgers. Measures that may be required to reduce negative effects could include: timing of sett closures to avoid the breeding season; restricted artificial light; installation of road underpasses and dry pipes to provide alternative means of dispersal.

Reptile Mitigation

7.7.5.10 We will prepare a mitigation method statement for reptiles. Measures to reduce negative effects could include: compensatory habitat creation (e.g. compost heaps close to water) for grass snakes; enhancement of existing terrestrial habitats; timed vegetation clearance to avoid peak breeding season in accordance with sensitive clearance methods.

Invertebrate Mitigation

7.7.5.11 We will prepare a mitigation method statement for invertebrates. Measures to reduce negative effects could include: planting blackthorn scrub/habitat enhancement for hairstreak butterfly *Thecla* sp.; sparsely

vegetated mound avoidance/creation for other terrestrial invertebrates; design of a range of flows for aquatic invertebrates.

Amphibian Mitigation

7.7.5.12 We will prepare a mitigation method statement for amphibians. Mitigation measures to reduce negative effects could include: habitat creation/enhancement; sensitive timing of construction activities; appropriate use of artificial lighting and potentially amphibian exclusion and translocation techniques.

Water Vole Mitigation

7.7.5.13 Protected Species Licences may be required if water voles are found, and a mitigation method statement will be produced for water voles. Measures that may be required to reduce negative effects could include: habitat creation/enhancement; sensitive timing of construction activities including lighting; and potentially displacement or exclusion and translocation techniques.

Fish and Eel Mitigation

7.7.5.14 We will prepare a mitigation method statement for fish and eel. Mitigation measures to reduce negative effects could include: habitat creation/enhancement; construction methods with minimal vibration and noise used wherever practical (piling method statement); seasonal restrictions for migratory periods; fish rescues; appropriate use of artificial lighting.

7.8 Further Work for the EIA

7.8.1.1 We will undertake a detailed EcIA covering the effects from construction and operation of the project in accordance with the methodology set out in Section 7.4 above, to inform the ES.

7.8.1.2 Our assessment will be based on the effects scoped in the assessment as described in Section 7.7.

7.8.1.3 The following additional species-specific surveys are to be completed and/or are due to be reported. The outcomes of these surveys (alongside the surveys done to date) will inform the baseline data collection for the EcIA:

- National Vegetation Classification surveys of habitats identified in the UK Habitats Classification survey as requiring more detailed classification are ongoing. The locations of the surveys are provided in the PEA (Appendix 7.2).
- Hedgerow surveys of all priority hedgerows recorded within the PEA are ongoing.
- Tree surveys are proposed for the RTS to support the DCO application, these will provide the baseline for any veteran trees likely to be affected by RTS.
- Bat surveys of suspected roost sites, and further assessment of all buildings to be potentially demolished (e.g. at Sheepwalk) for their suitability for bat roosting and surveys to identify key foraging and commuting sites. These surveys are proposed to supplement previous survey work in 2017 (BL Ecology, 2019), 2021 (BL Ecology; 2022) and 2022.
- Invertebrate surveys for stag beetle *Lucanus cervus* and any other notable species within areas of suitable habitat as identified in the PEA (Appendix 7.2) and previous surveys.
- Breeding bird surveys covering the period March to June have been completed, passage birds covering July – October 2023 inclusive are ongoing. These surveys are proposed to supplement previous surveys undertaken in 2021 (AECOM, 2021; APEM, 2021) and 2022 (AECOM, 2022).
- Non-breeding birds/wintering birds survey covering the period October 2023 to March 2024 inclusive. These surveys will supplement the surveys completed from October 2022 to March 2023 inclusive (Appendix 7.6) and data from previous surveys.
- Fish surveys of watercourses and lakes where data is required to understand the nature of effects from RTS is ongoing.
- Further macrophyte surveys will be taken within the lakes where boat access was not available in 2022; as per the recommendations in the Macrophyte and Macroinvertebrate Survey Report 2023 (Appendix 7.5).
- Monitoring for badgers and otter are being considered as part of ongoing surveillance works for these species where suitable habitats have been identified.

7.8.1.4 We will review the HRA Screening assessment following consultation on our PEIR. The final HRA Screening assessment and the Statement to

inform Appropriate Assessment will be reported in the information to be provided to the Competent Authority for the purposes of informing their Appropriate Assessment' with submission of the DCO application for the project.

7.8.1.5 We will undertake further assessments to characterise effects on biodiversity from project noise and vibration, lighting, air quality, increased nutrient deposition, contamination, water quality, hydromorphology, flows/residence times and flooding.

7.8.1.6 The ES will state the predicted significance of effects, provide further detail of relevant mitigation, and document the subsequent residual effects. We consider that the further development of the project design and mitigation measures which will be reflected in the ES and DCO application, will enable a reduction in the scale of identified negative likely significant effects set out in this chapter.

8 Climatic Factors

8.1 Introduction

8.1.1.1 This chapter of our Preliminary Environmental Information Report (PEIR) considers the effects from construction and operation of the River Thames Scheme (RTS) ('the project') in relation to climatic factors. Within this chapter we have included topic specific sections on:

- Legislation, policy and guidance (noting any changes since Environmental Impact Assessment (EIA) scoping);
- Engagement with consultees, including responses to comments received on the RTS EIA Scoping Report;
- The assessment methodology for this topic (again noting any changes or updates since EIA scoping);
- Key environmental considerations and opportunities,
- Primary and tertiary mitigation;
- Our preliminary assessment of effects;
- Secondary mitigation; and
- Future work for this topic of our EIA.

8.1.1.2 For a summary of the key baseline elements associated with climatic factors see Section 5.4.

8.1.1.3 The study area for both climate change mitigation and climate change resilience and adaptation will be as described in Section 8.2.3 of our RTS EIA Scoping Report (Environment Agency & Surrey County Council, October 2022) ('our EIA Scoping Report'). Some minor amendments have been made to account for updates to the PEIR design parameters and project boundary for our EIA PEIR, however the criteria used to determine the study area has remained the same. The updates are described in Section 2.4 of Chapter 2: Project Description.

8.1.1.4 For both the climate change mitigation assessment and the climate change resilience assessment, the study area comprises the area within the project boundary for our EIA PEIR, plus a 500m buffer, or if greater, the area of the 1 in 100 year floodplain (i.e. the area with a one per cent chance of flooding in any given year) that will experience a change in flood extent as a result of the project. The climate mitigation assessment

study area is the same as the climate change resilience assessment study area due to the requirement to include the construction and likely operational traffic routes and buildings with the potential to flood under a 1 in 100 year flood event (see Figure 5.5).

8.1.1.5 Aspects of this chapter have overlaps with other chapters of our PEIR, including Chapter 7: Biodiversity, Chapter 10: Flood Risk, Chapter 11: Health, Chapter 13: Materials and Waste, Chapter 15: Socio-Economics and Chapter 18: Water Environment.

8.1.1.6 The assessment will consider the likely significant effects of the project upon climate change, including against greenhouse gas emissions contextualised against science-based targets, and the resilience of the project to climate change effects. For the purpose of this assessment, the term 'climate change mitigation' refers to the likely significant effects arising from the project on climate (greenhouse gas (GHG) emissions), whereas 'climate change adaptation' refers to the risk and likely significant effects from projected future climate change on the project. Climate change mitigation and climate change adaptation will be considered separately for assessment purposes, as they affect vastly different spatial scales and follow distinct methodologies.

8.1.1.7 This chapter therefore includes subheadings to cover:

- Climate change mitigation (identification, management and minimisation of GHG emissions associated with construction and operation of the project); and
- Climate change resilience and adaptation (CCR) (climate change risk assessment) during the construction and operation of the project from future climate change and potential In-Combination Climate Impacts (ICCI) with other EIA topics).

8.2 Legislation, Policy and Guidance

8.2.1.1 A summary of key legislation, policy and guidance relevant to climatic factors is provided in Appendix M of the EIA Scoping Report. Since the publication of our EIA Scoping Report in October 2022, the National Policy Statement for Water Resources Infrastructure (NPS) has been updated and finalised (Defra, 2023). No notable changes to the NPS from the draft NPS (published in 2018) have been identified as relevant to this chapter. However, since October 2022, the following new guidance has

been introduced. The standard has an expanded scope, a new emphasis on whole life carbon, and a stronger alignment with the transition to a net zero carbon economy by 2050.

PAS 2080: 2023 (Carbon Management in Buildings and Infrastructure) (to replace PAS 2080:2016) – launched in April 2023

8.2.1.2 The guidance states that:

It was identified that infrastructure is responsible for over 50% of the UK's carbon emissions, therefore PAS 2080 was designed to specifically address the management of carbon in infrastructure.

It looks at the whole life cycle of the carbon used on projects and promotes reduced carbon, reduced cost infrastructure delivery and a culture of challenge in the infrastructure value chain where innovation can be fostered.

Environmental Improvement Plan: 2023 (First Revision of the 25 Year Environment Plan)

8.2.1.3 The plan states it will:

- *Update on progress and plans to reach net zero;*
- *Publish a Land Use Framework in 2023, setting out how the balance between multiple demands on land including climate mitigation and adaptation will be achieved;*
- *Publish the third National Adaptation Programme (NAP3) in 2023 that will set out the five year strategy to build the UK's climate resilience; and*
- *Continue the role as a global leader in tackling climate change, biodiversity loss and land degradation and push for an integrated approach to international action.*

Climate change is also exacerbating natural hazards and the risk they pose to our health, the environment, and to our economy – hence the goal of a reduced risk of harm from environmental hazards. It will:

- *Deliver an investment plan to improve coastal and flood defences, including £100 million on the most frequently flooded areas.*

8.3 Engagement

8.3.1 Responses to EIA Scoping

8.3.1.1 Table 8-1 below summarises the comments and responses received on our Scoping Report following formal submission to the Planning Inspectorate (PINS) including the PINS EIA Scoping Opinion (dated 15 November 2022) ('the PINS Scoping Opinion') and any key comments received from statutory consultees. Full consultee comments on our EIA Scoping Report and our responses to these comments are provided in Appendix 4.1.

Table 8-1: Responses to comments received on the EIA Scoping Report

Consultee or Organisation	Summary of comment	Project Response
PINS	The EIA Scoping Report proposes to scope out impacts from general maintenance, which are described in EIA Scoping Report Section 4.3.2 and across multiple chapters. However, the long-term maintenance activities required to ensure that the design profile is maintained are not described and the Inspectorate considers that this could include activities such as dredging or structural work which have potential to give rise to significant pollution and hydromorphological effects. In the absence of further details regarding the extent and nature of such effects, the Inspectorate does not consider that this matter may be scoped out. The ES should explain the likely maintenance activities and provide an outline of the operational maintenance plan, demonstrating how this would mitigate any likely significant effects.	Maintenance of the channel to restore the design profile was originally scoped into the Biodiversity and Water Environment topics, and has now also been scoped into the Climatic Factors, Flood Risk, Health, Landscape and Visual, and Materials and Waste topics as per the PINS scoping response. The ES and supporting Application material will clearly set out our approach to the maintenance regime(s) to be put in place, however, effects from general maintenance activities remain scoped out of the EIA.
PINS	The EIA Scoping Report explains that effects such as construction of compounds, vehicle use for	We will expand our assessment to include construction activities in the climate change mitigation

Consultee or Organisation	Summary of comment	Project Response
	embankment construction, processing materials, transportation of hazardous materials/waste to licensed sites will be managed through the CEMP and licenses, and that an assessment should be scoped out on this basis. It is unclear why such activities should be excluded from the carbon footprint assessment. The ES should quantify the emissions from activities and compare them against appropriate thresholds to demonstrate whether significant effects are likely to occur.	assessment. This is reported in our PEIR and will be reported in the ES.
PINS	The EIA Scoping Report paragraph 8.7.2.1 states it is not anticipated there will be impacts during construction due to the associated short relative timescales. Whilst the Inspectorate acknowledges that the timescales are short, the nature of the Proposed Development means that it is likely to be readily influenced by climate related effects e.g. increased drought or flood frequency. The Inspectorate considers that the ES should address this risk and identify relevant mitigation where significant effects are likely. The Inspectorate notes that Appendix D does not address the risk of major flooding events, when referencing Chapter 8 Climate Change. The ES should set out the necessary mitigation required to address a significant flooding event during construction where significant effects are likely.	We will expand our assessment to include the climate change risks, resilience and adaptation for the construction phase of the project. Major flooding events will also be included within the Climatic Factors assessment. This is reported in our PEIR and will be reported in the ES.
Local Planning Authority	It is not clear what has been scoped out for construction phase GHG effects. Some movement of plant and	All effects from construction (including movement of plant and materials) will be scoped in

Consultee or Organisation	Summary of comment	Project Response
(LPA) Project Group	materials appears to be scoped out with little evidence as to why. Further justification should be provided.	to the climate change mitigation and climate change resilience and adaptation assessments.
LPA Project Group	It is not clear if the construction stage is being scoped out of further assessment in the Climate Change Adaptation assessment. It is not scoped out in Section 8.5, however there a several references to “not envisioning climate will have any effect on the project during the construction phase”. No justification is given to support this statement. If the construction stage is being proposed to be scoped out, further justification is required given that there is an abundance of evidence that climate change is having impacts already and the construction period will go into the next decade.	All effects from construction (including movement of plant and materials) will be scoped in to the climate change mitigation and climate change resilience and adaptation assessments, although it is noted that climate effects in comparison to the baseline will not greatly differ. This is reported in our PEIR and will be reported in the ES.

8.3.2 Other Engagement since EIA Scoping

8.3.2.1 Section 8.2.2 of our EIA Scoping Report summarises the stakeholder engagement relevant to the Climatic Factors topic that was undertaken prior to submission of the EIA Scoping Report.

8.3.2.2 No further engagement with statutory consultees in relation to this topic has been undertaken in the preparation of our PEIR assessment. Further engagement with statutory consultees will take place, as required, to inform the ES.

8.4 Methodology

8.4.1 Introduction

8.4.1.1 This section should be read in conjunction with Chapter 4 ‘Approach to the Environmental Assessment’ which sets out relevant information on the design parameters and information that have informed our PEIR

assessment, and how we have approached various aspects of the assessment including:

- The scope of the assessment;
- The methodology (including the approach to defining the baseline environment, topic study areas, and assessment methodology and criteria);
- The approach to mitigation; and
- The approach to cumulative effects.

8.4.1.2 The assessment methodology used for the Climatic Factors assessment in our PEIR and to be used in the Environmental Statement (ES) is presented in Section 8.7 of our EIA Scoping Report and updated below in Sections 8.4.2 to 8.4.5.

8.4.1.3 The assessment methodology broadly follows that as stated within our EIA Scoping Report. On receipt of the PINS Scoping Opinion (see also Section 8.3.1), the assessment methodology has been updated to include:

- An assessment of the climate change risks, resilience and adaptation for the construction phase of the project (in addition to the operational phase);
- An assessment of the construction phase GHG emissions of the project; and
- Consideration of long-term maintenance activities such as restoring the channel profile, including an outline of the operational maintenance plan, in the Outline Climate Change Adaptation Plan to demonstrate how this would mitigate any likely significant effects.

8.4.2 Climate Change Mitigation

8.4.2.1 At the time of our PEIR assessment, the quantitative data required to carry out a detailed assessment of GHG emissions is not yet available. A high level (reasonable worst case) assessment has been carried out for the construction and operation stage GHG emissions, outlining the potential sensitivity and magnitude of change and subsequent likely significance, alongside proposed mitigation. This has incorporated professional judgement. These likely significant effects will be refined when further quantified detail on the project GHG emissions is provided at the ES stage.

8.4.2.2 Construction and operation phase GHG emissions will be assessed within the ES and an inventory of direct and indirect emissions associated with the project created and quantified for the whole project lifecycle.

8.4.2.3 The assessment will consider whole life project GHG emissions data identified in the Carbon Management Plan, which will align with PAS 2080: 2023, and rely on the Environment Agency carbon calculator (which is part of the Whole Life (Construction) Eric Carbon Planning Tool). Any sources of emissions that are not expected to result in a material contribution to the overall total emissions (c. < five per cent of the total) will be identified and excluded from further assessment. Data will also be obtained from other Development Consent Order (DCO) documents, such as outputs from the Natural Capital Assessment and the Materials Management Plan. The Carbon Management Plan includes quantification of sequestered carbon within the project (for example, through habitat creation, enhancement or mitigation works), alongside the quantification of lifecycle GHGs outlined within PAS2080.

8.4.2.4 An assessment of 'embedded' GHG emissions associated with the materials used to construct the project will be produced. For those materials used, a set of robust GHG 'emissions factors' (i.e. GHG emissions resulting from a given unit of a source activity or material) will be applied, to enable a like for like comparison to be made. These emissions factors will be sourced primarily from the UK Government Greenhouse Gas Conversion factors for Company Reporting (UK Government, 2022) as well as the project Carbon Management Plan.

8.4.2.5 Residual GHG emissions (following mitigation) will be compared against the statutory UK carbon budgets in order to view the project's GHG contribution in the context of this.

8.4.2.6 Firstly in this assessment of significance and in accordance with the NPS on Water Resource Infrastructure, the emissions associated with construction and operation will be assessed *'against the water company's ability to deliver its contribution to the government's targets and commitments'*. To determine the likely significance of the effect, the Institute of Environment Management and Assessment (IEMA) guidance (IEMA, 2020a) (see Appendix M of our EIA Scoping Report) considers that, based upon the judgement of the practitioner, this can be assessed against whether the project is compatible with the achievement of a

science-based target, as described below. Significance rating is based upon the relationship between the sensitivity of the receptor and the net change of residual GHG emissions. This is a robust and industry accepted approach and in accordance with guidance and policy.

8.4.2.7 A carbon budget places a restriction on the total amount of GHGs that can be emitted over a certain period of time. In the UK, carbon budgets cover a period of five years (Table 8-3). They have been set up to the sixth carbon budget, which covers the period between 2033 and 2037. For each budget, GHG emission levels are reduced (e.g. from 965 $MtCO_2e$ for the sixth carbon budget compared to 1,725 $MtCO_2e$ for the fifth budget (2028- 2032) (DBEIS, 2016)). The receptor will be the global climatic system (more specifically, the contribution to carbon budget during which the emissions occur, underpinning science-based targets). The receptor is of a high sensitivity in relation to the carbon budgets, to reflect how close globally we are to the scientifically defined limit.

8.4.2.8 The likely significance of effect will be determined through applying net change of residual GHG emissions with sensitivity (carbon budgets), as per other EIA assessments. However, according to the IEMA GHG Guidance (IEMA, 2022a) *"the crux of significance therefore is not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050."*

8.4.2.9 The assessment of GHGs does not include identification of local sensitive receptors, as GHG emissions do not directly affect specific locations, but lead to indirect effects by contributing to climate change. The sensitive receptor with respect to GHG emissions is therefore the atmosphere (which is always of high sensitivity), where GHGs contribute to increasing atmospheric temperatures and resultant climate change effects.

8.4.2.10 With regards to the magnitude of change, unlike other ES chapters, there are no impact descriptors for GHG emissions.

8.4.2.11 To establish the likely significance of the GHG emissions from a development therefore requires assessment of:

- Their consistency with policy requirements, since these have been specified to ensure the economy decarbonises in line with the UK's net zero target; and
- The degree to which the development has sought to mitigate its emissions.

8.4.2.12 Examining each of these dimensions allows the assessment to make professional judgement on the likely significance of effects based on a set of significance criteria established in the IEMA GHG Guidance, summarised in Table 8-2.

Table 8-2: GHG Significance Criteria

Significance Rating	Description	Criteria to Determine Significance of Net GHG Emissions
Major Adverse (Significant)	A project with major adverse effects is locking in emissions and does not make a meaningful contribution to the UK's trajectory towards net zero.	The project's net GHG impacts are: • not mitigated or are only compliant with do-minimum standards set through regulation; and • do not provide further reductions required by existing local and national policy for projects of this type.
Moderate Adverse (Significant)	A project with moderate adverse effects falls short of fully contributing to the UK's trajectory towards net zero.	The project's net GHG impacts are: • partially mitigated; and • may partially meet the applicable existing and emerging policy requirements but would not fully contribute to decarbonisation in line with local and national policy goals for projects of this type.

Significance Rating	Description	Criteria to Determine Significance of Net GHG Emissions
Minor Adverse (Not Significant)	A project with minor adverse effects is fully in line with measures necessary to achieve the UK's trajectory towards net zero.	The project's net GHG impacts are: • fully consistent with applicable existing and emerging policy requirements; and • in line good practice design standards for projects of this type.
Negligible (Not Significant)	A project with negligible effects provides GHG performance that is well 'ahead of the curve' for the trajectory towards net zero and has minimal residual emissions.	The project's net GHG impacts are: • reduced through measures that go well beyond existing and emerging policy; and • better than good practice design standards for projects of this type, such that radical decarbonisation or net zero is achieved well before 2050.
Beneficial (Significant)	A project with beneficial effects substantially exceeds net zero requirements with a positive climate impact.	The project's net GHG impacts are: • below zero; and • it causes a reduction in atmospheric GHG concentrations, whether directly or indirectly, compared to the without-project baseline.

8.4.2.13 Some impacts, such as those from changes to travel patterns or changes to flooding damage, are expected to contribute to the overall whole life GHG emissions in a positive way (i.e. changes to flood damage will avoid

future maintenance and repair). Commentary on improvements to active travel (walking and cycling infrastructure) will be provided in the ES either qualitatively or quantitatively dependant on the data available at the ES stage. There will also be reductions in the number of properties that will be subject to flooding, which will reduce the amount of damage and replacement to goods and fittings. This improvement will be quantified at the ES stage. Both these impacts have been qualitatively assessed in this PEIR chapter.

8.4.2.14 Table 8-3 shows the statutory UK carbon budgets up to 2037 (i.e. out to the Sixth Carbon Budget), which highlights a decline in the amount of GHG emissions that the UK can legally emit going into the future. This means that sources of emissions that make an increased contribution to the UK's carbon inventory will negatively affect the ability of the UK to meet its carbon budgets in the future. The appropriate carbon budget will be used within the assessment of the construction and operation phase, to assess the contribution and subsequent likely significance of effect.

Table 8-3: Relevant Carbon Budgets for the Assessment

Carbon Budget	Total Budget ($MtCO_2e$)
3rd (2018-2022)	123.3
4th (2023-2027)	65.9
5th (2028-2032)	34.3
6th (2033-2037)	17.9

8.4.2.15 The Environment Agency (2019) has set an ambitious target to be net zero by 2030. They therefore have a science-based target for an emissions reduction of 45 per cent by 2030 with the remaining 55 per cent to be offset. The Environment Agency has also adopted PAS 2080 into project processes using a carbon hierarchy to reduce whole life carbon and carbon calculators to project and record carbon data at the project level, which has been implemented on the RTS. They are adopting a carbon budgeting approach to place the same value on carbon reporting as on financial reporting. Surrey County Council has also adopted Surrey's Climate Change Strategy (Surrey County Council, 2020d), a shared ambition of Surrey's 12 local authorities. This outlines how, in

order to achieve net zero carbon emissions by 2050, current carbon emissions across all areas of Surrey's activity must be reduced by 46 per cent by 2025, and by 67 per cent by 2030, compared to 2019 levels.

Assumptions and Limitations

8.4.2.16 Where assumptions need to be made, they will be selected to present the reasonable worst-case scenario for that particular item/factor.

8.4.2.17 It is also assumed that operational energy use and transport linked to the project will produce less GHG emissions over time, as the grid is decarbonised.

8.4.2.18 Detailed data is not always available for particular emissions sources, and in these cases a description of the assumptions made (such as using benchmarks) will be stated.

8.4.3 Climate Change Resilience and Adaptation

8.4.3.1 At the time of our PEIR submission, sufficient design and construction information required to carry out a detailed CCR assessment is not yet available. However, a high level CCR assessment has been carried out based on data available at the time of submission.

8.4.3.2 The CCR assessment considers the resilience of the project itself to the physical impacts of climate change from construction and operation.

8.4.3.3 IEMA guidance 'Climate Change Resilience and Adaptation' (IEMA, 2020a) (see Appendix M of our EIA Scoping Report), defines climate change resilience as the '*ability to respond to changes in climate. If a receptor or project has good climate change resilience, it is able to respond to the changes in climate in a way that ensures it retains much of its original function and form. A receptor or project that has poor climate change resilience will lose much of its original function or form as the climate changes'.*

8.4.3.4 The CCR assessment differs from many other EIA topics in that it considers how the resilience of a development is affected by an external factor (climate change) not how environmental receptors are affected by a development's impacts. Consequently, the CCR impacts cannot be assigned significance with respect to the severity of impacts in the same way as for the other environmental topics. Instead a risk-analysis based

approach has been used for our PEIR CCR assessment and will be completed in greater detail at the ES Stage. The process followed for this high level CCR assessment is therefore described in paragraphs 8.4.3.5 to 8.4.3.7 and provided in Section 8.7.3.

8.4.3.5 The risk assessment uses a combination of likelihood of climate impacts occurring and the potential consequence of those impacts to determine risk according to a five-point scale: very low, low, medium, high or very high. Any effects determined to be high or very high risk have been identified as requiring mitigation. For the purposes of the CCR, the 2080s Future Climate Scenario has been used. This is in accordance with the IEMA guidance 'Climate Change Resilience and Adaptation' (IEMA, 2020a), which states that *"Recommended best practice is to use the higher emissions scenario (RCP 8.5 in the latest UKCP18 projections) at the 50th percentile, for the 2080s timelines, unless a substantiated case can be made for not doing this (e.g. anticipated lifespan of the project is shorter than 2080s)".*

8.4.3.6 The methodology for the CCR risk assessment is as follows (and is consistent with the IEMA Guidance mentioned in paragraph 8.4.3.3 above):

1. Identify the receptors (e.g. assets and asset groups) included within the project that would be potentially at risk from climate change impacts;
2. Identify climate change hazards (e.g. floods, heatwaves, droughts) that may affect the geographical location of the project;
3. Determine the likelihood of climate change hazards (e.g. floods, heatwaves, droughts) occurring in the future, based on the future climate change projections;
4. Determine the likelihood of the hazard having a climate change impact on the receptors, noting that:
    - the likelihood of each impact will be determined based on the definitions in Table 8.4 below;
    - the assessment will be qualitative using expert judgement and in discussion with the design team, with the exception of flood risk for which quantitative assessments will be carried out; and

- existing or embedded mitigation and enhancement measures will be taken into account in the assignment of a likelihood category.

5. Determine the consequence of each impact based on the definitions in Table 8-5 below; and
6. Determine the risk level and thus significance of effect on receptors based on a combination of likelihood and consequence, as shown in Table 8-6. The assessment is qualitative and uses expert judgement based on knowledge of similar projects, engagement with the wider project team and a review of relevant literature.

Table 8-4: Criteria to Assess Likelihood of Climate Change Impact

Level of Likelihood	Definition of Likelihood
Very Low	It is highly improbable that the impact will occur during the operational phase of the assets or systems or the construction phase.
Low	Impact is not expected to occur during the operational phase of the assets or systems or the construction phase.
Medium	Impact may occur during the operational phases of the assets or systems or the construction phase.
High	Impact is expected to occur during the lifespan of the assets or systems or the construction phase.
Very High	It is highly probable that the impact will occur during the lifetime of assets or systems or the construction phase.

Table 8-5: Criteria Used to Assess Consequence of a Climate Change Impact

Measure of Consequence	Description
Negligible	No damage to the project, minimal adverse effects on health, safety and the environment or financial loss. Little change to service and disruption lasting less than one day.
Minor Adverse	Localised disruption or loss of service. No permanent damage, minor restoration work required: disruption lasting less than one day. Small financial losses and/or slight adverse health or environmental effects.
Moderate Adverse	Limited damage and loss of service with damage recoverable by maintenance or minor repair. Disruption lasting more than one day but less than one week. Moderate financial losses. Adverse effects on health or the environment.
Large Adverse	Extensive damage and severe loss of service. Disruption lasting more than one week. Early renewal of 50-90% of the project. Permanent physical injuries and/or fatalities. Major financial loss. Large adverse effect on the environment, requiring remediation.
Very Large Adverse	Permanent damage and complete loss of service. Disruption lasting more than one week. Early renewal of the project >90%. Severe health effects or fatalities. Extreme financial loss. Very large adverse loss to the environment requiring remediation and restoration.

Table 8-6: Significance of Effects Matrix (Consequence of Climate Change Impact against Likelihood of Climate Change Impact)

	Negligible Consequence	Minor Adverse Consequence	Moderate Adverse Consequence	Large Adverse Consequence	Very Large Adverse Consequence
Very High Likelihood	Not Significant	Significant	Significant	Significant	Significant
High Likelihood	Not Significant	Not Significant	Significant	Significant	Significant
Medium Likelihood	Not Significant	Not Significant	Not Significant	Significant	Significant
Low Likelihood	Not Significant	Not Significant	Not Significant	Significant	Significant
Very Low Likelihood	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant

8.4.3.7 Step 7 of the IEMA Guidance listed in paragraph 8.4.3.6 highlights the need for adaptive management with regards to climate change resilience and adaptation. Adaptive management is the process that enables uncertainty to be included in operational decision-making. By taking an adaptive management approach, projects can introduce additional mitigation if required to avoid unacceptable effects on the receiving environment.

8.4.3.8 The ES will:

- Assess whether the adopted measures are likely to be sufficient for the project's whole lifespan, or whether further interventions are likely to be required in the future;
- Identify those parts of the project management measures that should be kept under periodic review, and/or passive provision be made for their incorporation; and
- Suggest a mechanism for how the likely significant effects from climate change can be monitored in the future, and updated over the project's lifespan.

8.4.3.9 On the basis of the above, an Outline Climate Change Adaptation Plan will be produced at the ES stage as a measure to mitigate against the likely significant effects of climate change on generic receptors. It will identify those parts of the project's design or management procedure that relate to resilience/adaptation (as well as those that could be the responsibility of others, such as future operators, Local Planning Authorities (LPAs) and neighbouring landowners).

8.4.4 In-Combination Climate Change Impacts

8.4.4.1 The ICCI assessment assesses the extent to which climate change exacerbates an effect on an environmental receptor considered in other technical assessments (Chapters 6-18).

8.4.4.2 The ICCI assessment methodology has been developed in line with the IEMA Guidance (IEMA, 2020a).

8.4.4.3 The ICCI assessment follows the same approach to assessing impacts and determining significance as for each of the PEIR topics, but with the added consideration of future climate change projections.

Phase 1 (PEIR Stage) Assessment of In-Combination Climate Change Impact Likelihood

8.4.4.4 Phase 1 aims to screen out any ICCIs that are considered too unlikely to occur, e.g. the climate change hazard does not influence the impact identified by the topic, and therefore they do not require further assessment.

8.4.4.5 It considers the effects already identified in other technical assessments based upon their own impact assessment methodologies, and the current PEIR design parameters. It also identifies any embedded mitigation measures proposed by the environmental discipline and the engineering and design teams.

8.4.4.6 A list of potential ICCIs was collated based on:

- the initial assessment from the other technical assessments based on their own assessment methodologies; and
- a literature review of recent guidance, science and policy relating to climate change impacts on the relevant receptors.

8.4.4.7 The likelihood of each potential ICCI occurring was assessed using expert judgement based on two factors:

- the likelihood of the climate impact occurring, based on the climate hazard assessment and
- the likelihood of the climate impact changing an effect already identified by another technical assessment within this PEIR. This assessment was based on the literature review and expert judgement of the climate and environmental specialists.

8.4.4.8 Due to the uncertainties involved, the potential ICCIs were assessed to be either 'likely' or 'unlikely'. Where the ICCI was deemed 'unlikely', either due to the climate impact being unlikely to occur or there being a weak link between the climate impact and the effect on a receptor, it will not be taken forward to Phase 2 (ES Stage).

Phase 2 (ES Stage) Assessment of In-Combination Climate Change Impact Likelihood

8.4.4.9 Phase 2 (ES Stage) will assess the consequence and likelihood of the ICCIs identified in Phase 1, enabling a determination of significance for each.

8.4.4.10 The effect of an ICCI will be considered significant if:

- an effect which was previously not significant becomes significant against the significance criteria used by the discipline due to climate change (e.g. an increase in consequence of effect or an increase in scale of change); and/or
- an existing significant effect is exacerbated against the significance criteria used by the discipline due to climate change (e.g. a further increase in the consequence of effect or a further increase in scale of change).

8.4.4.11 If an effect was not previously significant and any exacerbation by climate change does not change this, the ICCI effect is not significant.

Future Baseline Environment for Climate Change Resilience and In-Combination Climate Change Impacts Assessments

8.4.4.12 The current baseline environment for consideration within the Climatic Factors assessments is as described within our EIA Scoping Report and Chapter 5 of this PEIR. The future baseline to be considered within the Climate Change Resilience and ICCI assessments is described here.

8.4.4.13 Information regarding historic climate conditions was obtained from the UKCP18 observed climate data sets. All the data for the current baseline were obtained from this source.

8.4.4.14 The future climate projections for South East England, based on RCP8.5, are presented and described below for the climatic variables:

- Temperature;
- Precipitation; and
- Wind speed.

8.4.4.15 When assessing the effects of climate change on the engineering and design and in a technical PEIR/ES chapter, the data presented in the proceeding tables will be used as the basis for the assessments.

Temperature

8.4.4.16 Table 8-7 presents the projected air temperature data for South East England up until 2099, in 20 year time-slices, from 2020. In line with the Met Office predictions, the data presents future summers to be hotter and winters to be warmer, with the annual temperature steadily increasing.

8.4.4.17 As the assessment considers both construction and future year operational phases, different time-slices will be considered. When developing adaptive mitigation measures, consideration will be given to the appropriate time to implement these measures based on the temperature increase at each time-slice.

8.4.4.18 The data are presented for the Annual Mean, Summer Maximum, and Winter Minimum temperature for each time-slice. Construction phase assessments will use the 2020-2039 time-slice and operational phase assessments will use the 2080-2099 time-slice.

Table 8-7: Air Temperature Anomaly at 1.5m Above Ground Level (°C) Relative to Baseline

	Predicted Change from Baseline (°C) Annual Mean: 50th Percentile	Predicted Change from Baseline (°C) Summer Max: 50th Percentile	Predicted Change from Baseline (°C) Winter Min: 50th Percentile
Time-slice 2020-2039	1.05	1.50	0.91
Time-slice 2040-2059	1.87	2.77	1.65
Time-slice 2060-2079	2.96	4.28	2.53
Time-slice 2080-2099	4.29	6.43	3.60

Precipitation

8.4.4.19 Table 8-8 presents the predicted percentage change in precipitation levels relative to the 1980-2000 baseline. In line with the Met Office predictions, the data presents future summers to be drier and winters to be wetter. The data also predicts that annual precipitation will reduce marginally up to 2099.

8.4.4.20 When developing adaptive mitigation measures, consideration will be given to the appropriate time to implement these measures based on the precipitation change at each time-slice. The data are presented for the seasonal extremes of winter and summer, as well as an Annual projection for each time-slice.

Table 8-8: Precipitation Rate Anomaly (%) Relative to Baseline

	Predicted Change from Baseline (°C) Annual: 50th Percentile	Predicted Change from Baseline (°C) Summer: 50th Percentile	Predicted Change from Baseline (°C) Winter: 50th Percentile
Time-slice 2020-2039	1.39	1.50	0.91
Time-slice 2040-2059	-0.10	2.77	1.65
Time-slice 2060-2079	-0.04	4.28	2.53
Time-slice 2080-2099	-0.83	6.43	3.60

Wind Speed

8.4.4.21 UKCP18 probabilistic data for wind is not available, nor any RCP8.5 data for wind through alternative projections. However, the Met Office's UKCP18 Factsheet describes how there is expected to be an increase in near surface wind speeds over the UK for the second half of the 21st century for the winter season when more significant wind speeds are experienced. This is accompanied by an increase in frequency of winter storms over the UK. It is therefore assumed for the purposes of the operational phase (the construction phase will occur in the first half of the 21st century and therefore not be materially different) that there will be more future storm events within the 2080-2099 time-slice compared to current day, and without adaptation, the damage and associated economic losses from extreme winds will rise due to increasing asset values.

Summary

8.4.4.22 Based on the above UKCP data, information regarding the key climate change hazards for the South East of England from construction is given below:

- Increase in the number of extremely hot days; and
- Climate changes in 2020-2039 time period and increased probability of extreme weather events such as increased temperature and

increased rainfall. This period will see climate change effects much less pronounced than those outlined in the operational phase of the project.

8.4.4.23 The key climate change hazards to be considered through the project's operational phase are:

- Increased number of extremely hot days;
- Extremely cold weather;
- Increased frequency of flooding from river, surface and ground sources;
- Increased risk of drought;
- Extreme wind speeds; and
- Increased risk of lightning strikes.

8.4.5 Cumulative Effects

8.4.5.1 Noting the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 and the IEMA guidance (IEMA, 2020a), cumulative GHG emissions will be addressed in detail in the ES, within the Climatic Factors ES chapter. This cumulative assessment will be set out separately from the other technical ES chapters, given that GHG emissions do not have a local geographical limit, and therefore there is no basis for selecting any particular (or more than one) cumulative project that has GHG emissions for assessment over any other.

8.4.5.2 In terms of climate change adaptation, relevant cumulative schemes will be investigated to consider their resilience to the future climate scenario, and any changes to climatic risks in conjunction with the project. ICCI has been prepared through discussion with the technical specialists for the other PEIR chapters, whereby the effects identified have been reviewed in terms of the future climate scenarios' ability to affect both the sensitivity of the receptor and the magnitude of the change.

Assumptions and Limitations

8.4.5.3 The climate change adaptation assessment will provide an indication of the likely significant effects of climate change on the project based on professional judgement and engagement with the project team.

8.4.5.4 The UKCP18 projections do not provide a single precise prediction of how weather and climate will change years into the future. Instead UKCP18 provides ranges that aim to capture a spread of possible climate responses. This better represents the uncertainty of climate prediction science. It should also be noted that the level of uncertainty of the projections is dependent on the climate variable, for example, there is greater confidence around changes in temperature than there is on changes in wind. In the climate vulnerability assessment this will be considered when assessing the likelihood of effects. Key assumptions and limitations of UKCP18 data can be found on the Met Office Website (Lowe et al., 2018).

8.4.5.5 There are also general limitations at the PEIR stage, whereby specific details relating to construction worksite layouts and traffic data (amongst others) are not fully known, hence a quantified assessment of GHGs can only be carried out at the ES Stage.

8.5 Key Environmental Considerations and Opportunities

8.5.1.1 Below are the key considerations and opportunities with respect to Climatic Factors.

8.5.2 Climate Change Mitigation

8.5.2.1 The project has the potential to give rise to negative likely significant effects on climate by causing emissions of GHGs to be dispersed into the atmosphere from its construction and operational life.

8.5.2.2 Through ongoing use of the project's Carbon Management Plan, opportunities will be explored throughout the project development to minimise GHG emissions and where possible sequester carbon or generate renewable energy. Early calculations have ascertained that, through reducing the carbon footprint of the project and the use of carbon sequestration, carbon emissions through the construction and operational phases of the project are likely to be further reduced.

8.5.3 Climate Change Resilience and Adaptation

8.5.3.1 The project is a climate change adaptation project in itself by reducing flood risk overall as one measure to improve resilience. As part of the project, landscape and blue and green infrastructure will be designed to

be resilient and adapted for climate change i.e. so that they will continue to function even during flood events and particularly with future climate change as flood levels will continue to increase. In addition, they will work to improve interception of precipitation, reduce urban heat island effects and provide additional solar shading through additional canopy cover.

8.5.3.2 Based on the UKCP18 predictions, it is widely accepted that on average, the UK will experience hotter and drier summers, and warmer, wetter winters. Additionally, it is likely that climate change will increase the intensity and frequency of extreme weather events such as storms, heavy rainfall and heatwaves. The project has an opportunity to be designed to help alleviate the effects of these events.

8.6 Primary and Tertiary Mitigation

8.6.1 Introduction

8.6.1.1 On consideration of mitigation for the climate change mitigation assessment, reference should be made to Paragraph 4.4.16 of the NPS for Water Resources Infrastructure (Defra, 2023a), which states: '*The Secretary of State will consider the effectiveness of the mitigation measures in order to ensure that the greenhouse gas emissions are as low as reasonably practicable. The Secretary of State's view of the adequacy of the mitigation measures will be a material factor in the decision-making process, particularly the applicant's proposed offsetting measures, for any significant emissions expected from the project'.*

8.6.2 Primary Mitigation

Climate Change Mitigation

8.6.2.1 The carbon reduction hierarchy will be applied through the design process as primary mitigation for climate change mitigation effects. This will work to either eliminate, reduce, substitute or compensate carbon emissions (in order of preference).

Climate Change Resilience and Adaptation

8.6.2.2 Paragraph 8.5.3.1 explains how the project in itself is proposed to manage future climate change resilience and adaptation. In addition to this, the following primary mitigation is proposed in relation to climate change

resilience and adaptation effects. These will all ensure the project is designed to withstand effects from projected future climate change:

- Sustainable Drainage Systems (SuDS) will be designed for the operational stage to ensure no increase in surface water flooding, including an appropriate allowance for climate change.
- SuDS will be designed to manage flood risk through construction (that could be exacerbated by climate change). Design of construction surface water drainage systems (storage and conveyance of stormwater restricted appropriately) including temporary SuDS / specific plant (pumps / tanks) will also address water quality.
- An Outline Climate Adaptation Plan will be developed. Measures to make the project more resilient to projected future climate change could include monitoring and adaptive management such as:
  - Reduction of water consumption through the specification of highly efficient water installations. Further consideration of rainwater/greywater harvesting should be given, including the future adaptability to collect this in greater quantities;
  - Public realm could be installed with drinking water fountains;
  - External spaces could be planted with a range of species, including native and drought resistant species. Tree sizes and pits should be appropriately sized to deal with periods of drought in summers; and
  - Heating systems (if any are proposed) could be provided with zonal, programmable thermostatic controls linked to a master control panel which will allow occupants to control each zone independently for maximum flexibility. Hot water could be separately programmable.
- Climate Resilient Design for temporary and permanent structures and buildings. Design of temporary and permanent office buildings using appropriate guidance from the Chartered Institute of Building Service Engineers (CIBSE) to mitigate against the predicted effects of climate change.

8.6.3 Tertiary Mitigation

Climate Change Mitigation

8.6.3.1 Tertiary mitigation is proposed to reduce GHG emissions from construction and operation. Tertiary mitigation proposed in relation to climate change mitigation effects includes:

- Production of a Materials Management Strategy. The strategy will work to reduce GHG emissions and is being developed in parallel to the DCO process. It will:
  - Detail efficient management proposals for processing, recovery, or re-use of materials and waste generated by the project, reducing the need to import materials from off-site, and minimise the volume of unsuitable materials requiring off-site disposal.
  - Be implemented in line with relevant permitting requirements and CL:AIRE DoWCoP; and
  - Inform design development and the development of appropriate primary, tertiary, and secondary mitigation.
- Production of a Carbon Management Plan, in line with the requirements of PAS2080, that aims to:
  - Identify and deliver opportunities to reduce embodied and operational carbon as part of design development and through optimal construction methodologies;
  - Identify opportunities for delivery of carbon mitigation;
  - Identify and deliver carbon savings through the management and use of materials excavated on site; and
  - Identify and deliver renewable energy provision opportunities.
- Application of the waste hierarchy, for example, reduce generation of waste, reuse of arisings, treatment of waste to make it suitable for reuse etc.
- Production of a Site Waste Management Plan to set out the amount and type of waste and how it will be reused, recycled or disposed of in accordance with legislation.
- Use of Non-Road Mobile Machinery (NRMM) with low emissions.
- Production of a Construction Traffic Management Plan to ensure all highways works are safe, planned and co-ordinated in order to secure the expeditious movement of traffic on the road network; and to minimise inconvenience to the public. This would work to manage

and/or reduce congestion and associated GHG emissions as a result of traffic. It could include measures such as (this is not an exhaustive list):

  - Necessary modification to parking restrictions or suspensions (amending existing or implementing new);
  - Necessary bus stop suspensions or relocations;
  - Details on off-site lorry holding arrangements (site management); and
  - How stakeholder and community liaison and co-ordination will be managed.
- Production of a Construction Logistics Plan to detail the logistics management arrangements for worksites to minimise impacts on communities and the environment from transportation of construction materials/waste. This would work to manage and/or reduce congestion and associated emissions as a result of traffic. This could include measures such as (this is not an exhaustive list):
  - Details on standard working hours and any requirements to restrict vehicle movements during certain sensitive periods of the day/month/year;
  - Any commitments on construction vehicle routing e.g. any requirements to avoid certain junctions/routes/air pollution hotspots (e.g. AQMAs); and
  - Co-ordination with local stakeholders (Local Highway Authority and developers) to minimise collective disruption to operation of the highway from construction works.
- Production of a Construction Travel Plan to proactively manage and influence workforce (and visitor) travel to and from worksites to limit traffic movement and the associated GHG emissions, and reduce disruption in the vicinity of the site. This could include measures such as (this is not an exhaustive list):
  - Details of access arrangements to worksites to facilitate convenient and safe access for pedestrians, cyclists and drivers;
  - Provision of current information on the local transport network (pedestrian, cycle, bus, rail) to enable workers and visitors to make informed decisions on their travel behaviour; and
  - Objectives to be set, monitored and reported against to limit and reduce car travel.
- Production of an Operational Travel Plan to proactively manage and influence employee (and visitor) travel to and from facilities being

provided at the New Green and Blue Open Spaces, to encourage the use of sustainable travel methods and reduce GHG emissions and network disruption locally to these facilities. This could include measures such as (this is not an exhaustive list):

- Details of access arrangements, vehicle/electric vehicle/bicycle parking availability and information on the local transport network (pedestrian, cycle, bus, rail) to enable employees and visitors to make informed decisions on their travel behaviour;
- Provision of secure and convenient cycle storage and facilities such as changing facilities and lockers; and
- Objectives to be set, monitored and reported against to limit and reduce car travel.

Climate Change Resilience and Adaptation

8.6.3.2 There is currently no tertiary mitigation proposed for climate change resilience and adaptation effects.

8.7 Preliminary Assessment of Likely Significant Effects

8.7.1 Introduction

8.7.1.1 Our PEIR adopts a precautionary approach. Assessments reported within this chapter are a preliminary assessment of potential likely significant environmental effects based on the design parameters set out in Chapter 2. This precautionary approach has been taken for the PEIR as there is some information on the project that is currently incomplete and the parameters within Chapter 2 are high level and account for a range of uses and allowance for design development within a boundary that could possibly be refined once this work has been completed. For example, some designs, construction and mitigation details (and therefore also land requirements) or baseline information is still required from further surveys, assessments and/or consultation feedback. In making a determination of likely significant effects, we have considered the sensitivity of receptors (a receptor being a feature of the environment that responds to change) and the potential magnitude (i.e. size) of change caused by the RTS. The methodology for defining sensitivity and magnitude varies by topic and is defined in the topic sections of our Scoping Report and in Section 8.4 of this chapter.

8.7.1.2 We are committed to including mitigation measures as necessary to address likely significant negative environmental effects as far as reasonably practicable. Both primary and tertiary mitigation are considered to form part of the RTS; those applicable to this topic are set out in Section 8.6. Several of these mitigation measures are still being developed, and therefore as a precaution, the preliminary assessment of effects for our PEIR does not assume full achievement of these in considering if a project effect is likely to be significant (Appendix 4.2 identifies the implementation status of primary and tertiary mitigation for the PEIR assessment). Furthermore, the potential likely significant effects reported within our PEIR have been assessed prior to the implementation of secondary mitigation measures, those applicable to this topic are set out in Section 8.7.4. These secondary mitigation measures are the subject of further development; and given they are still being developed, are not able to be applied to develop a 'residual' effects assessment.

8.7.1.3 Our PEIR is based on the latest design and construction parameters and baseline information. As such the findings of the preliminary environmental appraisal presented within our PEIR may be subject to change as the design progresses, as mitigation is further developed or information from further studies becomes available, such as our work to produce a Carbon Management Plan to influence ongoing project designs. The final assessment of effects undertaken as part of the EIA and reported within the ES will be based on the latest information available at that time.

8.7.2 Climate Change Mitigation

Potential Likely Significant Effects

8.7.2.1 Our preliminary assessment of likely significant environmental effects has identified the potential for the following likely significant effects from construction in relation to climate change mitigation:

- Temporary significant increase in GHGs in the atmosphere as a result of all construction activities. This effect would be negative.

8.7.2.2 Our preliminary assessment of likely significant environmental effects has identified the potential for the following significant effects from operation in relation to climate change mitigation:

- Permanent significant increase in GHGs in the atmosphere as a result of operational activities, such as channel maintenance and operational works, altered traffic movements and through the provision of habitats and renewable energy. The effect would vary from neutral to negative.

8.7.2.3 It should be noted that, as explained in Section 8.7.1.1, the likely significant effects reported here are based on a reasonable worst-case assessment. The project is expected to provide many beneficial effects, most notably a reduction in flood risk to surrounding properties and the avoidance of carbon costs of recovery activities. These likely significant effects will be reviewed and quantified at the ES stage. Given the Environment Agency's target to be net zero by 2030, Surrey County Council's net zero targets, the decarbonisation agenda within this project and the knowledge that a Carbon Management Plan will influence the project designs (see Section 8.5.2.2), it is expected that the likely significant effects reported here will be reduced at the ES stage.

8.7.2.4 Further details of the potential likely significant effects from construction and operation with respect to receptors, project components and project activities, in relation to climate change mitigation can be found in Table 1 and 2 in Appendix 8.1.

Potential Likely Non-Significant Effects

8.7.2.5 Further details of the non-significant effects from construction and operation with respect to receptors, project components and project activities, in relation to climate change mitigation can be found in Table 3 and 4 in Appendix 8.1.

8.7.2.6 Some examples of climate change mitigation non-significant effects include (this is not an exhaustive list):

- Excavated material (including gravel) will be produced as a by-product of the project, and re-used within the project, causing a temporary avoidance of GHG emissions from excavating and transporting material from elsewhere. The effect would be positive.
- Potential for positive permanent effects on the global atmosphere through habitat planting and maturation of vegetation acting as a sink for carbon, generation of renewable energy promoting low carbon

sources of energy and active travel encouraging less GHG intensive forms of transportation.

8.7.3 Climate Change Resilience and Adaptation

8.7.3.1 As discussed in paragraph 8.4.3.5, the process followed for this high level CCR assessment is described here. No likely significant effects upon climate change and adaptation have been identified from this preliminary assessment.

Potential Likely Non-Significant Effects from Construction

8.7.3.2 As per the methodology described in paragraph 8.4.3.6, we have identified the following potential climate change hazards upon climate resilience and adaptation during the 2020-2039 time period and increased probability of extreme weather events:

- increased risk of overheating in temporary building accommodation for construction workers likely to have negative effects on working conditions during construction of the project (high likelihood); and
- disruption or hinderance of construction processes (high likelihood).

8.7.3.3 The receptors likely to experience these climate change hazards are identified below:

- temporary buildings for construction workers and site offices;
- temporary transport infrastructure;
- third party utilities;
- material handling areas;
- excavations; and
- construction processes

8.7.3.4 As per the methodology described in paragraph 8.4.3.6, construction-related climate resilience and adaptation effects are anticipated to be ‘high’ in likelihood and ‘minor adverse’ in consequence. These effects are therefore deemed likely not significant. Our proposed primary mitigation (see paragraph 8.6.2.2) will embed measures to mitigate climate change throughout construction.

Potential Likely Non-Significant Effects from Operation

8.7.3.5 As per the methodology described in paragraph 8.4.3.6, we have identified the following potential climate change hazards upon climate resilience and adaptation resulting from an anticipated future increase in the number of extremely hot days, extreme cold weather, increased frequency of flooding from river, surface and groundwater sources, increased risk of drought and extreme wind speeds:

- overheating could lead to structural damage to proposed bridges and road re-alignment (medium likelihood);
- overheating in structures and buildings leading to thermal discomfort and heat stress (high likelihood);
- overheating could lead to negative working conditions for site operatives (medium likelihood);
- increased hot days could lead to drought with effects on habitats by lack of water/drying out (medium likelihood);
- sensitive equipment and mechanical operating mechanisms may fail to operate correctly due to high temperatures (medium likelihood);
- reliability of journeys may reduce at low temperatures due to cracking of pavement surfaces (low likelihood);
- possible increase in number of days outside the normally acceptable range for heating systems and increased risk of heating ventilation and air conditioning failure (low likelihood);
- possible negative health implications for site users and disruption to service operation of the project (low likelihood);
- flooding of infrastructure during operation: inundation of transportation network (access roads and railways) (medium likelihood);
- flooding of new buildings and structures, basements and sub structures causing permanent damage (medium likelihood);
- flooding affecting the ability to carry out monitoring and maintenance activities (medium likelihood);
- flooding could drown any New Green and Blue Open Space (low likelihood);
- increased heat stress to plants/landscaped areas (medium likelihood);
- increased water stress for new buildings (medium likelihood);

- failure or damage to parts of structure or infrastructure as a result of changes in strong winds and gustiness (medium likelihood); and
- failure or damage to parts of structures or infrastructure as a result of changes in strong winds and gustiness (medium likelihood).

8.7.3.6 The receptors likely to experience these climate change hazards are identified below:

- transport infrastructure;
- flood channel capacity improvements;
- permanent new structures;
- habitat creation areas/landscaping;
- utilities; and
- proposed maintenance.

8.7.3.7 As per the methodology described in paragraph 8.4.3.6 operational-related climate resilience and adaptation effects will range from low to high likelihood, with the consequence for each impact being minor adverse. Operational-related climate resilience and adaptation effects are therefore anticipated to be likely not significant. The proposed primary mitigation (see paragraph 8.6.2.2) will embed measures to mitigate climate change from operation from the outset.

8.7.3.8 A key project goal is alleviating flood risk, which in itself is a consequence of climate change. Positive effects on climate resilience, to be reviewed in the ongoing design at the ES stage, will include protection of buildings and spaces making them more resilient to future climate change, as well as a reduction in flood risk within the study area leading to an avoidance of flood damages to properties (such flood damages usually resulting in increased GHG emissions).

8.7.4 Secondary Mitigation

8.7.4.1 No further secondary mitigation is currently identified for climate change mitigation effects. Primary and tertiary mitigation measures specified for this assessment (see Section 8.6) will be developed to further reduce GHG emissions resulting from the project.

8.7.4.2 Secondary mitigation is not currently under consideration for climate resilience and adaptation effects as they are likely not significant. Key mitigation for climate resilience and adaptation is already accounted for as

primary mitigation through construction and operation (see paragraph 8.6.2.2).

8.7.4.3 Further mitigation may be proposed if considered necessary at the ES stage, to ensure any mitigation from the ES assessment continues to feed into the primary and tertiary mitigation measures and subsequently be embedded within the detailed designs or construction practises.

8.8 Further Work for the EIA

8.8.1.1 Detailed climate change mitigation and climate change resilience and adaptation assessments for construction and operation of the project will be undertaken in accordance with the methodology set out Section 8.4.2 and Section 8.4.3 above.

8.8.1.2 The assessment will be based on the effects scoped in the assessment and as per those included within Section 8.7 of this PEIR. It will consider any relevant aspects of PINS EIA Scoping Opinion and be informed by any further information received during the statutory consultation process. The mitigation measures set out in this chapter will be further developed and their ability to reduce effects identified within the ES.

8.8.1.3 The climate change mitigation assessment will be based on the information provided within the Carbon Management Plan which will align with PAS2080: 2023, as well as the Environment Agency carbon calculator (which is part of the Whole Life (Construction) Eric Carbon Planning Tool).

8.8.1.4 An Outline Climate Adaptation Plan is to be progressed through ongoing design and assessment and will be provided as an Appendix to the ES.

8.8.1.5 We consider that the further development of the project design and mitigation measures which will be reflected in the ES and DCO application, will enable a reduction in the scale of identified negative likely significant effects set out in this chapter.

9 Cultural Heritage, Archaeology and Built Heritage

9.1 Introduction

9.1.1.1 This chapter of our Preliminary Environmental Information Report (PEIR) considers the effects from construction and operation of the River Thames Scheme (RTS) ('the project') in relation to cultural heritage, archaeology and built heritage. Within this chapter we have included topic specific sections on:

- Legislation, policy and guidance (noting any changes since Environmental Impact Assessment (EIA) scoping);
- Engagement with consultees, including responses to comments received on the RTS EIA Scoping Report;
- The assessment methodology for this topic (again noting any changes or updates since EIA scoping);
- Key environmental considerations and opportunities;
- Primary and tertiary mitigation;
- Our preliminary assessment of effects;
- Secondary mitigation; and
- Future work for this topic of our EIA.

9.1.1.2 For a summary of the key baseline elements associated with cultural heritage, archaeology and built heritage see Section 5.5.

9.1.1.3 To determine the potential likely significant effects on cultural heritage assets data was collated within three study areas which have been combined to form the Cultural Heritage Study Area for EIA PEIR (Figure 5.6). The areas are largely unchanged from our EIA Scoping Report, apart from the setting study area.

- For the archaeological desk-based assessment, a 500 metre study area from the Project Boundary for EIA scoping was used to assess the archaeological potential of the project and identify sensitive areas for further investigation (areas of high archaeological potential are shown on Figure 5.6).

- The 1 in 100 year floodplain (i.e. the area with a one per cent chance of flooding in any given year) benefitting from the RTS was also used in the desk-based assessment to consider the effects on designated and non-designated heritage assets of a change in the flood regime.
- An initial study area for the setting assessment was used in 2018 but has been amended to reflect changes to the project boundary. The setting assessment study area is now defined as an additional one kilometre from the archaeological Desk Based Assessment (DBA) boundary combined with the area within the 1 in 100-year floodplain benefitting from the RTS. This area was used to produce an updated setting assessment in 2022 (Appendix 9.1). The final setting assessment will include any additional assets where Zone of Theoretical Visibility (ZTV) indicates that the project will be visible which could affect their setting (see 9.7.1.2 for further detail).

9.1.1.4 The assessment of cultural heritage is connected to the assessment of landscape and visual amenity (Chapter 12) in relation to changes to the setting of heritage assets and historic landscapes. There is also a relationship with effects arising from flood risk (Chapter 10), water environment (Chapter 18), soils and land-use (Chapter 16), traffic and transport (Chapter 17), and noise and vibration (Chapter 14) assessments.

9.1.1.5 This chapter considers the effects from construction and operation of the project on cultural heritage and the likely significant effects that may arise. The cultural heritage resource comprises archaeological remains, historic buildings and historic landscapes. A cultural heritage asset is considered to be a building, monument, site, place, area or landscape identified as having a degree of significance meriting consideration in planning decisions, because of its heritage interest. Setting is defined as the surroundings in which the cultural heritage resource is appreciated (MHCLG, 2023).

9.1.1.6 In total the following numbers of assets within the Cultural Heritage Study Area for EIA PEIR were considered during the archaeological desk-based assessment and 2022 setting study:

- 14 Scheduled Monuments (SM);
- 18 Grade I listed buildings;
- 43 Grade II* listed buildings;

- 521 Grade II listed buildings;
- 41 Conservation Areas;
- 15 Registered Parks & Gardens;
- 63 Areas of High Archaeological Potential (AHAP) or County Sites of Archaeological Importance; and
- 2009 non-designated heritage assets

9.1.1.7 Scheduled Monuments, Conservation Areas and Registered Parks and Gardens are shown in Figure 5.7.

9.2 Legislation, Policy and Guidance

9.2.1.1 A summary of the key legislation, policy and guidance relevant to cultural heritage is provided in Appendix M of the RTS EIA Scoping Report (Environment Agency and Surrey County Council, October 2022) ('the EIA Scoping Report'). Since the publication of our EIA Scoping Report in October 2022 the National Policy Statement (NPS) for Water Resources Infrastructure (Defra, 2023) has been updated and finalised. With regard to the historic environment, the update included a statement that the applicant should undertake an assessment of likely significant heritage impacts including cumulative impacts and consideration of positive contributions to the historic environment (Defra, 2023a). There has been no additional new relevant legislation, policy or guidance published since the submission of our EIA Scoping Report.

9.3 Engagement

9.3.1 Responses to EIA Scoping

9.3.1.1 Table 9-1 below summarises the comments and responses received on our Scoping Report following formal submission to the Planning Inspectorate (PINS) EIA Scoping Opinion (dated 15 November 2022) ('the PINS Scoping Opinion') and any key comments received from statutory consultees. Full consultee comments on our EIA Scoping Report and our responses to these comments are provided in Appendix 4.1.

Table 9-1: Responses to comments received on our EIA Scoping Report

Consultee or Organisation	Summary of Comment	Project Response
PINS	Scoping out effects of transportation of non-hazardous material will depend on traffic routing and affect on setting of designated heritage assets.	Stages 1 and 2 of the setting study (Appendix 9.1) identifies heritage assets potentially affected by transportation of non-hazardous material. Once all haul routes are known, further assessment of effects will take place and will be covered in the Environmental Statement (ES).
PINS/ Historic England	The ES should explain the methodology for assessing impacts to historic landscape character and assess impacts to where significant effects are likely to occur.	In terms of work undertaken to date, historic landscapes have been discussed in the setting study (Appendix 9.1) and will be covered in the ES. Further liaison will be undertaken between the cultural heritage and LVIA teams to provide assessments for the ES, including differences in approach.
PINS	The ES should determine if demolition of buildings or other structures is likely to impact historic receptors and if so, assess significant effects where they are likely to occur.	Buildings at the upstream end of the Runnymede Channel and at Sheepwalk may require demolition. These have been considered as part of the desk-study for our PIER and are not of historic value. This will be verified on the ground for the ES.
PINS	The operation of the Proposed Development may include installation of new sources of lighting, such as stadium lighting at new recreational facilities. The ES should assess effects from operational lighting on cultural heritage where they are likely to be significant.	Lighting has been considered when identifying assets in the setting study at Appendix 9.1. Further assessment will be undertaken as part of the next stages of the setting study for the ES.
Historic England	The ES should encompass all areas to which the presence of the	This is being addressed as part of the setting study and will be

Consultee or Organisation	Summary of Comment	Project Response
	project might make a change to the setting of heritage assets and historic landscapes. This will mainly align to the extent of Zones of Theoretical Visibility (ZTVs) relating to Heritage Assets and Key Views.	developed further for the assessment as described in paragraph 9.1.1.3 above.
Historic England	The 'significance criteria' in the Scoping Report considers various magnitudes of change, distinctions between them are not clear.	The methodology set out in the Design Manual for Roads and Bridges (DMRB) has been used as a guide for the assessment methodology. The DMRB guidance has five levels for magnitude of change and these are set out in Section 9.4.3.3 of this chapter, along with criteria for each category.
Historic England	It is not entirely clear which areas within the study area have been robustly assessed and evaluated and where / whether there are areas for which little is known. Need to separately identify areas of unknown potential.	Figure 9-3 of our EIA Scoping Report shows evaluation undertaken to date. This has not been updated for our PIER as further evaluations were not complete at the time of writing. The ES will include these further evaluations as well as updating Figures with remaining areas of unknown potential.
Local Planning Authority Project Group	There is not a lot in the EIA Scoping Report about the location and nature of the proposed habitat creation in relation to cultural heritage. It is assumed that design of these areas are still at an early stage and that there will be more discussion, therefore, further engagement will be required.	Discussions are ongoing and cultural heritage is a strand in the design of priority areas for habitat creation, enhancement or mitigation.

9.3.2 Other Engagement since EIA Scoping

9.3.2.1 Section 9.2.2 of our EIA Scoping Report summarises the stakeholder engagement relevant to the Cultural Heritage, Archaeology and Built

Heritage topic that was undertaken prior to submission of our EIA Scoping Report.

9.3.2.2 A meeting was since held with Historic Environment Officers covering Surrey County Council and constituent local planning authorities in March 2023 to discuss the archaeological survey programme. A further briefing was given to the Local Planning Authority Project Group in summer 2023 on the current and proposed archaeological investigative fieldwork.

9.3.2.3 Written Schemes of Investigation (WSI) for individual surveys, in addition to survey reports, are circulated to Historic Environment Officers, and Historic England where applicable, for comment.

9.4 Methodology

9.4.1 Introduction

9.4.1.1 This section should be read in conjunction with Chapter 4 'Approach to the Environmental Assessment', which sets out relevant information on the design parameters and information that have informed our PEIR assessment, and how we have approached various aspects of the assessment including:

- The scope of the assessment;
- The methodology (including the approach to defining the baseline environment, topic study areas, and assessment methodology and criteria);
- The approach to mitigation; and
- The approach to cumulative effects.

9.4.1.2 The assessment methodology used for the Cultural Heritage assessment in this PEIR and to be used in the ES is presented in Section 9.7 of our EIA Scoping Report and updated below in Sections 9.4.2 to 9.4.3.

9.4.2 Baseline Methodology

9.4.2.1 Our baseline methodology is set out in Section 9.2 of our EIA Scoping Report. It comprises a combination of desk-based assessment (DBA), setting study, archaeological and palaeoenvironmental risk modelling, and a staged programme of field-based archaeological and geo-archaeological evaluation.

9.4.2.2 Archaeological investigative fieldwork has been conducted in areas considered to have moderate or high potential for archaeological remains (see Appendices 9.2 to 9.6). Fieldwork has been carried out in stages. Stage 1 comprises geophysical, earthwork, fieldwalking and metal detecting surveys, Stage 1a geoarchaeological survey and Stage 2 trial trench evaluations. Fieldwork conducted to date is summarised in our EIA Scoping Report Section 9.3.8. In addition, Stage 1, Stage 1A and Stage 2 surveys will take place at further sites during 2023/24. Full fieldwork reports for Stage 1 and Stage 2 evaluations will be provided as Appendices to the Environmental Statement (ES).

9.4.2.3 The setting assessment follows the five stage approach defined by guidance published by Historic England (Historic England, 2017). Stage 1 and 2 of a setting assessment was carried out in 2022 to identify designated and non-designated assets where setting could potentially be affected by the project through visual effect, noise, dust, lighting or a change in land use (Appendix 9.1). The assessment identified 37 designated heritage assets which could potentially be affected by the construction phase of the project and 13 designated heritage assets which could potentially be affected during the operational phase and are therefore considered in this PEIR. In addition, available data on haul routes has been incorporated into the assessment of potential likely significant effects in this PEIR.

9.4.2.4 Further assessment to refine the list and identify likely significant effects (negative or positive) will take place as part of preparation of the ES when the design is sufficiently advanced to perform a more detailed assessment. The effect on surviving areas of historic landscape will also be assessed.

9.4.3 Assessment Methodology

9.4.3.1 Our assessment of likely significant effects is based on the baseline conditions, including sensitivity and importance of receptors, and the magnitude of change, including the severity or scale of change. The assessment for cultural heritage follows the guidance in the DMRB, Section LA104 (Highways England, 2020a). Specific examples of how this guidance relates to cultural heritage are given in our EIA Scoping Report, Section 9.7.

9.4.3.2 Following the Planning Inspectorate (PINS) EIA Scoping Opinion (dated 15 November 2022) ('the PINS Scoping Opinion'), our assessment methodology references the latest revision of the DMRB (LA104 referenced above). The environmental value is described in Table 3.2N of LA104, which defines the Value Sensitivity of Receptor/Resource and gives a typical description:

- Very High – Very high importance and rarity, international scale and very limited potential for substitution.
- High – High importance and rarity, national scale, and limited potential for substitution.
- Medium – Medium or high importance and rarity, regional scale, and limited potential for substitution.
- Low – Low or medium importance and rarity, local scale.
- Negligible – Very low importance and rarity, local scale.

9.4.3.3 The magnitude of change is described in Table 3.4N with a typical description:

- Major negative – Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements.
- Major positive – Large scale or major improvement of resource quality; extensive restoration; major improvement or attribute quality.
- Moderate negative – Loss of resource, but not adversely affecting integrity; partial loss of/damage to key characteristics, features or elements.
- Moderate positive – Benefit to, or addition of, key characteristics, features or elements; improvement of attributable quality.
- Minor negative – Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements.
- Minor positive – Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some positive effect on attribute or a reduced risk of negative effect recurring.
- Negligible negative – Very minor loss or detrimental alteration to one or more characteristics, features or elements.

- Negligible positive – Very minor benefit to or positive addition of one or more characteristics, features or elements.
- No change – No loss or alteration of characteristics, features or elements; no observable change in either direction.

9.4.3.4 The sensitivity of the receptor and the magnitude of change are then compared to the significance matrix set out in Table 3.8.1 of LA104 (Highways England 2020a), reproduced below in Table 9-2. Effects which are moderate or above are considered to be significant.

Table 9-2: Effects Significance Matrix

	No change	Negligible Magnitude	Minor Magnitude	Moderate Magnitude	Major Magnitude
Very high sensitivity	Neutral	Slight	Moderate or large	Large or very large	Very large
High sensitivity	Neutral	Slight	Slight or moderate	Moderate or large	Large or very large
Medium sensitivity	Neutral	Neutral or slight	Slight	Moderate	Moderate or large
Low sensitivity	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or moderate
Negligible sensitivity	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight

9.4.4 Assumptions and Limitations

9.4.4.1 In areas where the original ground surface is no longer present and any potential deposits have been made inaccessible or destroyed by quarrying or landfill, these have been recorded as having negligible archaeological potential. It is possible that very deep deposits under these areas may exist, however it is not expected that the project will affect these due to their depth.

9.4.4.2 Similarly, it is possible that very small areas of intact ground may exist at the margins of former quarry or landfill areas. Such areas have been evaluated where possible, but it is possible that some areas of unidentified intact ground containing archaeological remains exist.

9.4.4.3 Some areas of high archaeological potential could not be fully evaluated due to logistical issues, for example tree cover or use for access (Thames Path). These sites will be carefully investigated at the construction stage, with time and facilities to do this built into the programme.

9.4.4.4 The archaeological survey work is ongoing, a reasonable worst-case scenario has been adopted for the assessment in relation to unknown archaeological remains for all periods.

9.5 Key Environmental Considerations and Opportunities

9.5.1.1 The key considerations with respect to cultural heritage, archaeology and built heritage are:

- Scheduled Monuments, Registered Parks and Gardens, Listed Buildings, Conservation Areas and historic landscapes present in the cultural heritage study area are sensitive to changes in setting from new built development;
- Buried archaeological deposits identified by Historic Environment Records (HERs) as non-designated heritage assets (including AHAPs) or identified during archaeological evaluations in the cultural heritage study area are sensitive to damage, truncation and/or removal caused by development; and
- Buried archaeology not identified or not yet identified during archaeological evaluations is sensitive to damage, truncation and/or removal caused by development.

9.5.1.2 The key opportunities with respect to cultural heritage, archaeology and built heritage are:

- Potential to reduce flooding of Scheduled Monuments, Registered Parks and Gardens, and Listed Buildings;
- Potential to uncover further new archaeological and paleoenvironmental finds during construction of the project, thereby expanding the archaeological record of the River Thames floodplain;
- Potential outreach and wider dissemination associated with such finds; and
- Potential heritage input into project design, thereby enriching the River Thames environment, increasing community connections with

the historic landscape and further assisting wider dissemination and outreach.

9.6 Primary and Tertiary Mitigation

9.6.1 Primary Mitigation

9.6.1.1 The design of the RTS uses areas such as existing waterbodies created through gravel extraction, re-instated ground and areas of landfill where possible. This generally avoids undisturbed ground where archaeological remains are more likely to survive. Much of the channel, the majority of green open spaces and many of the priority areas for habitat creation, enhancement or mitigation are situated across land which has been heavily affected by gravel extraction such that there is little to no remaining potential for the preservation of archaeological or palaeoenvironmental remains.

9.6.1.2 An integrated landscape design process approach is being pursued which aims to sensitively integrate all project components within the existing landscape. For construction this will consider the sensitive locating of material stockpiles and screening of construction components. For operation this will include consideration of landscape design and planting in relation to setting of Scheduled Monuments, material finishes to buildings and structures and the form and contouring of raised earthwork profiles into the existing landform, which will reduce visual effects on the setting of heritage assets.

9.6.2 Tertiary Mitigation

9.6.2.1 The following tertiary mitigation is proposed in relation to the cultural heritage, archaeology and built heritage effects assessed within our PEIR. Some of these measures will also serve as mitigation in respect of other EIA topics:

- A Hydro(geo)logical Risk Assessment to evaluate the environmental risk of pollution of groundwater from contaminated soils, in accordance with the Water Resources Act 1991. This will also inform the assessment of effects on archaeology that may result from changes to groundwater.

- A Construction Traffic Management Plan to ensure all highways works are safe, planned and co-ordinated in order to secure the expeditious movement of traffic on the road network; and to minimise inconvenience to the public. This will reduce effects on setting of heritage assets from construction traffic movements.
- A staged approach to archaeological evaluation including:
  - Stage 1 non-intrusive investigations;
  - Stage 1a geoarchaeological investigations; and
  - Stage 2 trial trenching.

9.6.2.2 Archaeological evaluation works will not reduce the likely significant effect as remains will still be damaged or removed, but it is a recognised approach to archaeological mitigation to recover as much information as possible prior to the loss of the receptor.

9.7 Preliminary Assessment of Likely Significant Effects

9.7.1 Introduction

9.7.1.1 Our PEIR adopts a precautionary approach. Assessments reported within this chapter are a preliminary assessment of potential likely significant environmental effects based on the design parameters set out in Chapter 2 Project Description. This precautionary approach has been taken for the PEIR as there is some information on the project that is currently incomplete and the parameters within Chapter 2 are high level and account for a range of uses and allowance for design development within a boundary that could possibly be refined once this work has been completed. For example, some designs, construction and mitigation details (and therefore also land requirements) or baseline information is still required from further surveys, assessments and/or consultation feedback. In making a determination of likely significant effects, we have considered the sensitivity of receptors (a receptor being a feature of the environment that responds to change) and the potential magnitude (i.e. size) of change caused by the RTS. The methodology for defining sensitivity and magnitude varies by topic and are defined in Section 9.7 of our EIA Scoping Report and updated in Section 9.4.3 above.

9.7.1.2 We are committed to including mitigation measures as necessary to address likely significant negative environmental effects as far as reasonably practicable. Both primary and tertiary mitigation are

considered to form part of the RTS; those applicable to this topic are set out in Section 9.6. Several of these mitigation measures are still being developed, and therefore as a precaution, the preliminary assessment of effects for our PEIR does not assume full achievement of these in considering if a project effect is likely to be significant (Appendix 4.2 identifies the implementation status of primary and tertiary mitigation for the PEIR assessment). Furthermore, the potential likely significant effects reported within our PEIR have been assessed prior to the implementation of secondary mitigation measures, those applicable to this topic are set out in Section 9.7.5. These secondary mitigation measures are the subject of further development; and given they are still being developed, are not able to be applied to develop a 'residual' effects assessment.

9.7.1.3 Our PEIR is based on the latest design and construction parameters and baseline information. As such the findings of the preliminary environmental appraisal presented within our PEIR may be subject to change as the design progresses, as mitigation is further developed or information from further studies, such as staged archaeological evaluation, becomes available. The final assessment of effects undertaken as part of the EIA and reported within the ES will be based on the latest information at that time.

9.7.2 Potential Likely Significant Effects

9.7.2.1 Our preliminary assessment of likely significant environmental effects has identified the potential for the following significant effects from construction in relation to cultural heritage:

- Permanent damage to buried archaeology and palaeoenvironmental deposits at Scheduled Monuments from habitat creation: Chertsey Abbey, specifically the cemetery identified to the north of the Abbey River where there are proposed works to the banks and also the habitats creation at the Earthworks on Laleham Burway.
- Permanent damage to buried archaeology from excavation, through truncation and/or removal of the extant remains at known sites: Roman or early medieval fish weir at Ferry Lane Lake (also known as Ferris Meadow Lake); a range of archaeological deposits at Abbey Meads Dry Floodway (Bronze Age drainage network, Mesolithic to Bronze Age flint scatters, preserved wooden structures from the Iron

Age and medieval period, Medieval stock enclosure, Post-Medieval wooden structures; medieval ridge and furrow; Roman period remains); Late Upper Palaeolithic flint scatter at Land South of Wraysbury Reservoir from planting; at Desborough Island Late Neolithic to Bronze Age deposits and other undated features; Mesolithic/Neolithic artefacts at Land between Desborough Cut and Engine River; and Medieval boundary of Oatlands Park.

- Permanent damage to buried or riverbed archaeology: Deposits in the Abbey River from improvements, particularly Medieval deposits; in-channel sediments and deposits in the River Thames at fish-passes, weirs and bed lowering downstream of Desborough Cut.
- Permanent damage to buried archaeology from excavation, habitat creation and/or sheet piling: Truncation and/or removal of organic remains and artefacts from palaeochannels, which can provide dating evidence and be used for re-creation of past landscapes.
- Permanent damage to buried archaeology from excavation, habitat creation and/or sheet piling: Truncation and/or removal of waterlogged deposits which could preserve organic remains.
- Permanent damage to buried archaeology from excavation and other construction activities: Truncation and/or removal of previously unknown remains: Palaeolithic, Mesolithic, Neolithic, Bronze Age, Iron Age, Romano-British, Early medieval, Medieval, Post-medieval.
- Temporary negative effect on historic landscape and setting at Scheduled Monuments from construction activities: Chertsey Abbey and Abbey Meads; Large Univallate Hillfort and 14th Century Chapel at St Ann's Hill Scheduled Monument; Chertsey Bridge.
- Temporary negative effect on setting from construction activities at Registered Parks & Gardens: St Ann's & The Dingle, Garrick's Villa.
- Temporary negative effect on setting from construction activities at Conservation Areas: Chertsey, Shepperton, Lower Sunbury, Hampton Village, East Molesey Kent Town, Hampton Court Green, Riverside North, Teddington Lock, Lower Halliford.
- Temporary negative effect on setting from construction activities of Listed Buildings: Grade I – Garrick’s Villa, Garrick's Shakespeare Temple Royal Mews and Great Barn; Grade II* St Mary's Church; Grade II - remains of St Ann's Chapel, St Ann's Hill and St Ann's Cottage, Dovecote in farmyard of Abbey Bridge, Abbey Farm Barn, Bridge and Remains of Abbey Mills Chertsey Lock Cottage, Chertsey

Bridge, Eyot House (D'Oyly Carte Island), Garrick's House, War Memorial (Molesey Wier), Old Office House, Mitre Hotel, Hampton Court Bridge, Boathouse (Teddington Weir), Teddington Footbridge.

9.7.2.2 Our preliminary assessment of likely significant environmental effects has identified the potential for the following significant effects from operation in relation to cultural heritage:

- Permanent damage to buried archaeology: A change in ground water levels adjacent to the new channels might have a negative effect on the preservation of unknown buried archaeology: Palaeolithic, Mesolithic, Neolithic, Bronze Age, Iron Age, Romano-British, Early medieval, Medieval, Post-medieval.
- Permanent negative effect on setting of Conservation Areas from creation of new green open spaces and changes such as new sculptural landforms or lighting: Shepperton, Egham, Staines, Egham Hythe, Lower Halliford and Manygate Lane.
- Permanent negative effect on setting of St Peter's Church Grade II from creation of new green open spaces and changes such as new sculptural landforms or lighting.
- Positive effect on users: Heritage is a consideration in design e.g. new green open spaces. Interpretation, research outputs and information produced by archaeological works will increase understanding of the heritage of the area, and appreciation of assets.
- Positive effect on setting of the Earthworks on Laleham Burway Scheduled Monument as former golf course contributes very little to its significance and habitat creation presents an opportunity to improve the setting of the asset.

9.7.2.3 Further details of the potential likely significant effects from construction and operation with respect to receptors, project components and project activities, in relation to cultural heritage can be found in Table 1 and 2 in Appendix 9.7.

9.7.3 Potential Likely Non-Significant Effects

9.7.3.1 Further details of the non-significant effects from construction and operation with respect to receptors, project components and project activities, in relation to cultural heritage can be found in Table 3 and 4 in Appendix 9.7.

9.7.3.2 Some examples of non-significant Cultural Heritage, Archaeology and Built Heritage effects include (this is not an exhaustive list):

- Temporary negative effects on setting of Laleham Burway Scheduled Monument, some Conservation Areas (Hampton Court Park, Hampton Wick, Laleham, Normansfield, Thorpe) and other assets.
- Permanent positive effects on designated and non-designated heritage assets from a reduction in flood risk.

9.7.4 In-Combination Climate Impact

9.7.4.1 Consideration of 'In-Combination Climate Impact' (ICCI) has been undertaken. The preliminary environmental assessment has considered a future climate scenario and has determined that the potential likely significant environmental effects identified for this topic are unlikely to be exacerbated further by climate change. Further consideration of ICCI will be included in the ES.

9.7.5 Secondary Mitigation

9.7.5.1 As noted in Section 9.7.1.2, primary and tertiary mitigation are still being developed, and therefore as a precaution, the preliminary assessment of effects for our PEIR does not assume full achievement of these in considering if a project effect is likely to be significant. Furthermore, the potential likely significant effects reported within our PEIR have been assessed prior to the implementation of secondary mitigation measures. For the majority of the identified likely significant environmental effects it is considered likely that the primary and tertiary mitigation will be sufficient at ES stage such that no secondary mitigation will be required. Where secondary mitigation is already under consideration for potential significant environmental effects, this is detailed below.

9.7.5.2 In order to reduce the magnitude of significant effects, a Historic Environment Management Plan (HEMP) is proposed. This comprises a written scheme of investigation (WSI) document detailing secondary mitigation measures. Measures could include strip, map and sample, bespoke archaeological excavation, geoarchaeological investigation and palaeoenvironmental sampling, and archaeological monitoring.

9.7.5.3 Further design is needed to mitigate effects on heritage. For example, the setting of some heritage assets and elements of historic landscapes may be negatively affected by the project. Stage 3 of the setting study will lay out steps where this can be avoided or reduced through further iteration of the design where possible.

9.8 Further Work for the EIA

9.8.1.1 The staged approach to archaeological investigations will continue throughout 2023/2024 to further inform the baseline data. Stage 1 and 1a works are planned at Land South of Wraysbury Reservoir, Abbey River, Grove Farm, Land South of Chertsey Road and Land Between Desborough Cut and Engine River. Stage 2 trial trenching works are currently planned at the former Laleham Golf Course. As design progresses, areas of high archaeological potential which could be affected by intrusive works, compression or changes in groundwater levels and which have not been assessed, would also be subject to the staged approach. Locations where this is not possible, for example where access or water levels do not permit investigation, would be identified and covered by the HEMP.

9.8.1.2 The 2022 setting assessment identified heritage assets which would potentially be affected during the construction and operational phases and preliminary consideration of this has informed this PEIR. The setting study will be refined to consider final design, ZTV analysis and issues such as type of lighting that could give rise to likely significant effects to heritage assets. As assessments will be further progressed, this will also take into account baseline assessments regarding noise and haul routes.

9.8.1.3 Buildings are proposed to be demolished at the upstream end of the Runnymede Channel and potentially also at Sheepwalk. An initial assessment using aerial photography and maps has shown that these are modern buildings with no historic value. This will be checked on the ground during the next phase of the setting study.

9.8.1.4 We consider that the further development of the project design and mitigation measures which will be reflected in the ES and DCO application, will enable a reduction in the scale of identified negative likely significant effects set out in this chapter.

10 Flood Risk

10.1 Introduction

10.1.1.1 This chapter of our Preliminary Environmental Information Report (PEIR) considers the effects from construction and operation of the River Thames Scheme (RTS) ('the project') in relation to flood risk. Within this chapter we have included topic specific sections on:

- Legislation, policy and guidance (noting any changes since the RTS Environmental Impact Assessment (EIA) Scoping Report (Environment Agency and Surrey County Council, October 2022) ('the EIA Scoping Report');
- Engagement with consultees, including responses to comments received on the RTS EIA Scoping Report;
- The assessment methodology for this topic (again noting any changes or updates since EIA scoping);
- Key environmental considerations and opportunities,
- Primary and tertiary mitigation;
- Our preliminary assessment of effects;
- Secondary mitigation; and
- Future work for this topic of the EIA.

10.1.1.2 For a summary of the key baseline elements associated with flood risk see Section 5.6.

10.1.1.3 An explanation of the topic study area can be found in Section 10.2.3 of our RTS EIA Scoping Report. The study area is the area within the project boundary for EIA PEIR, plus a 500 metre buffer or the area within the 1:100 year floodplain (i.e. the area with a one per cent chance of flooding in any given year) that benefits from the RTS, whichever is the greater. The study area is therefore slightly different to that presented in our EIA Scoping Report due to minor changes in the project boundary for EIA PEIR (the flood risk study area is shown in Figure 5.8).

10.1.1.4 Given the flood alleviation goal of the RTS and the site setting largely within the floodplain, the flood risk overlaps with most other environmental topics and these chapters should be read in conjunction with this chapter.

10.2 Legislation Policy and Guidance

10.2.1.1 A summary of the key legislation, policy and guidance relevant to flood risk is provided in Appendix M of our EIA Scoping Report.

10.2.1.2 There have been no significant changes made to the relevant legislation since the EIA Scoping Report, policy, and guidance for flood risk, based on a review we have undertaken for this PEIR.

10.2.1.3 Since the publication of our EIA Scoping Report in October 2022 the National Policy Statement (NPS) for Water Resources Infrastructure (Defra, 2023) has been updated and finalised. There is little change that would alter the assessment of flood risk as stated in our EIA Scoping Report. Nevertheless, the finalised NPS acknowledges that reservoirs can be used to store floodwater in some circumstances and that operational aspects of infrastructure can be adapted during critical flood risk periods to mitigate flooding impacts; as noted in Chapter 2: Project Description, we are exploring opportunities to adapt Thames Water's abstraction regime in times of flooding through an operating protocol.

10.2.1.4 The NPS effectively reinforces the National Planning Policy Framework (NPPF) (2023 as updated) and Planning Policy Guidance (PPG) (2023 as updated) flood risk requirements.

10.2.1.5 The UK government has also announced that it will implement Schedule 3 to the Flood and Water Management Act 2010 that will mandate sustainable drainage systems (SuDS) in new developments in England for 2024. It is understood that Defra will carry out a consultation to collect views on the impact assessment, national standards and statutory instruments during 2023. This will be monitored, but the RTS is being designed to optimise the use of SuDS. This is integral to the reduction in flood risk overall.

10.3 Engagement

10.3.1 Responses to EIA Scoping

10.3.1.1 Table 10-1 below summarises the comments and responses received on our EIA Scoping Report following formal submission to the Planning Inspectorate (PINS) including the PINS EIA Scoping Opinion (date 15 November 2022) ('the PINS Scoping Opinion') and any key comments

received from statutory consultees. Full consultee comments on our EIA Scoping Report and our responses to these comments are provided in Appendix 4.1.

Table 10-1: Responses to comments received on the EIA Scoping Report

Consultee or Organisation	Summary of Comment	Project Response
PINS	The EIA Scoping Report proposes that [construction works in and around waterbodies] will be secured through the CEMP and flood risk activities permit and will be informed by more detailed hydraulic modelling. The Inspectorate does not agree to scope this matter out without further information on the required mitigation to evidence that this would not lead to a likely significant effect.	Noted. We have considered this in the PEIR and will assess it within the Environmental Statement (ES) and proposed mitigation described.
PINS (and similar from LPA Planners Group and Environment Agency Sustainable Places)	The ES should assess impacts/effects from flood risk to third party land from the storage of materials on site where significant effects are likely to occur. Should any related mitigation be required this should be detailed in the ES and secured via the Development Consent Order (DCO).	We have already included within the EIA scope the assessment of construction stage flood risk resulting from temporary changes in land levels, in particular for stockpiles and processing areas (see Sections 10.4.1.1 and 10.7.3.2 of the EIA Scoping Report).
PINS	The Scoping Report states that the Flood Risk Assessment (FRA) will assess relevant effects from changes to flood flows downstream of the channels. As this impact is dependent on the outcomes of the sediment and hydraulic modelling, the Inspectorate does not have enough information to scope this matter out. The ES should assess significant effects from	As noted in Section 10.7, the RTS will have a significant positive effect on flood risk during operation, through significant reductions in flood levels and extents. There will be no increase in fluvial flood levels during operation at any location in any flood conditions and we therefore consider that effects on flood flows downstream can remain scoped out of the EIA. The Flood Modelling Report Non-Technical Summary (WBi, 2023) and

Consultee or Organisation	Summary of Comment	Project Response
	flood risk during operation where they are likely to occur.	detailed report issued as part of our materials for statutory consultation explain the fluvial hydraulic modelling that verifies this.
PINS	The ES should describe how the scheme alters drainage patterns and flood risk from all sources across the study area, with reference to hydraulic modelling in the FRA. Any significant effects arising from these changes should be reported in the ES.	Our FRA will address all relevant sources of flooding posed to and from the project for all stages of the project (including operation) for the intended lifetime of the RTS; this will be NPPF and PPG compliant. The FRA will be presented alongside the ES.
PINS	Long-term maintenance activities required to ensure that the design profile is maintained are not described…. in the absence of further details regarding the extent and nature of such effects, the Inspectorate does not consider that this matter may be scoped out. The ES should … provide an outline of the operational maintenance plan, demonstrating how this would mitigate likely significant effects.	Maintenance of the channel to restore the design profile has been scoped into this topic in response to the PINS scoping opinion. An outline of the operational maintenance plan will be provided alongside the DCO application.
LPA Planners Group	It is noted that a peak flow value of 150m3/s has been stated as a design value for the new channel. It is not clear what return period is the scheme being designed to / protect against (if applicable)?	The River Thames Scheme does not have a specific design standard - the benefit provided varies depending on location. The flood channel will work most effectively in moderate flood magnitudes such as the 1:20 year annual chance flood, which is similar to the observed 2003 and 2014 floods. However, the channel will continue to reduce flood depths and extent in much more extreme floods.
LPA Planners Group	Level for level floodplain compensation should be	There will be no loss of floodplain storage overall. Flood compensation will be incorporated where more

Consultee or Organisation	Summary of Comment	Project Response
	provided for any loss of floodplain storage capacity.	localised needs are identified by the hydraulic modelling and the FRA process and mitigation is required.
LPA Planners Group	Evidence should be provided within the FRA that the components of the RTS are located in appropriately compatible Flood Zones as per PPG Table 2.	The FRA will demonstrate how the most up to date flood risk policy has been addressed for all aspects of the RTS.
LPA Planners Group (and similar from Environment Agency Sustainable Places)	Will the FRA include analysis of sensitivity testing of structures (i.e. blockage scenarios of any new bridge crossings/culverts, sedimentation)?	The FRA will include appropriate sensitivity testing for the infrastructure used for the RTS.
LPA Planners Group	How will the Flood Zones be defined? (i.e. as the definition ignores the presence of formal defences, will the baseline flood zones remain as the pre-construction scenario or will a new baseline be defined post construction e.g. based on a reduced scheme operation?).	The RTS will result in a defended flood outline (area that benefits from the RTS) which is standard when new flood infrastructure is completed, and the performance verified. The planning flood zones will not change as a result. Relevant process will be followed in consultation with the relevant authorities.
LPA Planners Group	The Environment Agency are considering the updated definition of Flood Zone 3b Functional Floodplain to the 1 in 30 annual probability flood event (rather than 1 in 20). It is assumed this change would only formally take place once the revisions have passed through local planning policy documents (i.e. Strategic Flood Risk Assessments (SFRAs)).	The Environment Agency has confirmed that we should use the 1 in 30 year annual probability flood for Flood Zone 3b, which therefore by default already includes the 1 in 20. It is at the discretion of those preparing SFRAs if they use the Environment Agency's 1 in 30 year annual probability flood event or a different approach to designating their functional floodplain, as per guidance on preparing SFRAs.
LPA Planners Group	The study area is stated as the 'upstream and downstream boundaries of the 1:100 year floodplain to be affected by the	The study area was set to accord with the planning flood zones - i.e. the Flood Zone 3 planning extent is defined by the 1:100 year floodplain.

Consultee or Organisation	Summary of Comment	Project Response
	project' as defined in Figure 10.1. This should include climate change impacts.	RTS is also assessing the effects of climate change on flood risk (the 1:100 year floodplain + 35% climate change allowance as shown in Figure 5.11).
Environment Agency Sustainable Places	The Scoping Report indicates that the principle for the scheme … was established through the Lower Thames Flood Risk Management Strategy (LTFRMS) which was finalised after consultation in 2009. The EIA Scoping Report should justify why the LTFRMS is still an up to date and appropriate assessment of alternative flood risk management strategies.	The work done as part of the Strategic Outline Case (approved in 2017) and the Outline Business Case (approved in 2020) demonstrate that the LTFRMS is still an up to date and appropriate assessment of alternative flood risk management strategies and this will be discussed further in the DCO application.
Environment Agency Sustainable Places	We recommend that the scheme employ an adaptive approach regarding climate change and would encourage ongoing evaluation of the scenarios being used to inform the project as new information becomes available.	Hydraulic modelling will use the most up to date climate scenarios. The project has been designed to address the fact that the channels, for example, will be used more in the future as a result of climate change.
Environment Agency Sustainable Places	We are pleased to see that there is a discussion of fluvial and tidal interactions, and that modelling will look at effects downstream of Teddington Lock. The applicant should consider whether plans on other parts of the Thames could impact on the RTS. For example, the Thames Estuary 2100 Plan.	We are considering other relevant plans and operations in the FRA and Thames Estuary 2100 will be considered in the assessment of cumulative effects.

10.3.2 Other Engagement Since EIA Scoping

10.3.2.1 Section 10.2.2 of our EIA Scoping Report summarises the stakeholder engagement relevant to the Flood Risk topic that was undertaken prior to submission of the EIA Scoping Report.

10.3.2.2 Since EIA Scoping, we held a meeting with the Environment Agency National Infrastructure Team in October 2023 to discuss the approach the RTS is taking to the Flood Risk Assessment (FRA) and the Sequential Approach being taken to design project in accordance with flood risk policy (as discussed in Section 10.6.2).

10.3.2.3 We held a meeting with the LPA Project Group in September 2023 to present the content of our Flood Modelling Report Non-Technical Summary (WBi, 2023) to planning officers. Engagement with the LPA's has also been ongoing to understand the status of Strategic Flood FRAs produced by the LPAs as updates to these are known to be upcoming.

10.3.2.4 We have ongoing meetings with both Thames Estuary 2100 and the Environment Agency operations teams for the Thames Barrier to help refine the inputs to the fluvial model and understand the potential for future operational changes.

10.3.2.5 Stakeholder working groups have also been set up with communities and meetings held to discuss important anecdotal flooding challenges and access invaluable knowledge of local conditions which are critical to the flood risk assessment. These meetings have also provided the opportunity to explain the fluvial flood modelling, project design and next steps.

10.4 Methodology

10.4.1 Introduction

10.4.1.1 This section should be read in conjunction with Chapter 4 'Approach to the Environmental Assessment' which sets out relevant information on the design parameters and information that have informed our PEIR assessment, and how we have approached various aspects of the assessment including:

- The scope of the assessment;
- The methodology (including the approach to defining the baseline environment, topic study areas, and assessment methodology and criteria);
- The approach to mitigation; and
- The approach to cumulative effects.

10.4.1.2 Our baseline methodology for flood risk is documented in Section 10.2 of our EIA Scoping Report, including a summary of the information sources and engagement that has informed this.

10.4.1.3 The assessment methodology we have used for the Flood Risk topic in this PEIR, and to be used in the Environmental Statement (ES), is presented in Section 10.7 of our EIA Scoping Report, and is expanded and updated by the information in Section 10.4.3.

10.4.2 Baseline Methodology

10.4.2.1 We have completed extensive fluvial hydraulic (flood) modelling to understand the flood risk baseline conditions, develop, test, and refine the design of the RTS, and inform our assessments. This is the most up to date modelling of the current fluvial flooding regime for the Lower Thames and its tributaries and is being reviewed and agreed by the Environment Agency in its regulatory role.

10.4.2.2 We are using the modelled fluvial baseline (i.e. without the RTS in place) as the starting point for our environmental assessments, including those considered in this PEIR. In due course this baseline will be used to update the Environment Agency's online flood map for planning.

10.4.2.3 Our PEIR provides up to date modelled fluvial flood extents to demonstrate a) current flood risk without the project and b) future flooding with the project, under different flood return periods / scenarios, including an allowance for climate change.

10.4.2.4 We are undertaking ongoing flood modelling work, such as testing the refined landscape design, which continues to inform the RTS design decisions; the model is therefore subject to further refinement to optimise the hydraulic performance of the RTS and will be reported on in the ES. Information on the background, development, testing, and confidence of our fluvial modelling is presented in our Flood Modelling Report Non-Technical Summary (WBi, 2023).

10.4.2.5 We are also investigating flood risks from groundwater and surface water runoff. Our fluvial hydraulic model does not represent surface water and groundwater flooding – alternative modelling approaches are being used for those flood mechanisms. Preliminary modelling which couples the surface water and groundwater levels and flows is being used to inform

our PEIR and to determine the need for additional modelling and design input to jointly review potential effects on water quality, quantities, and flood risk.

10.4.3 Assessment Methodology

10.4.3.1 We are assessing flood risk in terms of the NPPF, Lead Local Flood Authority (LLFA) and LPAs approach, which assesses all relevant sources of flooding posed to and from the RTS for the lifetime of the project. The NPPF Annex 3 groups land uses into a range of flood risk vulnerability classifications (DLUHC, 2021). These classifications include essential infrastructure, highly vulnerable uses (such as basement homes and police stations), more vulnerable (such as hospitals, houses and places of education), less vulnerable (such as shops and restaurants) and water compatible development (such as outdoor recreational areas and wildlife sites). Our assessment uses these classifications to determine the sensitivity of flood risk receptors, as noted in Section 10.7 of our EIA Scoping Report.

10.4.3.2 We are undertaking a detailed NPPF compliant technical FRA (with Environment Agency approved modelling) and drainage assessment report that will form part of the appendices to the ES. We are undertaking the FRA iteratively as the design of the RTS progresses to ensure that there is no increase in flood risk from the operation of RTS and that any temporary loss in floodplain storage during construction is mitigated for. This will also include the need for construction methodologies that account for works being undertaken in a floodplain.

10.4.3.3 As noted in Section 10.3.1, PINS provided a response within its EIA Scoping Opinion (dated 15 November 2022) (‘the PINS Scoping Opinion’), which included the following requirements that have now been scoped into the EIA. We have included these requirements in this PEIR and they are part of our ongoing assessment to inform the ES and FRA as appropriate:

- To assess flood risk from construction stage elements in and around waterbodies such as cofferdams;
- To describe in the ES how the RTS alters drainage patterns and flood risk from all sources across the study area;

- To scope in the effects on flood risk from maintenance of the flood channel to restore the design profile; and
- To not scope out the effects from changes to flood flows downstream of the channels without the results of the sediment modelling and subsequent hydraulic modelling.

10.4.3.4 The PINS Scoping Opinion also noted that changes to flood flows downstream of the channels are dependent on the outcomes of the sediment and hydraulic modelling and that the ES should assess significant effects from flood risk during operation where they are likely to occur. As noted in The Flood Modelling Report Non-Technical Summary (WBi, 2023) there will be no increase in fluvial flood levels during operation at any location in any flood conditions and we therefore consider that effects on flood flows downstream can remain scoped out of the EIA.

10.5 Key Environmental Considerations and Opportunities

10.5.1.1 The key considerations with respect to flood risk are:

- The need to ensure that the project will be safe for its lifetime, without increasing flood risk elsewhere, particularly downstream;
- A large portion of the project is in the functional floodplain (Flood Zone 3b). Construction of infrastructure schemes in flood prone and damp areas is inherently challenging; and
- The government's NPPF and PPG place numerous restrictions on development in the floodplain - the most vulnerable development needs to be in areas of lowest flood risk, unless there are overriding reasons to prefer a different location, therefore a Sequential Approach needs to be taken for the project as a whole.

10.5.1.2 The key opportunities with respect to flood risk are:

- Increased flood resilience for an area of low lying floodplain that has no defences or future resilience;
- A reduction in fluvial flood risk within the study area;
- A reduction in surface water flooding through drainage design and new SuDS; and
- Removal of some "More Vulnerable" uses such as certain areas of landfill from the floodplain.

10.6 Primary and Tertiary Mitigation

10.6.1 Primary Mitigation

10.6.1.1 Flood risk reduction is one of the project core goals, hence most mitigation is already embedded.

10.6.1.2 We are applying the Sequential Approach to the design of the project, as defined by the NPPF, that seeks to reduce flood risk through sensitive positioning and design of project elements. This approach is the same for all developments: i.e. all elements of a project need to be located in the lowest flood risk area possible (with an appropriate assessment of alternatives) and designed to be in an appropriate flood setting relative to their sensitivity and they should not increase flood risk on or off site. Specifically, our Sequential Approach to design of the RTS includes:

- Application of the Sequential Test and Exception Test (if required) i.e. to evaluate and prioritise project components in the lowest flood risk areas;
- Consideration of all relevant sources of flooding posed to and from the project; and
- Avoiding increase in flood risk during different phases of construction (which includes preventing the displacement of flood flow pathways from surface water and groundwater sources).

10.6.1.3 As an example of how we are applying the Sequential Approach, the layout and design of the new green open spaces is being designed with reducing flood risk as a core input, including ensuring existing flood flow pathways are accommodated where appropriate and new pathways are created to direct flood water to lower risk areas and therefore further reducing flood risk to sensitive receptors.

10.6.1.4 The design of our construction surface water drainage system, including temporary SuDS / specific plant (pumps / tanks) and storage and restricted conveyance of stormwater are an important part of our primary mitigation for managing surface water flooding from construction and operation stages of the project, and will also mitigate negative effects to water quality. Our drainage strategy design is ongoing, including an appropriate allowance for climate change.

10.6.1.5 Our integrated landscape design process has flood risk management as a key design input. The design is ongoing and includes, for example, during construction sensitively locating and orienting materials stockpiles and areas of temporary compensatory flood storage to mitigate flood risk, and for operation, considering the form and contouring of raised earthwork profiles and locating activities within public spaces in accordance with NPPF and PPG flood risk requirements.

10.6.1.6 Our primary mitigation also includes specific design elements to reduce flood risk, such as altering the water level control structure from St Ann's Lake to Abbey Lake to divert floodwaters to reduce flood risk from the Chertsey Bourne, plus silt monitoring and maintenance in targeted locations of the flood channel to restore the design profile and ensure the flood channel can continue to operate effectively.

10.6.2 Tertiary Mitigation

10.6.2.1 The following tertiary mitigation is proposed in relation to the flood risk effects assessed within our PEIR to address the fact that the works are taking place in a floodplain.

- We will produce a specific Construction Surface Water Management Plan to address the effects of the temporary changes to land drainage of the work areas; this will include the minimisation of impermeable areas, careful management of surface water runoff and the required response for safe operations during storm events;
- We will also develop a construction flood protocol together with an Emergency Response Plan such that the construction can be managed safely in the floodplain, including for example flood warnings, evacuation and refuge requirements; and
- We will follow flood consenting regime requirements, pursuant to drafting in the DCO, responding to the fact that much of the project will be undertaken in the floodplain.

10.7 Preliminary Assessment of Likely Significant Effects

10.7.1 Introduction

10.7.1.1 Our PEIR adopts a precautionary approach. Assessments reported within this chapter are a preliminary assessment of potential likely significant

environmental effects based on the design parameters set out in Chapter 2 Project Description. This precautionary approach has been taken for the PEIR as there is some information on the project that is currently incomplete and the parameters within Chapter 2 are high level and account for a range of uses and allowance for design development within a boundary that could possibly be refined once this work has been completed. For example, some design, construction, and mitigation details (and therefore also land requirements) or baseline information is still required from further surveys, assessments and/or consultation feedback.

10.7.1.2 In making a determination of likely significant effects, we have considered the sensitivity of receptors (a receptor being a feature of the environment that responds to change) and the potential magnitude (i.e. size) of change caused by the RTS. The methodology for defining sensitivity and magnitude varies by topic and are defined in the topic sections of our EIA Scoping Report.

10.7.1.3 We are committed to including mitigation measures as necessary to address likely significant negative environmental effects as far as reasonably practicable. Both primary and tertiary mitigation are considered to form part of the RTS; those applicable to this topic are set out in Section 10.6. Several of these mitigation measures are still being developed, and therefore as a precaution, the preliminary assessment of effects for our PEIR does not assume full achievement of these in considering if a project effect is likely to be significant (Appendix 4.2 identifies the implementation status of primary and tertiary mitigation for the PEIR assessment). Furthermore, the potential likely significant effects reported within our PEIR have been assessed prior to the implementation of secondary mitigation measures, those applicable to this topic are set out in Section 10.7.5. These secondary mitigation measures are the subject of further development; and given they are still being developed, are not able to be applied to develop a ‘residual’ effects assessment.

10.7.1.4 Our PEIR is based on the latest design and construction parameters and baseline information. As such the findings of the preliminary environmental appraisal presented within our PEIR will be subject to change as the design progresses, as mitigation is further developed or information from further studies becomes available, such as our Sequential Approach to design the project in accordance with flood risk policy. The final assessment of effects undertaken as part of the EIA and

reported within the ES will be based on the latest information available at that time.

10.7.2 Potential Likely Significant Effects

10.7.2.1 Our preliminary assessment of likely significant environmental effects prior to the implementation of secondary mitigation, developed as a mandatory part of a compliant FRA, has identified the potential for temporary negative effects from construction on all NPPF classes of vulnerability to flooding. This results from temporary changes to floodplain storage and flow paths, thus potentially changing the risk to levels and extents of flooding from rivers and surface water. The FRA is an ongoing process, and these effects are a focus of the design optimisation and development of secondary mitigation if required.

10.7.2.2 Our preliminary assessment of the likely significant environmental effects prior to the implementation of secondary mitigation has identified the potential for effects from operation on flood risk, as follows:

- Potential permanent positive effects on all NPPF classes of vulnerability to flooding from an overall reduction in flood risk from all sources (the modelled predicted changes in fluvial flood extents are shown for a range of flood return periods in Figures 5.9 to 5.12); and
- Potential permanent negative effects on all NPPF classes of vulnerability to flooding due to potential permanent changes to groundwater flows causing an increase in flood risk due to permanent barriers as part of the RTS, including sheet piling. These effects are highlighted at this stage because the relevant data gathering, design assessments and FRA are ongoing.

10.7.2.3 Further details of the potential likely significant effects from construction and operation with respect to receptors, project components and project activities, in relation to flood risk can be found in Table 1 and 2 in Appendix 10.1.

10.7.3 Potential Likely Non-Significant Effects

10.7.3.1 Effects from construction considered to be non-significant with respect to flood risk are due to the movement of construction vehicles, equipment and operatives (off site), as noted in Table 3 in Appendix 10.1. No non-significant operation effects were identified in relation to flood risk.

10.7.4 In-Combination Climate Impact

10.7.4.1 We have considered 'In-Combination Climate Impact' (ICCI). Our preliminary environmental assessment has considered a future climate scenario. Potential likely significant positive flood risk effects during operation would be influenced by predicted climate change, essentially by affecting the frequency with which the channel is operated in times of flooding. Further consideration of ICCI will be included in the ES.

10.7.5 Secondary Mitigation

10.7.5.1 As noted in Section 10.7.1.2, primary and tertiary mitigation are still being developed, and therefore as a precaution, the preliminary assessment of effects for our PEIR does not assume full achievement of these in considering if a project effect is likely to be significant. Furthermore, the potential likely significant effects reported within our PEIR have been assessed prior to the implementation of secondary mitigation measures. For the majority of the identified likely significant environmental effects it is considered likely that the primary and tertiary mitigation will be sufficient at ES stage such that no secondary mitigation will be required. Where secondary mitigation is already under consideration for potential significant environmental effects, this is detailed below.

10.7.5.2 Given flood risk reduction from all sources is a core project goal, most mitigation is already included through the primary or tertiary measures noted in Section 10.6. Our ongoing assessment and design of the construction stage is being undertaken to ensure any temporary increase in flood risk will be avoided or mitigated.

10.7.5.3 The uncertainty of impacts on groundwater flows and levels that we have highlighted as part of the current assessment is being investigated using monitoring data and engineering impacts currently understood given the stage of the project. We will be developing secondary mitigation measures, where required, to avoid increased groundwater flooding during operation of the RTS, and these may require additional modelling, monitoring and further input to engineering designs to inform the ES.

10.8 Further Work for the EIA

10.8.1.1 Our next steps for the flood risk element of the EIA are to continue the FRA process and the Sequential Approach of embedding the reduction of flood risk into the design of all project components. This includes addressing the relevant interactions with other environmental disciplines in terms of the likely significant effects and importantly demonstrating the appropriate accommodation of climate change for all sources of flooding.

10.8.1.2 Our FRA and associated drainage assessment will be a technical appendix of the EIA. The appendices of the FRA will document the detailed modelling and methodologies. The FRA will document the flood risk reduction performance of the project as a whole and the proposed mitigation.

10.8.1.3 Ongoing engagement with, for example, the Environment Agency National Infrastructure Team (NIT), LPAs, the Thames Barrier and Thames Estuary 2100 teams, landowners, local community groups and the LLFA is required to ensure the FRA and EIA have the most comprehensive and up to date data for all flood sources, especially more recent records of flood incidents and other flood related projects. The FRA will help ensure policy is appropriately updated as local policies and plans are renewed. The up-to-date designs and layout of the RTS may also be used by LPAs to update their Strategic Flood Risk Assessments where and when appropriate.

10.8.1.4 We consider that the further development of the project design and mitigation measures which will be reflected in the ES and DCO application, will enable a reduction in the scale of identified negative likely significant effects set out in this chapter.

11 Health

11.1 Introduction

11.1.1.1 This chapter of our Preliminary Environmental Information Report (PEIR) considers the effects from construction and operation of the River Thames Scheme (RTS) ('the project') in relation to health. Within this chapter we have included topic specific sections on:

- Legislation, policy and guidance (noting any changes since Environmental Impact Assessment (EIA) scoping);
- Engagement with consultees, including responses to comments received on the RTS EIA Scoping;
- The assessment methodology for this topic (again noting any changes or updates since EIA scoping);
- Key environmental considerations and opportunities;
- Primary and tertiary mitigation;
- Our preliminary assessment of effects;
- Secondary mitigation; and
- Future work for this topic of our EIA.

11.1.1.2 For a summary of the key baseline elements associated with health see Section 5.7. Appendix 11.1 provides the updated health baseline and Appendix 11.2 provides the sources used for the health evidence base.

11.1.1.3 In order to determine the potential for significant health and wellbeing effects from construction and operation of the RTS, this chapter will draw on the outputs of other topics within the PEIR, in particular: Chapter 6: Air Quality, Chapter 7: Biodiversity, Chapter 8: Climatic Factors, Chapter 10: Flood Risk, Chapter 12: Landscape and Visual Amenity, Chapter 13: Materials and Waste, Chapter 14: Noise and Vibration, Chapter 15: Socio-economics, Chapter 17: Traffic and Transport and Chapter 18: Water Environment.

11.1.1.4 The World Health Organisation (WHO) Europe defines health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO, 2020). Public health encompasses general wellbeing, not just the absence of illness. The assessment of likely health effects therefore takes a broad view of physical and mental

health and wellbeing. It will assess how a range of factors determine health outcomes (the determinants of health).

11.1.2 Study Area

11.1.2.1 The health study area for PEIR (the health study area) is the area within the project boundary for the EIA PEIR plus a 500 metre buffer or the area within the 1 in 100-year floodplain (i.e. the area with a one per cent chance of flooding in any given year) that is expected to experience a change in flood risk as a result of the project, whichever is the greater (see Figure 5.14). The buffer combined with the floodplain that could be changed as a result of the RTS means that the likely significant changes in relation to health can be fully captured.

11.1.2.2 The Planning Inspectorate (PINS) Environmental Impact Assessment (EIA) Scoping Opinion (dated 15 November 2022) (‘the PINS Scoping Opinion’) outlined several suggestions from local authorities, which included the use of Middle Layer Super Output Area (MSOA) level data within the baseline, as health data is aggregated at this level.

11.1.2.3 The health study area is a bespoke geography which does not align exactly with the datasets required to complete the health baseline. For this reason, the health baseline section will focus on MSOA-level datasets, based on recommendations from local authorities. The health study area for the PEIR is spread across parts of 23 MSOAs (over five relevant local authorities) which are listed below:

- Richmond upon Thames 017
- Richmond upon Thames 018
- Richmond upon Thames 022
- Richmond upon Thames 023
- Windsor and Maidenhead 011
- Windsor and Maidenhead 016
- Elmbridge 001
- Elmbridge 002
- Elmbridge 004
- Elmbridge 007
- Elmbridge 009
- Elmbridge 012
- Elmbridge 013

- Runnymede 003
- Runnymede 004
- Runnymede 005
- Runnymede 006
- Runnymede 007
- Spelthorne 004
- Spelthorne 009
- Spelthorne 011
- Spelthorne 012
- Spelthorne 013.

11.1.2.4 Taken together, the 23 MSOAs form a wider geographic area than the health study area. For that reason, the term 'approximately' is used to highlight health indicators that cover the 23 MSOAs rather than the health study area. See Figure 5.14 for a map of the health study area. The map shows the relationship between the health study area and the 23 MSOAs.

11.1.2.5 Some effects scoped into the health assessment relate to traffic, noise and air quality. It is important to note that the traffic, noise and air quality topics use study areas that cover different geographies from the health study area. Further details on the study areas for the traffic, noise and air quality topics are mentioned in specific technical chapters, as highlighted in paragraph 11.1.1.3.

11.2 Legislation, Policy and Guidance

11.2.1.1 A summary of the key legislation, policy and guidance relevant to health is provided in Appendix M of the RTS EIA Scoping Report (Environment Agency and Surrey County Council, October 2022) (the 'EIA Scoping Report').

11.2.1.2 The National Policy Statement for Water Resources Infrastructure (NPS) has been updated and finalised (Defra, 2023a). In relation to health, the NPS now states that where the proposed project has likely significant environmental impacts that would have an effect on human population or health, the applicant should identify and set out the assessment of any likely significant health impacts. It goes on to state that applicants should consider the cumulative impacts on health and measures to avoid, reduce or compensate for negative health impacts and seek enhancement opportunities as appropriate.

11.2.1.3 The NPS states that "*access to high quality open spaces and the countryside and opportunities for sport and recreation can be a means of providing necessary mitigation and/or compensation requirements. There is good and growing evidence that connecting people with green space can deliver positive health outcomes through the prevention of mental ill-health, as an alternative option for managing mild to moderate mental health conditions and in some cases supporting the management of more severe conditions. It can also deliver important benefits for recreation, physical health, social well-being and employment. Green and blue infrastructure can also enable developments to provide positive environmental, social, health and economic benefits*."

11.2.1.4 The following new guidance documents have been published since the EIA Scoping Report and have informed the approach to the assessment:

- IEMA – Determining Significance for Human Health in Environmental Impact Assessment (IEMA, 2022b). This new guidance provides guidance on what should be included within the scope of human health. This includes explaining the range of issues that can be relevant within an EIA, including not only health protection, but also health promotion and healthcare service considerations.
- IEMA – Effective Scoping of Human Health in Environmental Impact Assessment (IEMA, 2022c). This guide explains how human health significance relates to the degree and context of changes in population health, including effects on vulnerable groups. This is explained with reference to public health evidence sources and consistent judgement criteria.

11.2.1.5 Based on recommendations from local authorities and Environment Agency within the EIA Scoping Opinion, these existing guidance documents have been included:

- Wales Health Impact Assessment Support Unit (WHIASU) – Health Impact Assessment Overview (WHIASU, 2020a). This provides an overview on a Health Impact Assessment (HIA).
- Wales Health Impact Assessment Support Unit (WHIASU) – Health Impact Assessment: A Practical Guide (WHIASU, 2020b). The guide is a toolkit for practitioners and those who may have an interest in using the process as part of their work.

11.2.1.6 Health assessment policy and guidance is now being adopted by greater numbers of local authorities, although this typically aligns with the UK Health Security Agency (UKHSA) and Town and Country Planning Association (TCPA) guidance. Since the EIA Scoping Report, London Borough of Richmond upon Thames (LBRUT) has updated its Health Impact Assessment (HIA) Guidance for developers, which was published in 2022. This HIA Guidance supports existing policies in the Council's adopted Richmond Local Plan and draft Local Plan. The new guidance has been reflected in our approach to the assessment in the PEIR.

11.3 Engagement

11.3.1 Responses to EIA Scoping

11.3.1.1 Table 11-1 below summarises the comments and responses received on the Scoping Report following formal submission to the Planning Inspectorate (PINS) including the PINS EIA Scoping Opinion (dated 15 November 2022) ('the PINS Scoping Opinion') and any key comments received from statutory consultees. Full responses to consultee comments on our EIA Scoping Report and our responses to these comments are provided in Appendix 4.1.

Table 11-1: Responses to comments received on the EIA Scoping Report

Consultee or Organisation	Summary of Comment	Project Response
PINS	The Environmental Statement (ES) should describe how the scheme alters drainage patterns, based on modelling, and how this alters flood risk from all sources across the study area. Likely significant effects on health from altered flood risk should be set out in the ES where they are likely to occur.	Changes in flood risk will be detailed in the Flood Risk Assessment (FRA) accompanying the Development Consent Order (DCO) application as well as in the ES. The likely significant effects considered in this chapter include changes to flood risk during construction and operation.
PINS	The Inspectorate agrees to scope out risk of the Proposed Development on public health and safety on the basis it will be assessed and mitigated in an	A PSRA will be prepared and included in the DCO application.

Consultee or Organisation	Summary of Comment	Project Response
	appropriate Public Safety Risk Assessment (PSRA) that will inform the design of the Proposed Development and will be submitted with the application.	It is not covered in the health assessment in the PEIR.
PINS	The Scoping Report suggests that loss of access to existing public open spaces should be scoped out on the basis that either no public open space is affected, or replacement public open space would be provided as part of the Proposed Development design. The ES should demonstrate how any loss of public open space has been adequately mitigated to avoid a significant effect. The value of any existing open space to be lost should be explained.	There may be some minor temporary losses of public open space during the construction period, for example for access or working areas. Details are to be confirmed and will be considered in the ES, including the value of open spaces. For the PEIR, a precautionary approach has been taken.
PINS/ Local Planning Authority (LPA) Project Group	The Inspectorate notes that the baseline year is 2021 during the pandemic. Covid-19 may have influenced human health indices, for example, reduced vehicle emissions may skew associated health indicators such as rates of asthma. Where it is possible and appropriate to do so, such datasets should be validated, and the ES should explain the limitations and assumptions made in relation to 2021 being used as a baseline.	The pandemic changed patterns of behaviour which could well have implications for health determinants such as air quality. However, there will be a considerable time lag before effects like this filter through into changes in health outcomes which are then reflected in health indicators, and it is unlikely that the Covid-19 pandemic will have affected health indicators published during 2021. It is considered that using 2021 as the baseline year for the assessment provides consistency with the recently published data from the 2021 Census which was not available for the preparation of the EIA Scoping Report.
LPA Project Group	Engagement list does not include Local Authority Environmental Health	Environmental Health Officers have been engaged in relation to

Consultee or Organisation	Summary of Comment	Project Response
	Departments but rather is through the County Public Health Team. In order to reach specialists in air quality and noise it would be prudent to also consult the Senior Environmental Health Managers for the Project Group.	air quality and noise effects. A separate workshop for the health assessment has not been undertaken to date but is planned.
LPA Project Group	In addition to understanding the baseline characteristics, engagement with local authority public health officers should include discussion of local health priorities and how the Scheme can support these. The Applicant should seek the public health officer's local knowledge of vulnerable groups, to be considered in the assessment.	LPA equalities officers were consulted via a workshop that took place on 20th July 2023 as part of the Equality Impact Assessment (EqIA) process for the DCO. This session provided valuable local intelligence on vulnerable groups in the study area. We are planning a similar workshop with LPA health officers.
LPA Project Group	The health baseline should include data that is relevant to the potential impacts of the RTS, where available. An example is air quality and related baseline on percentage of the community with respiratory diseases/ chronic obstructive pulmonary disease (and relevant source data). Another example is outdoor recreation in relation to current activity levels of the population in the Study Area (Sports England Active Lives data tables). The assessment should then identify how the RTS could influence this baseline.	A revised baseline to include wider health data and related assessment will be provided in the ES.
LPA Project Group	The Wales Health Impact Assessment Support Unit (WHIASU) provides a list of potential vulnerable groups that should be reviewed to ensure all potential groups are captured. Consideration should be given to relevant vulnerable groups in the assessment and during consultation,	Vulnerable groups (based on the WHIASU potential vulnerable group list) are listed in the assessment methodology at Section 11.4.3 of this Chapter.

Consultee or Organisation	Summary of Comment	Project Response
	and any specific mitigation to reduce impacts on vulnerable groups should be identified.	
LPA Project Group	It is advised that the Applicant use the Middle Super Output Area (MSOA) level data, as health data is aggregated at this level. This would allow for more direct comparisons between datasets. Furthermore, MSOA level data are more stable over time compared to wards.	The PEIR addresses this query by revising the health study area, which now comprises of 23 MSOAs. The baseline at Appendix 11.1 has been updated with an average of the MSOA data for the study area.
LPA Project Group	Consideration should be given to the role that lighting may provide in reducing crime/ fear of crime, especially in areas of the RTS which may not benefit from natural surveillance.	The consideration of landscape design and personal security, specifically for people with protected characteristics, will be covered as part of the EqIA process and not considered further in the health chapter.
LPA Project Group	Consideration should be given to how vulnerable groups will be considered within the consequent stages of the RTS's design and consultation. For example, shading and suitable paving along active travel routes, and provision of benches and a range of seating areas will help to ensure the elderly, pregnant women and those with pre-existing health conditions can benefit from the RTS. The mitigation section of the ES should set out how these elements will be considered and secured during the detailed design phases.	This information will be included in the EqIA process for RTS, which helps ensure that the design, construction and operation of the scheme does not disadvantage these groups.
LPA Project Group	The Applicant has referenced the Healthy Urban Development Unit (HUDU) rapid HIA toolkit (2019) within Chapter 23 References, however it's not clear how the toolkit will be utilised in the health assessment.	The HUDU Healthy Urban Planning Checklist (2017) will not be used as the main basis for this assessment. Therefore, reference to the HUDU rapid HIA toolkit (2019) has been removed.

Consultee or Organisation	Summary of Comment	Project Response
		The guidance now used for this assessment is set out in Section 11.2 of this Chapter.
LPA Project Group	The magnitude of effect should also consider whether any vulnerable groups are likely to be affected by the impact, and whether the impact is linked to a local public health priority/ objective. The scientific literature/ strength of evidence base linking the aspect of the RTS to health outcomes should also be considered. The Human health: ensuring a high level of protection (International Association of Impact Assessment, 2020) paper sets out how contextual considerations should support a robust reasoned conclusion on significance.	These magnitude criteria are taken from UKHSA's "Advice on the content of Environmental Statements accompanying an application under the Nationally Significant Infrastructure Planning Regime". Therefore, further discussions are required to understand how effects on vulnerable groups can be included within the existing UKHSA guidance on the magnitude of change related to vulnerable groups. The guidance now used for this assessment is set out in Section 11.2 of this Chapter. Links to reference material can be found in Appendix 11.2.

11.3.2 Other Engagement since EIA Scoping

11.3.2.1 Section 11.2.2 of our EIA Scoping Report summarises the stakeholder engagement relevant to Health that was undertaken prior to submission of the EIA Scoping Report.

11.3.2.2 As set out in the table above, LPA equalities officers were consulted via a workshop that took place on 20th July 2023 as part of the Equality Impact Assessment (EqIA) process for RTS. This session provided valuable local intelligence on vulnerable groups in the study area (also refer to 11.4.3.5 below). We are planning a similar workshop with LPA health officers to help inform the ES.

11.4 Methodology

11.4.1 Introduction

11.4.1.1 This section should be read in conjunction with Chapter 4 'Approach to the Environmental Assessment' which sets out relevant information on the design parameters and information that have informed the PEIR assessment, and how we have approached various aspects of the assessment including:

- The scope of the assessment;
- The methodology (including the approach to defining the baseline environment, topic study areas, and assessment methodology and criteria);
- The approach to mitigation; and
- The approach to cumulative effects.

11.4.1.2 The assessment methodology used for the Health assessment in this PEIR and to be used in the ES is presented in Section 11.7 of the EIA Scoping Report and updated below in Section 11.4.3.

11.4.2 Baseline Methodology

11.4.2.1 We have used a desktop assessment to prepare the health baseline, using a range of data sources as set out in Section 11.2 of the EIA Scoping Report.

11.4.2.2 According to the Design Manual for Roads and Bridges (DMRB) LA 112 'Population and human health' (Highways England, 2020c), there is a requirement to establish baseline health profiles of the health study area which should consider the following datasets:

- Percentage of community with increased susceptibility to health issues (vulnerable members, e.g. <16 & >65);
- Percentage of community with pre-existing health issues, e.g. respiratory disease/chronic obstructive pulmonary disease (COPD);
- Deaths from respiratory diseases;
- Percentage of community with long term illness or disability;
- General health;
- Life expectancy; and

- Income deprivation.

11.4.2.3 Data for general health, disability and deprivation are summarised in Appendix 11.1; other health profiles will be collected for the ES. Furthermore, DMRB LA 112 Section 3.26 also notes the requirement to identify health determinants. Health determinants are a diverse range of social, economic and environmental factors which influence people's mental and physical health and social wellbeing and will be included in the ES.

11.4.3 Assessment Methodology

Vulnerable groups

11.4.3.1 This PEIR has identified key vulnerable groups who may be disproportionately affected by the RTS and these will used in the subsequent assessment. WHIASU provides a list of potential vulnerable groups (outlined below), which will be used to ensure that all potentially affected groups are captured. These vulnerable groups include:

Age related groups

- Children and young people; and
- Older people.

Income related groups

- People on low income;
- Economically inactive;
- Unemployed/workless; and
- People who are unable to work due to ill health.

Groups who suffer discrimination or other social disadvantage

- People with physical or learning disabilities/difficulties;
- Refugee groups;
- People seeking asylum;
- Travellers[1];

[1] Travellers is a broad term used in encompass all groups that fit under this term such as Gypsies and Romany peoples.

- Single parent families;
- Lesbian and gay and transgender people;
- Black and minority ethnic groups; and
- Religious groups.

Geographical groups

- People living in areas known to exhibit poor economic and/or health indicators;
- People living in isolated/over-populated areas; and
- People unable to access services and facilities.

11.4.3.2 We will consider relevant vulnerable groups in the consultation and assessment stages in the ES, with any specific mitigation recommended to reduce impacts on vulnerable groups, where identified.

Significance Criteria

11.4.3.3 There is no definitive single guidance or methodology for defining the significance criteria for health effects. However, the significance criteria set out below has been updated since the EIA Scoping Report and will (in this PEIR and the ES) use the Institute of Environmental Management and Assessments (IEMA) "*Determining Significance for Human Health in Environmental Impact Assessment*". This guidance discusses what 'significance' means for 'human health' as an EIA topic and will be applied to the assessment in the ES. This guidance has *"been produced, both to inform current practice and in anticipation of potential changes to the way that EIA is undertaken in the UK and Republic of Ireland, and addresses inequalities and population health as environmental outcomes of a project"* (IEMA, 2022b).

11.4.3.4 The assessment will continue to be informed by the following sources:

- Former Public Health England's (PHE) *"Advice on the content of Environmental Statements accompanying an application under the Nationally Significant Infrastructure Planning (NSIP) Regime"* (PHE, 2021) is guidance related to significance determination in EIAs.
- The DMRB LA 112 'Population and human health' is a guidance document that provides advice on assessing human health effects. The DMRB outlines guidance for scoping, baseline and assessment, mitigation and reporting stages (Highways England, 2020c).

Sensitivity

11.4.3.5 As explained in the IEMA guidance, sensitivity assessments should consider determinants linked to vulnerable groups. However, it is important to note that several groups with protected characteristics as defined by the Equality Act 2010 are not necessarily considered as vulnerable. Therefore, the effects on protected characteristic groups will be assessed separately within the EqIA to be undertaken as part of the DCO application.

11.4.3.6 The IEMA "*Determining Significance for Human Health in Environmental Impact Assessment*" guidance will be used to define receptor sensitivity to determine the significance of effects. The sensitivity of receptors pays particular attention to the ability of receptors to respond to change that may arise as a result of the project. The sensitivity of receptors will be categorised into high, moderate and low as outlined below. The categorisation of sensitivity is based on good practice, professional judgement and experience on other projects.

<u>High sensitivity</u>

- High levels of deprivation (including pockets of deprivation);
- Reliance on resources shared (between the population and the project);
- Existing wide inequalities between the most and least healthy;
- A community whose outlook is predominantly anxiety or concern;
- People who are prevented from undertaking daily activities; and
- Dependants; people with very poor health status; and/or people with a very low capacity to adapt.

<u>Moderate sensitivity</u>

- Moderate levels of deprivation;
- Few alternatives to shared resources;
- Existing widening inequalities between the most and least healthy;
- A community whose outlook is predominantly uncertainty with some concern;
- People who are highly limited from undertaking daily activities;
- People providing or requiring a lot of care; and

- People with poor health status; and/or people with a limited capacity to adapt.

Low sensitivity

- Low levels of deprivation; many alternatives to shared resources;
- Existing narrowing inequalities between the most and least healthy; a community whose outlook is predominantly ambivalence with some concern;
- People who are slightly limited from undertaking daily activities;
- People providing or requiring some care; people with fair health status; and/or
- People with a high capacity to adapt.

Negligible sensitivity

- Very low levels of deprivation;
- No shared resources; existing narrow inequalities between the most and least healthy;
- A community whose outlook is predominantly support with some concern;
- People who are not limited from undertaking daily activities;
- People who are independent (not a carer or dependant);
- People with good health status; and/or
- People with a very high capacity to adapt.

Magnitude

11.4.3.7 We will use the IEMA "*Determining Significance for Human Health in Environmental Impact Assessment*" guidance to define impact magnitude to determine the significance of effects. The magnitude (scale) of effects will be defined using the following criteria:

High magnitude

- High exposure or scale; long-term duration; continuous frequency; severity predominantly related to mortality or changes in morbidity (physical or mental health) for very severe illness/ injury outcomes; majority of population affected; permanent change; substantial service quality implications.

Medium magnitude

- Low exposure or medium scale; medium-term duration; frequent events; severity predominantly related to moderate changes in morbidity or major change in quality-of-life; large minority of population affected; gradual reversal; small service quality implications.

Low magnitude

- Very low exposure or small scale; short-term duration; occasional events; severity predominantly related to minor change in morbidity or moderate change in quality-of-life; small minority of population affected; rapid reversal; slight service quality implications.

Negligible magnitude

- Negligible exposure or scale; very short-term duration; one-off frequency; severity predominantly relates to a minor change in quality-of-life; very few people affected; immediate reversal once activity complete; no service quality implication.

11.4.3.8 For the ES, the assessment of environmental effects will use the criteria shown in Table 11-2 below. After establishing the sensitivity of the receptor and assessing the magnitude of change using the criteria above, the effect on the receptor can be determined as either significant (major or moderate effects) or not significant (minor or negligible effects).

Table 11-2: Determination of significance of environmental effects (Sensitivity of Receptor & Magnitude of Change)

	High Sensitivity	**Moderate** Sensitivity	**Low** Sensitivity	**Negligible** Sensitivity
High Magnitude	Major (Significant)	Major / moderate (Significant)	Moderate / minor (Significant)	Minor / negligible
Medium Magnitude	Major / moderate (Significant)	Moderate (Significant)	Minor	Minor / negligible
Low Magnitude	Moderate / minor (Significant)	Minor	Minor	Negligible
Negligible Magnitude	Minor / negligible	Minor / negligible	Negligible	Negligible

11.4.3.9 The significant effects detailed in Table 11-2 are defined as follows:

Major (significant)

- Changes, due to the project, have a substantial effect on the ability to deliver current health policy and/or the ability to narrow health inequalities, including as evidenced by referencing relevant policy and effect size (magnitude and sensitivity levels), and as informed by consultation themes among stakeholders, particularly public health stakeholders, that show consensus on the importance of the effect.
- Change, due to the project, could result in a regulatory threshold or statutory standard being crossed (if applicable).
- There is likely to be a substantial change in the health baseline of the population, including as evidenced by the effect size and scientific literature showing there is a causal relationship between changes that would result from the project and changes to health outcomes.
- In addition, health priorities for the relevant study area are of specific relevance to the determinant of health or population group affected by the project.

Moderate (significant)

- Changes due to the project, have an influential effect on the ability to deliver current health policy and/or the ability to narrow health inequalities, including as evidenced by referencing relevant policy and effect size, and as informed by consultation themes among stakeholders, which may show mixed views.
- Change, due to the project, could result in a regulatory threshold or statutory standard being approached (if applicable).
- There is likely to be a small change in the health baseline of the population, including as evidenced by the effect size and scientific literature showing there is a clear relationship between changes that would result from the project and changes to health outcomes.
- In addition, health priorities for the relevant study area are of general relevance to the determinant of health or population group affected by the project.

Minor (not significant)

- Changes, due to the project, have a marginal effect on the ability to deliver current health policy and/or the ability to narrow health inequalities, including as evidenced by effect size of limited policy influence and/or that no relevant consultation themes emerge among stakeholders.
- Change, due to the project, would be well within a regulatory threshold or statutory standard (if applicable); but could result in a guideline being crossed (if applicable).
- There is likely to be a slight change in the health baseline of the population, including as evidenced by the effect size and/or scientific literature showing there is only a suggestive relationship between changes that would result from the project and changes to health outcomes.
- In addition, health priorities for the relevant study area are of low relevance to the determinant of health or population group affected by the project.

Negligible (not significant)

- Changes, due to the project, are not related to the ability to deliver current health policy and/or the ability to narrow health inequalities, including as evidenced by effect size or lack of relevant policy, and

as informed by the project having no responses on this issue among stakeholders.

- Change, due to the project, would not affect a regulatory threshold, statutory standard or guideline (if applicable).
- There is likely to be a very limited change in the health baseline of the population, including as evidenced by the effect size and/or scientific literature showing there is an unsupported relationship between changes that would result from the project and changes to health outcomes.
- In addition, health priorities for the relevant study area are not relevant to the determinant of health or population group affected by the project.

11.5 Key Environmental Considerations and Opportunities

11.5.1.1 The key considerations with respect to health are:

- Recreational or open space assets are sensitive to land use changes and development that may reduce the availability of land for these uses;
- Lakes within the study area which are used for recreation are sensitive to changes in lake water quality. Deterioration of lake quality can affect the use of these lakes for recreation;
- Communities vulnerable to changes to air quality, noise, traffic, access and other factors; and
- Recreational activities within the lakes, gravel pits and River Thames are sensitive to changes (for example changes in water quality) which may restrict access to these resources.

11.5.1.2 The key opportunities with respect to health are:

- Overall improvement of health and wellbeing and the reduction of health inequalities due to improved green space;
- Improved connectivity between communities due to increased access;
- Creating more sustainable and greener travel options, by introducing active travel routes;
- Creating new green open spaces and multi-functional landscaped spaces that are inclusive to the needs and abilities of different

people, as well as providing people with opportunities for connection with nature;
- Providing new accessible areas of waterway and opportunities for localised navigation and recreation;
- Providing new outdoor spaces for social interaction and good health; and
- Reduced flood risk to vulnerable groups, residential dwellings, businesses and community facilities could increase health and wellbeing through a reduction in stress/anxiety.

11.6 Primary and Tertiary Mitigation

11.6.1 Primary Mitigation

11.6.1.1 The following primary mitigation is proposed in relation to health effects. For further detail of these measures see Chapter 2 Project Description.

- The sequential approach – the proposed project components will be appropriately located in the areas of lowest flood risk where feasible and adhere to what is appropriate based on their vulnerability. This reduces health risks from flooding such as anxiety and physical injury.
- Integrated landscape design process - aims to sensitively integrate all project components within the existing landscape. This should include sensitively locating material stockpiles, screening of construction components and consideration of public space to be inclusive and meet the needs of vulnerable groups. This minimises health effects related to amenity and limiting access to green space for exercise during construction and maximises benefits during operation.
- Management of augmented flow - a small, continuous flow into the flood channels to maintain water quality by preventing stagnation of water in the flood channel and lakes, reducing the risk of algal blooms and eutrophication. This reduces related health risks during activities such as exercise due to algal blooms or waterborne illness for users of waterbodies.

11.6.2 Tertiary Mitigation

11.6.2.1 The following tertiary mitigation is proposed in relation to the health effects assessed within our PEIR. Many of these measures will also serve as mitigation for other environmental effects including air quality; noise; water and flooding; soils and land-use; materials and waste; landscape and socio-economic; and traffic:

- **Standard construction practices – Air quality:** for example, mitigation measures in accordance with the following Institute of Air Quality Management (IAQM) guidance documents: 'Guidance on the assessment of dust from demolition and construction' (2014) and 'Guidance on the Assessment of Minerals Dust Impacts' (2016). These measures reduce health risks from dust such as asthma and respiratory disease.
- **Air Quality Management Plan:** to include measures associated with managing dust and air quality during earthworks, demolition, construction activities, vehicle movements, odour and monitoring. These measures reduce health risks from dust and vehicle emissions such as asthma and respiratory disease.
- **Best Practicable Means noise and vibration mitigation:** for example, selection of quieter equipment or working methods, temporary screening, majority of construction work to take place during normal working hours. These measures reduce health risks such as stress and quality of sleep from noise disturbance.
- **Construction Surface Water Management Plan:** this could include measures such as design of stockpiles, sized and orientated to not obstruct storm surface water flow paths; and design of the sequencing and timing of works to optimise storm water storage. These measures reduce health risks from flooding such as anxiety and physical injury.
- **Construction flood protocol / Construction Emergency Planning**: to include sequencing of construction to enable safe flood response management and associated procedures of working in a floodplain (in accordance with PPG 2022). These measures reduce health risks from flooding such as anxiety and physical injury.
- **Standard construction practices – Handling of soils**: mitigation measures in accordance with documents such as Good Practice Guide for Handling Soils (The Institute of Quarrying (IQ), 2021).

These measures reduce health risks associated with poor air quality and odours, such as asthma and respiratory disease.

- **Site Waste Management Plan**: this sets out the amount and type of waste and how it will be reused, recycled or disposed of in accordance with legislation. These measures can reduce vehicle movements associated with waste and thereby health risks associated with vehicle emissions such as asthma and respiratory disease.
- **Materials Management Strategy:** this details efficient management proposals for processing, recovery, or re-use of materials and waste generated by the project, mitigating the need to import materials from off-site, and minimise the volume of unsuitable materials requiring off-site disposal. These measures reduce health risks associated with vehicle emissions such as asthma and respiratory disease by reducing the number of vehicle movements.
- **Standard construction practices – Waste & Materials Management:** this would include mitigation measures in accordance with legislation and guidance, for further details see the tertiary mitigation section of Chapter 13: Materials and Waste. In particular, for the purposes of this PEIR assessment, environmental permits for waste have been relied upon as mitigation in relation to potential spread of contaminants, with the assumption that these are in place. These measures reduce health risks associated with contamination such as stomach disorders and physical effects.
- **Application of the waste hierarchy**: for example, minimise generation of waste, reuse of arisings, treatment of waste to make it suitable for reuse etc. These measures reduce health risks associated with dust and vehicle emissions (from transportation of waste) such as asthma and respiratory disease by reducing the number of vehicle movements.
- **Standard construction practices – Amenity:** for example, mitigation measures such as appropriate designs of construction fencing and hoarding surrounding construction areas; location of construction-related visually obtrusive activities away from sensitive receptors such as existing residential properties. These measures improve amenity value and reduces health risks such as anxiety.
- **Artificial lighting to be restricted** to control light spill. This reduces health risks such as sleep-deprivation and stress.

- **Stakeholder Engagement** Plan to include engagement with residents, businesses and other members of the public to keep them informed about the proposed construction works (e.g. locations, timing, duration, any impacts on access and alternative routes available etc) to minimise disturbance. This helps reduce health effects related to anxiety and inadequate physical activity.
- **Construction Travel Plan:** aims to proactively manage and influence workforce (and visitor) travel to and from worksites to limit traffic movement and reduce disruption in the vicinity of the site. This reduces health risks associated with vehicle emissions such as asthma and respiratory disease.
- **Construction Public Right of Way (PRoW) Management Plan**: including details of temporary stopping up and diversions**.** This reduces health effects associated with limiting access to greenspace such as anxiety, low mood, and limiting exercise.
- **Operational Travel Plan:** aims to proactively manage and influence employee (and visitor) travel to and from facilities being provided at the New Green and Blue Open Spaces, to encourage the use of sustainable travel methods and reduce network disruption locally to these facilities. This reduces health risks associated with vehicle emissions such as asthma and respiratory disease.
- **Construction Traffic Management Plan:** aims to ensure all highways works are safe, planned and co-ordinated in order to secure the expeditious movement of traffic on the road network; and to minimise inconvenience to the public. This reduces health risks associated with vehicle emissions such as asthma and respiratory disease.
- **Construction Logistics Plan**: aims to detail the logistics management arrangements for worksites to minimise effects on communities and the environment from transportation of construction materials/waste. This reduces health risks associated with vehicle emissions such as asthma and respiratory disease.
- **Risk assessment / modelling of landfill gas migration and leachate migration**: desk-based assessments using ground investigation data to understand and mitigate the potential effects of landfill gas and leachate migrating out of landfills under compression from project components. This reduces health risks associated with contamination such as stomach disorders and physical effects.

11.7 Preliminary Assessment of Likely Significant Effects

11.7.1 Introduction

11.7.1.1 Our PEIR adopts a precautionary approach. Assessments reported within this chapter are a preliminary assessment of potential likely significant environmental effects based on the design parameters set out in Chapter 2. This precautionary approach has been taken for the PEIR as there is some information on the project that is currently incomplete and the parameters within Chapter 2 are high level and account for a range of uses and allowance for design development within a boundary that could possibly be refined once this work has been completed. For example, some designs, construction and mitigation details (and therefore also land requirements) or baseline information is still required from further surveys, assessments and/or consultation feedback. In making a determination of likely significant effects, we have considered the sensitivity of receptors (a receptor being a feature of the environment that responds to change) and the potential magnitude (i.e. size) of change caused by the RTS. The methodology for defining sensitivity and magnitude is defined in Section 11.4.3.

11.7.1.2 We are committed to including mitigation measures as necessary to address likely significant negative environmental effects as far as reasonably practicable. Both primary and tertiary mitigation are considered to form part of the RTS; those applicable to this topic are set out in Section 11.6. Several of these mitigation measures are still being developed, and therefore as a precaution, the preliminary assessment of effects for our PEIR does not assume full achievement of these in considering if a project effect is likely to be significant (Appendix 4.2 identifies the implementation status of primary and tertiary mitigation for the PEIR assessment). Furthermore, the potential likely significant effects reported within our PEIR have been assessed prior to the implementation of secondary mitigation measures, those applicable to this topic are set out in Section 11.7.5. These secondary mitigation measures are the subject of further development; and given they are still being developed, are not able to be applied to develop a ‘residual’ effects assessment.

11.7.1.3 Our PEIR is based on the latest design and construction parameters and baseline information. As such the findings of the preliminary environmental appraisal presented within our PEIR may be subject to

change as the design progresses, as mitigation is further developed or information from further studies becomes available, such as our work to develop an adaptive augmented flow and further development of standard construction practices for air quality, amenity, waste and materials. The final assessment of effects undertaken as part of the EIA and reported within the ES will be based on the latest information available at that time.

11.7.2 Potential Likely Significant Effects

11.7.2.1 Our preliminary assessment of likely significant environmental effects has identified the potential for the following negative significant effects from construction in relation to health:

- Temporary risks to residents, including vulnerable groups from temporary increased emissions and dust due to the transportation of construction materials and waste that may exacerbate health risks including, but not limited to, asthma and respiratory disease.
- Temporary risks to residents from increased dust and particulate matter generated by construction activities that may exacerbate health risks including, but not limited to, asthma and respiratory disease.
- Temporary risks to residents, businesses and visitors, including vulnerable groups, from increased flood risk due to changes in the floodplain, which may cause or exacerbate health risks including, but not limited to, anxiety, physical injury and drowning.
- Temporary risks to residents and businesses operating on lakes, including vulnerable groups from changes at lakes in water quality and levels, hydromorphology, flow regime or sediment processes from construction of channels that may cause or exacerbate health risks including, but not limited to, water-borne illness and other physical effects.
- Temporary risks to residents, including vulnerable groups, visiting waterbodies and businesses on waterbodies, from worsened amenity values at bodies of water due to construction activities that may cause or exacerbate health risks including, but not limited to, anxiety due to limited access to open / blue space.
- Temporary risks to residents and workers, including vulnerable groups from increased traffic congestion from construction plant and

vehicles on local roads that may cause or exacerbate health risks including, but not limited to, stress and anxiety.

- Temporary risks to residents, including vulnerable groups from night-time light pollution from construction works that may cause or exacerbate health risks including, but not limited to, sleep deprivation, fatigue, stress and blood pressure.
- Temporary risks to residents and businesses, including vulnerable groups, from closures or reduced access at open / green spaces due to presence of construction works that may cause or exacerbate health risks including, but not limited to, anxiety due to limited access to open / green space and obesity due to limiting access to exercise.
- Temporary risks to residents, including vulnerable groups, and businesses from airborne noise from construction plant and methods causing a disturbance to residential receptors near construction areas that may cause or exacerbate health risks including, but not limited to, stress and quality of sleep.

11.7.2.2 Our preliminary assessment of likely significant environmental effects has identified the potential for the following significant negative effects from operation in relation to health:

- Permanent risks to residents, including vulnerable groups, and businesses operating on lakes from fluctuations at lakes in water quality (from connectivity with other water bodies including the River Thames and from channel maintenance) and levels, hydromorphology, flow regime or sediment processes that may cause or exacerbate health risks including, but not limited to, water-borne illness and other physical effects.
- Permanent inability for residents and businesses to use lakes and flood channels from the introduction of River Thames water and potential pollution from maintenance; could potentially cause or exacerbate health risks including, but not limited to, anxiety, inadequate physical activity and obesity.
- Permanent risks to residents and businesses, including vulnerable groups, from increased traffic congestion from traffic on local roads that may cause or exacerbate health risks including, but not limited to, stress and anxiety.

11.7.2.3 Our preliminary assessment of likely significant environmental effects has identified the potential for the following significant positive effects from operation in relation to health:

- Permanent benefits from decreased risk to residents and businesses, including vulnerable groups, from flooding that may remove or reduce health risks including, but not limited to, anxiety, physical injury and drowning.
- Permanent improved access for residents and businesses, including vulnerable groups, to open and green space which may remove or reduce health risks including, but not limited to, anxiety, inadequate physical activity and obesity.
- Permanent improved public access (e.g. footpaths and cycle ways) and provision of recreational facilities (e.g. moorings and visitor facilities) for residents and businesses, including vulnerable groups may remove or reduce health risks including, but not limited to, anxiety, inadequate physical activity and obesity.
- Permanent benefits during flood events due to greater protection of some amenities.

11.7.2.4 Further details of the potential likely significant effects from construction and operation with respect to receptors, project components and project activities, in relation to health can be found in Table 1 and 2 in Appendix 11.3.

11.7.3 Potential Likely Non-Significant Effects

11.7.3.1 Further details of the non-significant effects from construction and operation with respect to receptors, project components and project activities, in relation to health can be found in Table 3 and 4 in Appendix 11.3.

11.7.3.2 Some examples of non-significant effects include (this is not an exhaustive list):

- Temporary closures of PRoW, cycling and equestrian routes during construction which may cause or exacerbate health risks such as anxiety and obesity due to limiting access to exercise.
- Permanent positive effects on health on visitors using new green and blue open spaces from physical activity.

11.7.4 In-Combination Climate Impact

11.7.4.1 Consideration of 'In-Combination Climate Impact' (ICCI) has been undertaken. The preliminary environmental assessment has considered a future climate scenario and has identified certain potential likely significant environmental effects for this topic which may be exacerbated further by predicted climate change. Further consideration of ICCI will be included in the ES.

11.7.5 Secondary Mitigation

11.7.5.1 As noted in Section 11.7.1.2, primary and tertiary mitigation are still being developed, and therefore as a precaution, the preliminary assessment of effects for our PEIR does not assume full achievement of these in considering if a project effect is likely to be significant. Furthermore, the potential likely significant effects reported within our PEIR have been assessed prior to the implementation of secondary mitigation measures. For the majority of the identified likely significant environmental effects it is considered likely that the primary and tertiary mitigation will be sufficient at ES stage such that no secondary mitigation will be required. Where secondary mitigation is already under consideration for potential significant environmental effects, this is detailed below.

11.7.5.2 In order to reduce the magnitude of significant effects, the following secondary mitigation is under consideration:

- Water quality monitoring (during construction) and subsequent remedial actions, where required, to ensure that effective water and waste management plans (tertiary mitigation) are mitigating the risk to human health from waterborne illness or other physical effects.
- Additional location best practicable means and/or receptor specific noise mitigation may be specified during construction, for example, physical mitigation such as barriers or noise insulation improvements; or monitoring. These measures reduce health risks such as stress and quality of sleep from noise disturbance.
- Water quality monitoring (during operation) and subsequent remedial actions, where required, to enable management of augmented flow to reduce the risk to human health from waterborne illness or other physical effects.

- Junction / Highway Improvements may be required to improve traffic flow and reduce effects relating to congestion such as stress and anxiety.

11.8 Further Work for the EIA

11.8.1.1 The assessment for this chapter has drawn on effects from related topics. The development of mitigation and further assessment as part of the ES for many of these topics, in particular, air quality, flood risk, landscape, materials and waste, noise and vibration, traffic and transport and water environment, will better inform the assessment of health-related effects.

11.8.1.2 A detailed assessment of the effects from construction and operation on human health from the project will be undertaken and documented in the ES in accordance with the methodology set out in Section 11.4 above.

11.8.1.3 The assessment will be based on the effects scoped in the assessment and documented within this PEIR. It will continue to be informed by relevant aspects of PINS EIA Scoping Opinion and be informed by any additional baseline information that may become available, particularly on the distribution of vulnerable groups in the health study area. The assessment will also take account of further information received during the statutory consultation process.

The assessment will state the predicted significance of effects, provide further detail of relevant mitigation and document the subsequent residual effects. We consider that the further development of the project design and mitigation measures which will be reflected in the ES and DCO application, will enable a reduction in the scale of identified negative likely significant effects set out in this chapter.

12 Landscape and Visual Amenity

12.1 Introduction

12.1.1.1 This chapter of our Preliminary Environmental Information Report (PEIR) considers the effects from construction and operation of the River Thames Scheme (RTS) ('the project') in relation to landscape and visual amenity. Within this chapter we have included topic specific sections on:

- Legislation, policy and guidance (noting any changes since Environmental Impact Assessment (EIA) scoping);
- Engagement with consultees, including responses to comments received on the RTS EIA Scoping Report;
- The assessment methodology for this topic (again noting any changes or updates since EIA scoping);
- Key environmental considerations and opportunities;
- Primary and tertiary mitigation;
- Our preliminary assessment of effects;
- Secondary mitigation; and
- Future work for this topic of our EIA.

12.1.1.2 For a summary of the key baseline elements associated with landscape and visual amenity see Section 5.8 of this PEIR.

12.1.1.3 The study area for the assessment of landscape character and visual effects is shaped by the provisional perceived extents of any effects from the proposed channel works, the range of landscape and biodiversity design proposals being considered, and the changes to the flooding regime as a result of the project. This is broadly the same study area used for the landscape and visual amenity chapter of the RTS EIA Scoping Report (Environment Agency and Surrey County Council, October 2022) ('the EIA Scoping Report'). However, the study area for the PEIR has slight differences due to minor changes in the project boundary. The revised study area is shown on Figure 12.1: LVIA Study Area and Viewpoint Locations.

12.1.1.4 The assessment of landscape effects deals with the effects of change and development of the landscape as a resource in its own right. The

assessment of visual effects deals with the effects of change and development on the views available to people and their visual amenity.

12.1.1.5 Historic landscape character is considered within the Landscape and Visual Impact Assessment (LVIA) as an aspect of Landscape Character Assessment (LCA) and continues to be informed by an ongoing collaboration between landscape and cultural heritage specialists, utilising some similar baseline information. Historic landscape is further detailed within Chapter 10: Cultural Heritage, Archaeology and Built Heritage where effects on the heritage assets and their settings will be assessed.

12.1.1.6 Further information on ecological baseline can be found in Chapter 7: Biodiversity. The methodology we will apply for a separate Lighting Impact Assessment of the RTS is set out in Appendix 12.1.

12.2 Legislation, Policy and Guidance

12.2.1.1 A summary of the key legislation, policy and guidance relevant to landscape and visual amenity is provided in Appendix M of the EIA Scoping Report.

12.2.1.2 Since the publication of the EIA Scoping Report in October 2022, the National Policy Statement (NPS) for Water Resources Infrastructure (Department for Environment, Food and Rural Affairs (Defra), 2023a) ('the 2023 NPS') has been finalised and was designated in September 2023. Changes to the NPS relevant to LVIA (Section 4.9 of the NPS) since the draft version was released in 2018 are:

- The omission of the potential land use impacts of water resources Nationally Significant Infrastructure Projects (NSIPs) tables. This amendment has not changed the methodology or assessment of effects for this topic.

12.2.1.3 Since October 2022 the following new guidance has been identified:

- Elmbridge Borough Council Local Green Space Study (EBC, 2022a); and
- Runnymede 2035 Open Space Study 2016 (RBC, 2016, republished 2017).

12.2.1.4 Both guidance documents suggest provision for public amenity is likely to improve with potentially more areas being opened up for public access, or areas of importance to the local community provided with increased protection e.g. designated as Local Green Space.

12.2.1.5 In order to follow good practice and effectively satisfy the requirements of the Development Consent Order (DCO) process, LVIA methodology follows the principles set out in *Guidelines for Landscape and Visual Impact Assessment 3* GLVIA3 (Landscape Institute and Institute of Environmental Management and Assessment (IEMA), 2013).

12.3 Engagement

12.3.1 Responses to EIA Scoping

12.3.1.1 Table 12.1 below summarises the comments and responses received on the Scoping Report following formal submission to the Planning Inspectorate (PINS) including the PINS EIA Scoping Opinion (dated 15 November 2022) ('the PINS Scoping Opinion') and any key comments received from statutory consultees. Full responses to consultee comments on our EIA Scoping Report and our responses to these comments are provided in Appendix 4.1.

Table 12-1: Responses to comments received on the EIA Scoping Report

Consultee or Organisation	Summary of Comment	Project Response
PINS	The ES should explain the likely maintenance activities and provide an outline of the operational maintenance plan, demonstrating how this would mitigate any likely significant effects.	Maintenance of the channel to restore the design profile has been scoped into this topic in response to the PINS scoping opinion. An operational maintenance plan will be provided at ES stage.
Local Planning Authority Project Group	Lighting should be assessed in the LVIA and consideration should be given to the need for night-time viewpoint photography, particularly for key sensitive receptors / key representative viewpoints.	It is thought unlikely that night time viewpoint photography will be necessary, but it will be considered in relation to sensitive locations once further design detail/location is understood. A separate lighting

Consultee or Organisation	Summary of Comment	Project Response
		assessment will be completed, in accordance with the approach set out in Appendix 12.1.

12.3.2 Other Engagement since EIA Scoping

12.3.2.1 Section 12.2.2 of our EIA Scoping Report summarises the stakeholder engagement relevant to the LVIA topic that was undertaken prior to submission of the EIA Scoping Report.

12.3.2.2 We have since engaged with the relevant local planning authorities (LPAs) to present and agree the provisional Indicative Viewpoint Locations to be used for the LVIA.

12.3.2.3 There has been ongoing engagement with stakeholders and local communities regarding the landscape and green infrastructure design, in particular the design of the areas of enhanced public connection and new green and blue open spaces under consideration. This has included discussions with interest groups representing users of existing green spaces and rights of way and has provided reassurance that the project includes elements that stakeholders would like to see.

12.4 Methodology

12.4.1 Introduction

12.4.1.1 This section should be read in conjunction with Chapter 4 ‘Approach to the Environmental Assessment’ which sets out relevant information on the design parameters and information that have informed the PEIR assessment, and how we have approached various aspects of the assessment including:

- The scope of the assessment;
- The methodology (including the approach to defining the baseline environment, topic study areas, and assessment methodology and criteria);
- The approach to mitigation; and
- The approach to cumulative effects.

12.4.1.2 The assessment methodology used for the LVIA in this PEIR and to be used in the Environmental Statement (ES) is presented in Chapter 12 of the EIA Scoping Report.

12.4.1.3 The LVIA is dealt with as two discrete parts within the EIA, considering physical changes to the landscape character and the visual effects of the project as perceived by people. The separation of these two aspects is in accordance with the recommendations of GLVIA3 However, they remain closely related and will inform and cross-reference each other where appropriate.

12.4.1.4 The assessment has defined the key landscape characteristics and visual context of the site and its surrounds, including the baseline landscape character and landscape receptors upon which the effects of the project are assessed. These are shown on Figure 12.3. It has also set out the sensitivity of the landscape and visual receptors based upon their value, and their susceptibility to change. Further detail of this including figure references is provided in the Site Description Section 5.8.1 Existing Baseline. A selection of viewpoint locations representative of these receptors have provisionally been agreed with the LPAs and for which Type 1 annotated viewpoint photographs will be prepared. Baseline photography will comply with Landscape Institute-Technical Guidance Note - 06/19 (LI TGN 06/19) for a Type 3 Visualisation for all viewpoint locations and will also capture a wider panoramic view. There will be further consultation with the LPAs for the ES regarding which will be developed as visualisations to illustrate the project in the landscape. It is considered likely that these will be Type 2 or Type 3 Visualisations (as detailed in the LI TGN 06/19). These will include aspects of the proposals that have been embedded in the design to avoid, reduce or compensate for any likely significant negative landscape and visual effects or to achieve positive effects, and other mitigation and enhancement measures. The provisional Indicative Viewpoint Locations that have been agreed with the relevant LPAs are shown on Figure 12.1: LVIA Study Area and Viewpoint Locations. The development of these viewpoints from those originally agreed with the LPAs is set out in the EIA Scoping Report.

12.4.1.5 The nature of the resulting effect that is likely to occur has been assessed for this PEIR, i.e. the magnitude of change brought about by the RTS to the landscape as a resource and the identified visual receptors. This has

been combined with each receptor's sensitivity to produce a preliminary assessment of level of significance of effect.

12.4.1.6 Section 12.7 of the EIA Scoping Report describes in full the proposed assessment methodology for the assessment of landscape and visual amenity. It defines the significance criteria for the sensitivity of receptors and the magnitude of effect.

12.5 Key Environmental Considerations and Opportunities

12.5.1.1 The key considerations with respect to landscape and visual amenity are:

- A relatively complex landscape in which to suitably place a major linear infrastructure project.
- Despite the frequency of PRoW and roads, the area is relatively enclosed, and generally only short to medium length views predominate. Flood management components are being introduced to a landscape that is already characterised by similar infrastructure.
- The presence of the Thames Path National Trail, a long distance walking route designated by the Government and managed to a set of quality standards.
- Valued views experienced by receptors within the study area and susceptible to influence from development.
- Landscape complexities (such as below ground landfill) that may restrict the future planting of trees and other vegetation.
- A relatively active landscape in which movement and 'bustle' both on the ground and in the air, are part of its overall character, though smaller pockets of comparatively more tranquil landscapes can be found, such as at Desborough Island and Shepperton waterside. The landscape character of the study area is sensitive to change from development and changes to recreational use of the area.
- Existing vegetation including protected trees within the project boundary are sensitive to land use changes and development which many result in their loss.
- Existing engineered infrastructure and utilities including the motorways, railways and pipelines pose a risk to future access and landscape improvement opportunities.
- Green Belt, Metropolitan Open Land and other planning policies that may restrict the provision and extent of built development.

12.5.1.2 The key opportunities with respect to landscape and visual amenity are:

- The creation of a range of accessible public spaces for active and passive use, enhanced active travel links, new planting, habitat creation and enhancement.
- Identifying existing characteristics of the landscape that will be used to inform the developing landscape design of the project, with opportunities for strengthening existing landscape character within both an historic and fragmented landscape.
- The overall landscape enhancement through the provision and long-term management of landscape and green infrastructure initiatives including tree, woodland and hedgerow planting, wildflower meadows and marginal and aquatic planting of waterbodies.
- Enhancement opportunities throughout the local area including increased public access to green infrastructure and amenity spaces, and the provision of wider associated benefits, including improved connections to wider existing green space and Public Right of Way (PRoW) networks.

12.6 Primary and Tertiary Mitigation

12.6.1 Primary Mitigation

12.6.1.1 A project goal of the RTS is to provide an area of landscape and green infrastructure that positively effects the local community, through accessible green space provision, enhancements to biodiversity and the provision of new active travel. The following primary mitigation is proposed in relation to landscape and visual effects from construction and operation:

- An integrated landscape design process, which wherever possible aims to sensitively integrate all project components within the existing landscape to reduce landscape and visual effects from both construction and operation. This will include:
  - Sensitively locating material stockpiles.
  - Screening of construction components.
  - Consideration of material finishes to buildings and structures including use of local materials and design vernacular.

  - Consideration of the form and contouring of proposed earthwork profiles into existing landform to visually settle features.
  - Consideration of sensitive landscape design and planting in relation to the setting of Scheduled Monuments.
  - Consideration of public space and its use to be inclusive and meet the needs of vulnerable groups.
  - Incorporation of existing green infrastructure including trees and vegetation to visually assist in complementing and settling the project components.
  - New planting including that to achieve carbon mitigation and Natural Capital outcomes, and in relevant locations to screen project components.
  - A management and maintenance programme to ensure that the objectives of the landscape and green infrastructure components are continually realised.
- Habitat creation, mitigation or enhancement to achieve Biodiversity Net Gain, mitigation and/or compensation for other effects on habitats or species.
- Application of the mitigation hierarchy for habitats and species as a part of the integrated design development. This would reduce visual effects by settling built project elements into the landscape.
- Enhancement of habitats immediately downstream of three weirs on the River Thames in the reach bypassed by the flood channel (at Penton Hook, Chertsey and Shepperton). This would reduce visual effects by settling built project elements into the landscape.

12.6.2 Tertiary Mitigation

12.6.2.1 The following tertiary mitigation is proposed in relation to landscape and visual effects assessed within our PEIR:

- Standard construction practices to protect amenity and reduce landscape and visual effects from construction. For example, mitigation measures such as (this is not an exhaustive list):
  - Appropriate designs of construction fencing and hoarding surrounding construction areas to reduce visual effects from construction;

  - Protection of retained vegetation in accordance with BS:5837 (2012) reducing potential visual effects by reducing changes to existing views;
  - Notices and information provision/project updates at local events; and
  - Production of a Construction Traffic Management Plan and Construction Logistics Plan. These will proactively manage and influence workforce (and visitor) travel to and from worksites to limit traffic movement and reduce disruption to landscape and visual receptors in the vicinity of the site. See Chapter 17: Traffic and Transport for details of this mitigation measure.
- Construction PRoW management plan to include details of temporary PRoW stopping up and diversion processes, management measures and restoration to reduce negative effects to the views experienced by users of existing PRoW.
- Artificial lighting to be restricted to control light spill that may otherwise have negative effects upon views. Detail is provided in Appendix 12.1.
- Stakeholder Engagement with residents, businesses and other members of the public to keep them informed about the proposed construction works (e.g. locations, timing, duration, any effects on access etc.) and potential visual effects (such as restricted views).

12.7 Preliminary Assessment of Likely Significant Effects

12.7.1 Introduction

12.7.1.1 Our PEIR adopts a precautionary approach. Assessments reported within this chapter are a preliminary assessment of potential likely significant environmental effects based on the design parameters set out in Chapter 2. This precautionary approach has been taken for the PEIR as there is some information on the project that is currently incomplete and the parameters within Chapter 2 are high level and account for a range of uses and allowance for design development within a boundary that could possibly be refined once this work has been completed. For example, some designs, construction and mitigation details (and therefore also land requirements) or baseline information is still required from further surveys, assessments and/or consultation feedback. In making a determination of likely significant effects, we have considered the sensitivity of receptors (a

receptor being a feature of the environment that responds to change) and the potential magnitude (i.e. size) of change caused by the RTS. The methodology for defining sensitivity and magnitude vary by topic and are defined in Section 12.2 of our EIA Scoping Report.

12.7.1.2 We are committed to including mitigation measures as necessary to address likely significant negative environmental effects as far as reasonably practicable. Both primary and tertiary mitigation are considered to form part of the RTS; those applicable to this topic are set out in Section 12.6. Several of these mitigation measures are still being developed, and therefore as a precaution, the preliminary assessment of effects for our PEIR does not assume full achievement of these in considering if a project effect is likely to be significant (Appendix 4.2 identifies the implementation status of primary and tertiary mitigation for the PEIR assessment). Furthermore, the potential likely significant effects reported within our PEIR have been assessed prior to the implementation of secondary mitigation measures, those applicable to this topic are set out in Section 12.7.5. These secondary mitigation measures are the subject of further development; and given they are still being developed, are not able to be applied to develop a 'residual' effects assessment.

12.7.1.3 Our PEIR is based on the latest design and construction parameters and baseline information. As such the findings of the preliminary environmental appraisal presented within our PEIR may be subject to change as the design progresses, as mitigation is further developed or information from further studies becomes available, such as design development and the location of certain project elements. The final assessment of effects undertaken as part of the EIA and reported within the ES will be based on the latest information available at that time.

12.7.2 Potential Likely Significant Effects

12.7.2.1 Our preliminary assessment of likely significant environmental effects has identified the potential for the following likely significant effects from construction in relation to landscape and visual amenity. All would be temporary.

- Negative visual effects to some users (such as pedestrians, cyclists and equestrians) of the Thames Path National Trail and users of the

Sustrans National Cycle Route 4. The effects are associated with changes in view due to:

- Temporary flood channel inlet and outlet construction;
- Associated general construction activities including construction of new pedestrian / cycle bridges at Chertsey and Desborough;
- Erection of temporary screens or fences; and
- The use of temporary wharfs and mobile pontoons.

- Negative visual effects from changes in view for residents between Devil's Lane and Chertsey Road, north of Royal Hythe, adjacent to Royal Hythe on Chertsey Road and north of Ferry Avenue. The effects are associated with:
  - Views of temporary flood channel construction;
  - General construction activities; and
  - Creation and/or use of construction compounds and material processing and storage sites.
- Associated general construction activities could include the following and would be clearly visible in some of the views above:
  - Material excavation;
  - General construction activities;
  - Movement of vehicles, equipment and operatives, processing/placement of waste;
  - Sheet piling;
  - Temporary screens and fences; and
  - Use of compounds.

12.7.2.2 Our preliminary assessment of likely significant environmental effects has identified the potential for the following significant effects on landscape and visual amenity in Year 0 of the project operation. As designs are still emerging and developing at this PEIR stage a precautionary approach is being taken in assessing likely significant effects for Year 0. It is anticipated that some significant visual effects will be reduced when assessed for the ES with potential for further neutral / positive effects.

- Negative visual effects, reducing in time with the establishment of mitigation proposals and resulting in neutral and positive effects to:
  - Recreational users of sections of the public footpaths and cycle routes who would experience changes in some views into a more managed and publicly accessible landscape with new permanent components including the flood channel, landforms and

temporary operational activities including channel maintenance to restore design profile.

- As the project design develops, negative and/or positive effects might be achieved between new landform and the emerging blue-green infrastructure including green open spaces. Embedded planting would assist in screening and settling project components into the landscape, reducing visual effects from Year 0 to Year 15.
- Negative visual effects, reducing in time with the establishment of mitigation proposals and resulting in neutral and positive effects to:
  - Residents at home within an approximate 100 metre radius between Thames Side and Wheatsheaf Lane and between Ferry Avenue and 103 Chertsey Lane (see Figure 12.2 LVIA Visual Receptor Locations - reference RES-001). These receptors will have a change in view from a riparian residential outlook to new permanent components including the channel inlet structure (and glimpsed views of the new green open space beyond including new landforms). Robust landscape design mitigation including planting would assist in screening and settling project components into the riverscape, reducing significance from Year 0 to Year 15.
  - Residents at home within an approximate 100 metre radius location between Devil's Lane and Chertsey Road, north of Royal Hythe and adjacent to Royal Hythe on Chertsey Road and north of Ferry Avenue, and south of Chertsey Road adjacent to Sheepwalk (see Figure 12.2 LVIA Visual Receptor Locations - references RES-002 and RES-004). These receptors will have a change in view to new permanent components including the flood channel, landforms, road realignment and temporary effects from operation. As the project design develops, negative and/or positive effects might be achieved between new landform and the emerging blue-green infrastructure including green open spaces. Embedded planting would assist in screening and settling project components into the landscape, reducing visual effects from Year 0 to Year 15.
- Negative landscape effects to:
  - The key characteristics of RTS Landscape Character Areas 2d Farmland and 2f Settlement (see Figure 12.3 LVIA Landscape Receptors) from project components including the existence of

the flood channel and other components, priority areas for habitat creation, enhancement or mitigation; new pedestrian bridges across the River Thames, permanent new green open space and raised landforms.

12.7.2.3 Planting will mature and develop and by Year 15 bring about a positively improved, richer and more diverse landscape character within Landscape Character Areas 2d Farmland and 2f Settlement that will assist in conserving and restoring original characteristics of the historic floodplain, by virtue of putting them into areas of green open space and habitat creation.

12.7.2.4 Key components of the project including the bridges and potential raised landforms would settle and become part of the key characteristics of those landscape character areas. Planting around landforms would establish and the proposed bridges contribute to the movement of receptors and their visual experience of the landscape. Over time these elements would become part of an ongoing understanding of a landscape, where adaptation and appreciation of change in the Thames floodplain has historically developed.

12.7.2.5 It is considered that the potential likely significant effects on landscape and visual amenity in Year 15 of the project operation are:

- Positive landscape effects to the key characteristics of RTS Landscape Character Areas Farmland (2d), Settlement (2f) and Farmland (2n) (see Figure 12.3 LVIA Landscape Receptors) from project components when planting has been established and the project has settled into the landscape context.
- Positive visual effects to recreational users of sections of the PRoW, residents at home within an approximate 100 metre radius location between Thames Side and Wheatsheaf Lane and between Ferry Avenue and 103 Chertsey Lane and some residents at home between Devil's Lane and Chertsey Road, north of Royal Hythe and adjacent to Royal Hythe on Chertsey Road, and south of Chertsey Road adjacent to Sheepwalk from project components, when planting has been established and the project has settled into the visual context.

12.7.2.6 Further details of the potential likely significant effects from construction and operation with respect to receptors, project components and project activities, in relation to landscape and visual amenity can be found in Table 1 and 2 in Appendix 12.2.

12.7.3 Potential Likely Non-Significant Effects

12.7.3.1 Further details of the non-significant effects from construction and operation with respect to receptors, project components and project activities, in relation to landscape and visual amenity can be found in Table 3 and 4 in Appendix 12.2.

12.7.3.2 Some examples of LVIA non-significant effects include (this is not an exhaustive list):

- None of the key characteristics of the Landscape Character Area will be lost or significantly altered, nor the aesthetic or perceptual aspect of the receptor changed through the introduction of the new habitats and permanent project components.
- The permanent introduction of increased habitats and planting would form a small component of a wider view with a positive but non-significant effect on its overall quality.
- Permanent changes in distant views due to permanent features including new green open space and enhanced public connection including raised earthworks and new bridge.
- Permanent changes in glimpsed views across the broad extents of the floodplain area. Permanent project components will be difficult to distinguish amongst the broad range of urban, industrial and landscape features within the view.

12.7.4 In-Combination Climate Impact

12.7.4.1 Consideration of ‘In-Combination Climate Impact’ (ICCI) has been undertaken. The preliminary environmental assessment has considered a future climate scenario and has determined that the potential likely significant environmental effects identified for this topic are unlikely to be exacerbated further by climate change (see Chapter 8: Climatic Factors). Further consideration of ICCI will be included in the ES.

12.7.5 Secondary Mitigation

12.7.5.1 As noted in paragraph 12.7.1.2, primary and tertiary mitigation are still being developed, and therefore as a precaution, the preliminary assessment of effects for the PEIR does not assume full achievement of these in considering if a project effect is likely to be significant. Furthermore, the potential likely significant effects reported within this PEIR have been assessed prior to the implementation of secondary mitigation measures. For the majority of the identified likely significant environmental effects it is considered likely that the primary and tertiary mitigation will be sufficient at ES stage such that no secondary mitigation will be required. Where secondary mitigation is already under consideration for potential significant environmental effects, this is detailed below.

12.7.5.2 It is anticipated that limited secondary mitigation will be required for effects from construction and operation, as an integrated landscape design process is being embedded into the project as detailed in paragraph 12.6.1.1. Nevertheless, as a secondary mitigation measure, we will consider selective advance boundary planting of certain construction elements to assist in filtering views and reducing visual effects from sensitive receptors towards areas of construction.

12.8 Further Work for the EIA

12.8.1.1 The assessment of landscape and visual effects will continue to be undertaken following the methodology set out in Section 12.7 of the EIA Scoping Report and the principles set out in GLVIA3. This will be further informed by the PINS Scoping Opinion and other consultation feedback on baseline, methodology and effects scoped into the assessment.

12.8.1.2 Further to the assessment presented within this PEIR, the following has been undertaken as part of the LVIA:

- Presentation, discussion and agreement with LPAs on viewpoint locations.
- Commencement of summer viewpoint photography to provide the baseline for the identified visual receptors and to allow for more targeted mitigation measures and assessment of effects.

12.8.1.3 Further to the assessment presented within this PEIR, the following will be undertaken as part of the LVIA to inform the ES:

- Refinement of the LVIA study area through visual envelope mapping and/or Zone of Theoretical Visibility (ZTV) mapping, and taking into account those receptors assessed in this PEIR as having no significant landscape or visual effects (Table 3 and 4 in Appendix 12.2).
- Winter viewpoint photography.
- Further consideration of lighting effects to landscape and visual receptors as the lighting design for the project progresses and the Lighting Assessment is produced.
- Further continuing involvement with the development of design iterations to reduce landscape and visual effects.

12.8.1.4 We consider that the further development of the project design and mitigation measures which will be reflected in the ES and DCO application, will enable a reduction in the scale of identified negative likely significant effects as set out in this chapter.

13 Materials and Waste

13.1 Introduction

13.1.1.1 This chapter of our Preliminary Environmental Information Report (PEIR) considers the likely significant effects from construction and operation of the River Thames Scheme (RTS) ('the project') in relation to materials and waste. Within this chapter we have included topic specific sections on:

- Legislation, policy and guidance (noting any changes since Environmental Impact Assessment (EIA) scoping);
- Engagement with consultees, including responses to comments received on the RTS EIA Scoping Report;
- The assessment methodology for this topic (again noting any changes or updates since EIA scoping);
- Key environmental considerations and opportunities,
- Primary and tertiary mitigation;
- Our preliminary assessment of effects;
- Secondary mitigation; and
- Future work for this topic of our EIA.

13.1.1.2 For a summary of the key baseline elements associated with materials and waste see Section 5.9.

13.1.1.3 This chapter describes the proposed scope of the assessment on materials and waste. It describes the likely significant effects of the project and the measures proposed to avoid or reduce such effects.

13.1.1.4 For the purposes of waste management (for which waste management infrastructure is considered), the study area encompasses the Southeast region of England. For hazardous waste management, the study area is defined as the whole of England, due to the limited number of active sites that accept such hazardous material.

13.1.1.5 For the purposes of primary minerals and waste (the extent to which waste could be generated as a result of the project, and how it will be managed) the study area includes the full extent of the area within the project boundary for EIA PEIR.

13.1.1.6 This is the same definition for the study area as used for the Materials and Waste chapter of the RTS EIA Scoping Report (Environment Agency and Surrey County Council, October 2022) ('the EIA Scoping Report') in Section 13.2.3 of the Scoping Report. However, the study area will be slightly different to that presented in the EIA Scoping Report due to minor changes in the project boundary for EIA PEIR (see Chapter 2 and Figure 5.21).

13.1.1.7 The assessment of materials and waste effects overlaps with the following other topics and uses similar baseline information: Chapter 10: Flood Risk (for effects related to flood risk), Chapter 16: Soils and Land (for effects related to the quality of farmland in the context of Agricultural Land Classifications (ALC), soil properties, and excavation of landfill waste), Chapter 17: Traffic and Transport (for effects related to transport of waste), and Chapter 18: Water Environment (for effects related to water / cross over with Water Framework Directive regulatory mechanisms).

13.2 Legislation, Policy and Guidance

13.2.1.1 A summary of the key legislation, policy, and guidance relevant to materials and waste assessment is provided in Appendix M of the EIA Scoping Report. Since publication of the EIA Scoping Report in October 2022, the National Policy Statement for Water Resources Infrastructure (NPS) has been finalised and was designated in September 2023 (Defra, 2023a). No notable changes to the NPS from the draft NPS (published in 2018) have been identified as relevant to this chapter. Additionally, the Environmental Targets (Residual Waste) (England) Regulations 2023 and waste policies in the Environmental Improvement Plan were published in January 2023 but no notable content was relevant to this chapter. We will evaluate emerging minerals and waste policy during the EIA process due to Surrey County Council's ongoing preparation for their first joint Minerals and Waste Local Plan in 2023.

13.2.1.2 We have used IEMA guidance relevant to materials and waste to inform the assessment methodology.

13.3 Engagement

13.3.1 Responses to EIA Scoping

13.3.1.1 Table 13-1 below summarises the comments and responses received on the EIA Scoping Report following formal submission to the Planning Inspectorate (PINS) including the PINS EIA Scoping Opinion (date 15 November 2022) ('the PINS Scoping Opinion') and any key comments received from statutory consultees. Full responses to consultee comments on the EIA Scoping Report and our responses to these comments are provided in Appendix 4.1.

Table 13-1: Responses to comments received on the EIA Scoping Report

Consultee or Organisation	Summary of Comment	Project Response
PINS	The Scoping Report states that there could be potential "adverse effects of waste management at established third party facilities" but seeks to scope these out on the basis that such facilities "will be operating under relevant planning and permitting authorisations." The Inspectorate agrees this matter can be scoped out on the understanding that these potential effects would relate to management of the facility, i.e. noise, air quality, odour and stockpiling rather than facility capacity, which is proposed to be scoped in to the Environmental Statement (ES).	This comment has been noted. This matter will remain scoped out.
PINS	Please see box 2.1.1 of this Scoping Opinion "The Scoping Report proposes to scope out impacts from general maintenance, which are described in Scoping Report section 4.3.2 and across multiple Chapters. However, the long-term maintenance activities required to ensure that the design profile is maintained are not described and the Inspectorate considers that this could include activities such as dredging or structural work which have potential to give rise to significant pollution and hydromorphological effects. In the absence of further details regarding the extent and nature	Maintenance of the channel to restore the design profile has been scoped into this topic for the PEIR/ES in response to the PINS scoping opinion. An outline of the operational maintenance plan will be provided alongside the DCO application.

Consultee or Organisation	Summary of Comment	Project Response
	of such effects, the Inspectorate does not consider that this matter may be scoped out. The ES should explain the likely maintenance activities and provide an outline of the operational maintenance plan, demonstrating how this would mitigate any likely significant effects.	
PINS	The Scoping Report states that, at time of writing, the exact quantity and type of material that will be excavated during construction of the Proposed Development and from maintaining the design capacity of the flood channel during operation is unknown. It is stated that a materials management feasibility study and materials management plan (MMP) are being developed in parallel to the DCO application to provide clarity with regard to construction. The Inspectorate advises that the ES should clearly describe the predicted volume, type and end use of all excavated construction materials and sediment removal during operation, as well as the predicted cut and fill balance. Where assumptions are made, these should be explained.	A Materials Management Strategy (MMS) will be developed alongside the ES, which will provide information on waste volumes and uses including from maintenance sediment removal during operation. The waste assumptions are detailed in the project description Chapter of the PEIR.
PINS	In addition to the receptors listed, consideration should also be given to existing mineral infrastructure, Preferred Areas for mineral extraction and Areas of Search in the assessment of effects to mineral resource.	These have been considered as receptors within the PEIR and will be in the ES, as well as being reflected in the baseline information.
LPA Project Group	In respect of the assessment of effects, receptors listed at Paragraph 13.7.2.2 should, in addition to Minerals Safeguarding Areas, include existing mineral infrastructure, Preferred Areas for mineral extraction and Areas of Search as identified in the Surrey Minerals Plan Primary Aggregates Development Plan Document (DPD) and emerging planning policy. Approved restoration scheme requirements for mineral workings should also be given consideration in the context of the supply and	These have been considered as receptors within the PEIR and will be in the ES, as well as being reflected in the baseline information. We will evaluate emerging minerals and waste policy during the EIA process.

Consultee or Organisation	Summary of Comment	Project Response
	availability of suitable restoration material. Otherwise, the operational and construction effects set out in Paragraphs 13.7.3.1 to 13.7.5.2 are agreed.	

13.3.2 Other Engagement since EIA Scoping

13.3.2.1 Section 13.2.2 of our EIA Scoping Report summarises the stakeholder engagement relevant to the Materials and Waste topic that was undertaken prior to submission of the EIA Scoping Report.

13.3.2.2 Briefings have been held with the LPA Project Group in 2023 to provide updates on our approach to materials and waste management, including a summary of our ground investigations (GI). We have also met with the Environment Agency National Infrastructure team to discuss consenting requirements in relation to materials management, waste and permitting requirements, and this will continue as the project progresses.

13.4 Methodology

13.4.1.1 This section should be read in conjunction with Chapter 4 'Approach to the Environmental Assessment' which sets out relevant information on the design parameters and information that have informed the PEIR assessment, and how we have approached various aspects of the assessment including:

- The scope of the assessment;
- The methodology (including the approach to defining the baseline environment, topic study areas, and assessment methodology and criteria);
- The approach to mitigation; and
- The approach to cumulative effects.

13.4.1.2 The assessment methodology used for the materials and waste assessment in this PEIR and to be used in the (ES) is presented in Section 13.7 of the EIA Scoping Report.

13.4.1.3 We have based our assessment of significance of effects for the PEIR on established EIA approaches, our expert professional judgement and according to relevant guidance.

13.4.1.4 Our assessment for the PEIR has considered the types and quantities of solid waste that will be generated from construction of the project based on the materials management assumptions set out in Chapter 2 'Project Description' Section 2.2.6 and the likely significance of the environmental effects that could arise with the management of such waste. We have identified the different means by which waste may be managed during construction and assessed the effects of these routes for the different types of waste. We have also evaluated the use of excavated materials and waste from the construction and operation of the project. These material volumes will be refined for the ES as refined data on waste arisings to be generated by the project become available and as the design responds to statutory consultation feedback.

13.4.1.5 We have evaluated the mineral resources that could be affected by the project from construction and any prevention of future mineral resource extraction due to the presence of the completed project.

13.4.1.6 We have also identified the type of wastes likely to be generated from operation, such as waste generation from maintenance activities. Section 13.7 of the EIA Scoping Report describes in full the proposed methodology that is used for the assessment of materials and waste effects, defining categories for the sensitivity of receptors and the magnitude of effects. No changes to the methodology were required in response to the Planning Inspectorate (PINS) EIA Scoping Opinion.

13.5 Key Environmental Considerations and Opportunities

13.5.1.1 The key considerations with respect to materials and waste are:

- The presence and availability of primary material resources, existing mineral extraction sites and Mineral Safeguarding Areas (MSAs) are sensitive to land use changes and development which prevents future extraction.
- The availability of key material resources within the UK.
- The availability and capacity of landfill sites, treatment centres and restoration sites and associated management of waste and materials on site.

13.5.1.2 The key opportunities with respect to materials and waste are:

- To improve flood risk to industrial assets in the area and upstream of it, such as quarries and landfill sites.
- Excavation through landfill will contribute to reducing the volume of landfilled waste within the study area, as excavated landfill arisings will be processed and deposited for recovery via an appropriate permitting route or off-site disposal.
- The potential to recover or place excavated arisings from construction of the project through application of the waste hierarchy, and CL:AIRE Definition of Waste Code of Practice (DoWCoP).

13.6 Primary and Tertiary Mitigation

13.6.1 Primary Mitigation

13.6.1.1 The following primary mitigation is proposed in relation to Materials and Waste effects. For further detail of these measures see Chapter 2: Project Description:

- Silt monitoring and channel maintenance (excavation of materials and waste) during operation to restore the design profile, including sampling and testing of the accumulated sediment in the channel will allow classification to identify its properties as a waste and undertake subsequent treatment to minimise disposal to landfill and reduce additional demands upon existing landfill capacity.

13.6.2 Tertiary Mitigation

13.6.2.1 The following tertiary mitigation is proposed in relation to the materials and waste effects assessed within our PEIR. Many of these measures will also serve as mitigation in respect of other EIA topics such as to the water environment and human health:

- Apply standard construction practices in relation to management and protection of soils as a material resource to mitigate the effects from the deterioration of existing soil and materials on site (both geotechnically and geochemically) and preserve them for future use, for example:

    - Topsoil stripping, storage, and replacement to preserve and protect the soil as a resource from deterioration during construction.
    - Limiting construction traffic to delineated routes and away from riverbanks to prevent damage to soils.
    - Placement of granular layers of hardcore with geotextile at construction compounds and material processing sites to minimise ground compaction.
- Soil handling measures will be undertaken to preserve soils in accordance with the following guidance documents (this is not an exhaustive list):
    - Good Practice Guide for Handling Soils in Mineral Workings (The Institute of Quarrying (IQ), 2021).
    - BS4428:1989 British Standard code of practice for general landscape operations.
    - BS3882:2007 British Standard specification for topsoil and requirements for use.
    - Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (Defra, 2009).
    - Site Specific Soil Resource Plan.
- Develop a Materials Management Strategy. We are developing the strategy in parallel to the Development Consent Order (DCO) process and it will:
    - Detail efficient management proposals for processing and recovery of waste and placement of materials generated by the project, using specific criteria based on risk assessments to ensure geochemical and geotechnical suitability for minimal acceptable effect on environmental receptors. This reduces effects form the need to import materials from off-site, and minimises the volume of unsuitable materials requiring off-site disposal.
    - Be implemented in line with relevant permitting requirements and CL:AIRE DoWCoP.
    - Inform the further development of appropriate primary, tertiary, and secondary mitigation.
- Apply the waste hierarchy. This includes, for example minimising the generation of waste, and treatment of excavated waste to make it suitable for recovery, thereby minimising the volumes of unsuitable

waste being disposed of at landfill sites off-site and therefore reducing the additional demand upon existing landfill capacity.

- Apply standard construction practices in relation to waste and materials management. The application of these measures would minimise disposal to landfill and reduce additional demand on existing landfill capacity, and also mitigate for the deterioration of existing materials on site (both geotechnically and geochemically) and preserve them for future use. This would include mitigation measures and associated monitoring (such as for groundwater quality) in accordance with the following standard practice guidance documents and legislation (this is not an exhaustive list) to control and minimise the transfer of pollution to various receptors:
  - Technical Guidance WM3: Waste Classification - Guidance on the classification and assessment of waste (Environment Agency, 2021a).
  - Land Contamination Risk Management (LCRM).
  - Model Procedures for the Management of Contaminated Land (CLR 11).
  - Part IIA of the Environmental Protection Act 1990.
  - Water Framework Directive.
  - Groundwater Regulations 1998.
  - Water Resources Act 1991.
  - Site Waste Management Plan.
  - Environmental consents and permitting (Environmental Permitting (England and Wales) Regulations, 2016) – see below.
  - Environment Agency Landfill Gas Guidance (Environment Agency, 2004).
- Obtain and comply with environmental permits for waste in relation to potential spread of contaminants as a result of compression from project components, e.g. new landforms, as well as changes in land use of historical landfills due to the project. This would mitigate the deterioration of existing materials on site (both geotechnically and geochemically) and preserve them for future use. Any works within or affecting landfills or involving waste will be subject to the requirement of an environmental permit under the Environmental Permitting (England and Wales) Regulations 2016. For the purposes of this PEIR assessment, environmental permits for waste have been relied upon as mitigation, with the assumption that these are in place to mitigate the spread of contamination to environmental and human

receptors and will be complied with and enforced by the Environment Agency as regulator as part of the permitting process, we will be required to:

  - Undertake a range of risk assessments / modelling of landfill leachate and gas migration (based on the outcomes of our current Ground Investigations and ground modelling), which will be subject to scrutiny by the Environment Agency's National Permitting Service to ensure that they are robust;
  - Propose and put in place suitable measures to mitigate effects on the environment to an acceptable level, which the Environment Agency National Permitting Service will review and scrutinise in terms of their adequacy and appropriateness for mitigating the risks and effects identified. An environmental permit will only be granted if the Environment Agency National Permitting Service is satisfied that effects on human health and the environment are acceptable.
  - Comply with conditions to limit effects on human health and the environment and ensure that the activities are subject to suitable controls.
- The project will have, and adhere to, a Site Waste Management Plan (SWMP). The SWMP sets out the amount and type of waste and how it could be recovered, recycled or disposed of in accordance with legislation.

13.7 Preliminary Assessment of Likely Significant Effects

13.7.1 Introduction

13.7.1.1 This PEIR adopts a precautionary approach. Assessments reported within this chapter are a preliminary assessment of potential likely significant environmental effects based on the design parameters set out in Chapter 2. This precautionary approach has been taken for the PEIR as there is some information on the project that is currently incomplete and the parameters within Chapter 2 are high level and account for a range of uses and allowance for design development within a boundary that could possibly be refined once this work has been completed. For example, some designs, construction and mitigation details (and therefore also land requirements) or baseline information is still required from further surveys, assessments and/or consultation feedback.

13.7.1.2 In making a determination of likely significant effects, we have considered the sensitivity of receptors (a receptor being a feature of the environment that responds to change) and the potential magnitude (i.e. size) of change caused by the RTS. The methodology for defining sensitivity and magnitude vary by topic and are defined in the topic sections of our EIA Scoping Report.

13.7.1.3 We are committed to including mitigation measures as necessary to address likely significant negative environmental effects as far as reasonably practicable. Both primary and tertiary mitigation are considered to form part of the RTS; those applicable to this topic are set out in Section 13.6. Several of these mitigation measures are still being developed, and therefore as a precaution, the preliminary assessment of effects for the PEIR does not assume full achievement of these in considering if a project effect is likely to be significant (Appendix 4.2 identifies the implementation status of primary and tertiary mitigation for the PEIR assessment and notably confirms that measures secured through permits are assumed to be implemented). Furthermore, the potential likely significant effects reported within this PEIR have been assessed prior to the implementation of secondary mitigation measures, those applicable to this topic are set out in Section 13.7.2. These secondary mitigation measures are the subject of further development; and given they are still being developed, are not able to be applied to develop a 'residual' effects assessment.

13.7.1.4 The PEIR is based on the latest design and construction parameters and baseline information. As such the findings of the preliminary environmental appraisal presented within this PEIR may be subject to change as the design progresses, as mitigation is further developed or information from further studies becomes available, such as the on-going GI and waste classification works. The final assessment of effects undertaken as part of the EIA and reported within the ES will be based on the latest information available at that time.

13.7.2 Potential Likely Significant Effects

13.7.2.1 Our preliminary assessment of likely significant environmental effects has identified the potential for the following likely significant effects from construction in relation to materials and waste:

- Negative permanent effect from reduced capacity and availability of permitted inert and non-hazardous landfill sites in Surrey after materials generated from construction of the RTS have been accounted for. In particular from project activities associated with material excavation (contaminated), processing / placement of non-hazardous waste and bed lowering.
- Negative temporary effect from reduced capacity and availability of treatment centres in Surrey as a result of processing site-won waste material from the RTS, in particular from material excavation (contaminated), processing / placement of hazardous waste and non-hazardous waste and bed lowering.
- Negative permanent effect from the reduced capacity and availability of permitted hazardous waste landfill sites in the South East and wider UK as a result of disposal of hazardous waste gained from project activities including material excavation (contaminated) and processing / placement of hazardous waste.
- Positive permanent effects due to excavation through landfill and associated processing and disposal reducing the volume of landfilled waste in the project boundary and releasing this land for change of use to flood channel. Suitable waste will be processed for recovery within the project boundary where appropriate.
- Permanent negative effect from loss of former Shepperton quarry, as a potential landfill site on the Spelthorne flood channel.

13.7.2.2 Our preliminary assessment of likely significant environmental effects has identified the potential for the following likely significant effects from operation in relation to materials and waste:

- Negative permanent effects from the prevention of future extraction of mineral resources from MSAs due to the existence of new flood channels, new landforms, and other permanent project components.

13.7.2.3 Further details of the potential likely significant effects from construction and operation with respect to receptors, project components and project activities, in relation to materials and waste can be found in Table 1 and 2 in Appendix 13.1.

13.7.3 Potential Likely Non-Significant Effects

13.7.3.1 Further details of the non-significant effects from construction and operation with respect to receptors, project components and project activities, in relation to materials and waste can be found in Table 3 and 4 in Appendix 13.1.

13.7.3.2 An example of a materials and waste non-significant effect includes (this is not an exhaustive list):

- A positive non-significant effect to topsoil and subsoil. The project could produce a surplus of topsoil and subsoil which can be utilised on other projects or for mineral restoration sites.

13.7.4 In-Combination Climate Impact

13.7.4.1 Consideration of 'In-Combination Climate Impact' (ICCI) has been undertaken. The preliminary environmental assessment has considered a future climate scenario and has determined that the potential likely significant environmental effects identified for this topic are unlikely to be exacerbated further by climate change. Further consideration of ICCI will be included in the ES.

13.7.5 Secondary Mitigation

13.7.5.1 No secondary mitigation has been identified for effects from construction and operation. Primary mitigation in design and tertiary mitigation in the form of standard construction practices such as the waste permitting and Materials Management Strategy have been included in the assessment. The need for any further mitigation (including any site specific control measures) will be considered further as design and assessment work continues to progress as part of the EIA, and any secondary mitigation developed will be reported in the ES.

13.8 Further Work for the EIA

13.8.1.1 The assessment of likely significant effects in relation to materials and waste effects will be undertaken following the methodology set out in Section 13.7 of the EIA Scoping Report, having been informed by the PINS Scoping Opinion, public consultation, and other consultation

feedback on baseline, methodology, mitigation and effects scoped into the assessment.

13.8.1.2 To further the assessment presented in this PEIR, the following will be undertaken as part of the Materials and Waste assessment for the EIA and reported in the ES:

- Ground model to be updated from recent GIs providing more accurate volumes of each type of material and waste to be excavated that will inform the EIA;
- Update the baseline as set out in the EIA Scoping Report where there is more updated information available, including obtaining additional data from the ongoing GI works and review associated factual reports to establish a full baseline; and
- Develop a Materials Management Strategy for approval (and development of related Materials Management Plans and SWMPs for specific areas) and consider their effects as mitigation in the EIA.

13.8.1.3 We consider that the further development of the project design and mitigation measures which will be reflected in the ES and DCO application, will enable a reduction in the scale of identified negative likely significant effects set out in this chapter.

14 Noise and Vibration

14.1 Introduction

14.1.1.1 This chapter of our Preliminary Environmental Information Report (PEIR) considers the effects from construction and operation of the River Thames Scheme (RTS) ('the project') in relation to noise and vibration. Within this chapter we have included topic specific sections on:

- Legislation, policy and guidance (noting any changes since Environmental Impact Assessment (EIA) scoping);
- Engagement with consultees, including responses to comments received on the RTS EIA Scoping Report;
- The assessment methodology for this topic (again noting any changes or updates since EIA scoping);
- Key environmental considerations and opportunities,
- Primary and tertiary mitigation;
- Our preliminary assessment of effects;
- Secondary mitigation; and
- Future work for this topic of our EIA.

14.1.1.2 For a summary of the key baseline elements associated with noise and vibration see Section 5.8.

14.1.1.3 An explanation of the topic study area can be found in Section 14.2.3 of the RTS EIA Scoping Report (Environment Agency and Surrey County Council, October 2022) ('the EIA Scoping Report'). The study area includes noise sensitive receptors within 300 metres of construction and operation activities associated with the project. It is therefore slightly different to that presented in our EIA Scoping Report due to minor changes in the project boundary for EIA PEIR (see Figure 5.23).

14.1.1.4 Other aspects of noise and vibration which are not considered within this chapter but are instead covered in other chapters of our PEIR and should therefore be read in conjunction with this chapter. Chapter 7: Biodiversity considers disturbance to designated site interest features (e.g. birds) and other terrestrial and aquatic protected species from noise and vibration. Chapter 11: Health considers potential effects of noise and vibration on the health of local populations. Chapter 17: Traffic and Transport

considers the potential effects of traffic and has strong linkages with this chapter.

14.2 Legislation, Policy and Guidance

14.2.1.1 A summary of the key legislation, policy and guidance relevant to noise and vibration is provided in Appendix M of our EIA Scoping Report. Since the publication of our EIA Scoping Report in October 2022 the National Policy Statement (NPS) for Water Resources Infrastructure (Defra, 2023) has been updated and finalised. Otherwise, there has been no new legislation, policy or guidance relevant to the assessment of noise and vibration published since the submission of our EIA Scoping Report.

14.2.1.2 Changes to the NPS relevant to noise and vibration since the draft version was released in 2018 are:

- Further clarification of the stakeholders to consult in relation of noise and vibration effects on wildlife. This is considered further in Chapter 7: Biodiversity.
- A section is now included on mitigation. The measures listed have been considered and are consistent with the measures presented in our PEIR.

14.3 Engagement

14.3.1 Responses to EIA Scoping

14.3.1.1 Table 14-1 below summarises the comments and responses received on the Scoping Report following formal submission to the Planning Inspectorate (PINS) including the PINS EIA Scoping Opinion (dated 15 November 2022) (‘the PINS Scoping Opinion’) and any key comments received from statutory consultees. Full responses to consultee comments on our EIA Scoping Report and our responses to these comments are provided in Appendix 4.1.

Table 14-1: Responses to comments received on the EIA Scoping Report

Consultee or Organisation	Summary of Comment	Project Response
PINS	The Inspectorate agreed to scope out impacts from transportation and handling of hazardous waste from the major road network to placement at appropriate facilities offsite, on the basis that waste will be handled by a licensed waste carrier and will be disposed of in line with relevant permits. The Environmental Statement (ES) should be accompanied by an outline Construction Environmental Management Plan (CEMP), which demonstrates that appropriate measures are in place to manage the storage and handling of such waste on site.	This comment has been noted. The recommendation to include a CEMP with appropriate mitigation is agreed and will be developed based on the Environmental Action Plan produced for the ES. This will include measures to manage the storage and handling of waste on site, including those required to mitigate for potential noise and vibration effects.
PINS	The EIA Scoping Report proposed to scope out operational effects relating to the use of the new green open spaces and recreational facilities. PINS noted that a range of recreational facilities remain under consideration and that some proposed locations are in close proximity to noise sensitive receptors. It also noted that secondary mitigation might be required to control noise impacts from these activities. On this basis, PINS did not agree to scope this matter out.	This effect will be scoped in. The ES will include an assessment or otherwise explain how the use(s) would be designed and controlled to avoid significant effects from noise from the use of new open spaces.
PINS	The EIA Scoping Report proposed to scope out construction effects of vibration from offsite construction traffic on the basis that effects are unlikely to be significant because	This comment has been noted. The ES will present the outcome of the review of construction routes and receptors to ascertain whether vibration effects are likely.

Consultee or Organisation	Summary of Comment	Project Response
	heavy road traffic would only be expected to lead to potentially significant vibration levels if it is within 5 to 10 m distance from the sensitive receptors and the roads are in poor condition. PINS agreed that this approach is acceptable and specified that the outcome of the review should be reported in the ES.	
PINS	PINS noted that no reference is made to ecological receptors within the Noise and Vibration chapter of the EIA Scoping Report. The EIA Scoping Opinion noted that the ES should present noise and vibration baseline information at relevant sensitive ecological receptors and appropriate cross-referencing to where the assessment is presented in the ES.	This information will be clearly presented in more detail in the ES, with the assessment on ecological receptors documented in the Biodiversity chapter.
PINS	Non-residential receptors considered in the assessment should include existing and proposed green spaces and recreational areas and operational noise impacts on use of those sites. Effort should be made to agree suitable assessment location(s) with relevant consultation bodies.	As indicated in paragraph 14.7.1.9 of the EIA Scoping Report the ES will assess potential noise impact on tranquil outdoor spaces. In preparation of the PEIR, we asked local authorities to identify quiet spaces and spaces prized for their tranquillity for the assessment. We received responses from Spelthorne and Runnymede Councils and as a result Thorpe Hay Meadow, Sunbury Walled Gardens and Chertsey Meads Local Nature Reserve have been added as receptors within the assessment. Activities associated with the provision of the new green open spaces and other landscape works have the potential for negative

Consultee or Organisation	Summary of Comment	Project Response
		noise effects on residential and non-residential receptors. Likely significant effects as a result of this will be assessed according to the methodology presented in Section 14.7.4 of the Scoping Report.
Marine Management Organisation (MMO)	The MMO would expect the method(s) of piling proposed for use (for example percussive or vibropiling) to be specified and a more comprehensive assessment of potential impacts of underwater noise in relation to fish receptors.	It is considered likely that in most cases the airborne noise will have a greater impact than waterborne noise, so the assessment of effects will concentrate on airborne noise at these receptors. Waterborne noise predictions will however be carried out and presented where the cumulative impact of these is likely to be significant. See paragraph 14.4.5.3 for further information.
Local Planning Authority (LPA) project group	The classification of temporary accommodation receptors (including traveller sites and houseboats, if any exist within the study area) as non-residential should be justified within the ES, if they are considered to be non-residential. Parks/outdoor amenity areas are not included within the list. Any existing or proposed parks/outdoor amenity areas within the study area should also be outlined within the PEIR and assessed within the ES.	For the PEIR all houseboats and traveller sites that have been identified have been assumed to be permanently occupied but this will be reviewed for the ES. As noted above, quiet spaces and spaces prized for their tranquillity have been included in our PEIR. Noise from activities associated with the provision of the new green open spaces and other landscape works have also been included in our PEIR and will be assessed in more detail for the ES.

14.3.2 Other Engagement Since EIA Scoping

14.3.2.1 Section 14.2.2 of our EIA Scoping Report summarises the stakeholder engagement relevant to Noise and Vibration that was undertaken prior to submission of the EIA Scoping Report.

14.3.2.2 As noted above, since EIA Scoping, we have asked LPAs to identify quiet spaces and spaces prized for their tranquillity for the assessment. We received responses from Spelthorne and Runnymede Councils and as a result Thorpe Hay Meadow, Sunbury Walled Gardens and Chertsey Meads Local Nature Reserve have been added as receptors within the assessment.

14.4 Methodology

14.4.1 Introduction

14.4.1.1 This section should be read in conjunction with Chapter 4 'Approach to the Environmental Assessment' which sets out relevant information on the design parameters and information that have informed our PEIR assessment, and how we have approached various aspects of the assessment including:

- The scope of the assessment;
- The methodology (including the approach to defining the baseline environment, topic study areas, and assessment methodology and criteria);
- The approach to mitigation; and
- The approach to cumulative effects.

14.4.1.2 The assessment methodology used for the noise and vibration assessment in our PEIR and to be used in the Environmental Statement (ES) is presented in Section 14.7 of our EIA Scoping Report with the following clarifications.

14.4.2 Noise and Vibration Sensitive Receptors

14.4.2.1 In response to the PINS Scoping Opinion, the following clarifications are provided to the list of noise and vibration sensitive receptors in Section 14.3.1 of the EIA Scoping Report:

- The assessment will consider houseboats and traveller communities' sites to be residential where they are permanently occupied or likely to be occupied for a substantial duration of the construction phase. For our PEIR all that have been identified have been assumed to be permanently occupied but this will be reviewed for the ES;

- As indicated in paragraph 14.7.1.9 of the EIA Scoping Report, our PEIR and the ES will assess potential noise effect on tranquil outdoor spaces. Local authorities have been asked to identify quiet spaces and spaces prized for their tranquillity for the assessment. Information has been received from environmental health officers from Spelthorne Borough Council and Runnymede Borough Council and these spaces have been included as receptors within our PEIR;
- Any ecological receptors sensitive to noise and vibration are set out in Chapter 7: Biodiversity.

14.4.2.2 The approximate location of noise and vibration receptors assessed within our PEIR are provided in Figure 14.1.

14.4.2.3 As stated in our EIA Scoping Report, where identified, particularly sensitive equipment or infrastructure (e.g. utilities) will also be considered as a non-residential vibration sensitive receptor. No such receptors have been identified for our PEIR; however further review will be undertaken, and results presented within the ES as appropriate.

14.4.3 Noise Survey Measurements

14.4.3.1 Noise survey measurements have been completed according to the method set out in Section 14.2 of our EIA Scoping Report. Measurements have been completed at locations identified in the EIA Scoping Report with some minor modifications where there were access restrictions. Appendix 14.1 sets out the findings from these noise survey measurements and the measurement locations are shown on Figure 14.1. Additional noise survey measurements will be completed where required for project development and, if undertaken, these will be presented in the ES.

14.4.4 Significance Criteria

14.4.4.1 There are no changes to the significance criteria presented in Section 14.7.1 of our EIA Scoping Report.

14.4.5 Assessment of Effects from Construction

14.4.5.1 As set out in Section 14.7.3 of our EIA Scoping Report, the assessment of effects from construction noise and vibration includes assessment of:

- Noise and vibration from on-site construction; and
- Noise and vibration from offsite construction traffic.

14.4.5.2 In response to the Planning Inspectorate (PINS) EIA Scoping Opinion (dated 15 November 2022) ('the PINS Scoping Opinion'), the following clarifications are made:

- The assessment of potential noise effects from construction to existing tranquil outdoor spaces is being undertaken according to the method described in paragraph 14.7.1.9 of our EIA Scoping Report.
- While we stated in our EIA Scoping Report that significant levels of vibration from offsite construction traffic are unlikely; a review of vibration sensitive receptors within five to ten metres of traffic routes associated with the transportation of excavated material will be undertaken and results presented in the ES.
- As referred to in the PINS EIA Scoping Opinion, noise and vibration impacts on ecological receptors and associated impacts are set out in Chapter 7 Biodiversity.

14.4.5.3 Houseboats and other water-based receptors have the potential to be affected by waterborne noise and vibration from works in or near to the watercourse. For example, vibration from piling in the watercourse can transmit through the water and into the structure of houseboats or boats as vibration and, depending on the frequency of the vibration, be retransmitted inside as audible noise. This is different to airborne noise which transmits through the air. It is considered likely that in most cases the airborne noise will have the greater impact, so the assessment of effects will concentrate on airborne noise at these receptors, but for the ES waterborne noise predictions will be carried out and presented where the cumulative impact of waterborne and airborne noise is likely to be significant.

14.4.5.4 For the PEIR, detailed information related to the construction of the project is not yet available, so detailed noise and vibration predictions have not been completed. The assessment of noise and vibration effects presented in our PEIR is therefore approximate and preliminary and will be updated in greater detail for the ES.

14.4.5.5 The assessment of construction noise and vibration presented in our PEIR has been based on:

- Approximated distances that effects are likely to occur from the different construction activities presented in Chapter 2 Project Description;
- The baseline noise survey results presented in Appendix 14.1; and
- Professional judgement.

14.4.5.6 The approximated distances that effects are likely to occur within are based on the work methods and plant which are likely to be required for the construction activity. No allowances have been made, at the PEIR stage, for detailed noise propagation such as the positive effect of any acoustic screening.

14.4.6 Assessment of Effects from Operation

14.4.6.1 As set out in Section 14.7.4 of our EIA Scoping Report, the assessment of effects from operational noise and vibration includes assessment of:

- Noise effects from traffic movements from operation of the RTS;
- Noise from activities in new green open spaces;
- Noise from maintenance activities; and
- Noise from use of the flood alleviation channels and associated facilities.

14.4.6.2 In response to the PINS Scoping Opinion, the following clarifications are made:

- Activities associated with the provision of the new green open spaces and other landscape works have the potential for noise effects on residential and non-residential receptors. Likely significant effects as a result of this have been assessed for the PEIR according to the methodology presented in Section 14.7.4 of our EIA Scoping Report and will be further assessed using this methodology for the ES;
- Noise from flood alleviation channels and flow control structures including the flow of water and warning sounds have the potential for noise effects on residential and non-residential receptors. Likely significant effects as a result of this will be assessed according to the methodology presented in Section 14.7.4 of our EIA Scoping Report;
- The suitability of the acoustic environment in new green open spaces will be assessed and presented in the ES. This assessment will be based on guidance from WHO ‘Guidelines for Community Noise

1999' for outdoor spaces and also take into account the nature and character of the sounds within the proposed spaces and their suitability for the proposed uses.

14.4.6.3 The assessment of operational noise presented in our PEIR has been based on:

- Approximated distances that effects are likely to occur from the different operational activities presented in Chapter 2 Project Description;
- Baseline noise survey results presented in Appendix 14.1; and
- Professional judgement.

14.4.6.4 The approximated distances that effects are likely to occur are based on the likely worst case operational activities. No allowances have been made, at PEIR stage, for detailed noise propagation such as the effect of screening (secondary mitigation).

14.5 Key Environmental Considerations and Opportunities

14.5.1.1 The key considerations with respect to noise and vibration are:

- The large number of residential and non-residential receptors (e.g. schools, hospitals, hotels or offices) within the study area; these will be sensitive to changes in noise and vibration levels from major infrastructure projects such as the RTS.

14.5.1.2 The key opportunities with respect to noise and vibration are:

- The suitability of the acoustic environment in existing and new areas of public access where there is the opportunity to adapt these spaces so that the nature and character of the sounds within the spaces are suitable for, and in some cases enhance, the uses.

14.6 Primary and Tertiary Mitigation

14.6.1 Primary Mitigation

14.6.1.1 No specific primary mitigation in relation to noise and vibration effects has been identified at this stage, nevertheless, it is anticipated that the new planting being considered within our integrated landscape design process will provide noise attenuation benefits as well as visual screening.

Furthermore, the nature and character of the sounds from potential uses of areas of enhanced public connection will be explored as the design develops, to enhance user experience where feasible.

14.6.2 Tertiary Mitigation

14.6.2.1 The following tertiary mitigation is proposed in relation to noise and vibration effects.

- Best Practicable Means Noise and Vibration Mitigation. This may include, for example, selection of quieter equipment or working methods, temporary screening, and majority of construction work to take place during normal working hours. These details will be set out in the Construction Environmental Management Plan (CEMP).
- The production of a Construction Traffic Management Plan. This would aim to ensure all highways works are safe, planned and co-ordinated in order to secure the expeditious movement of traffic on the road network; and to minimise inconvenience to the public including associated noise disturbance.
- The production of a Construction Logistics Plan. This would detail the logistics management arrangements for worksites to minimise effects on communities and the environment from transportation of construction materials/waste, including consideration of associated noise and vibration disturbance.
- The production of a Construction Travel Plan. This aims to proactively manage and influence workforce (and visitor) travel to and from worksites to limit traffic movement and reduce disruption in the vicinity of the site, including associated noise disturbance.

14.7 Preliminary Assessment of Likely Significant Effects

14.7.1 Introduction

14.7.1.1 Our PEIR adopts a precautionary approach. Assessments reported within this chapter are a preliminary assessment of potential likely significant environmental effects based on the design parameters set out in Chapter 2 Project Description. This precautionary approach has been taken for the PEIR as there is some information on the project that is currently incomplete and the parameters within Chapter 2 are high level and account for a range of uses and allowance for design development within

a boundary that could possibly be refined once this work has been completed. For example, some designs, construction and mitigation details (and therefore also land requirements) or baseline information is still required from further surveys, assessments and/or consultation feedback.

14.7.1.2 In making a determination of likely significant effects, we have considered the sensitivity of receptors (a receptor being a feature of the environment that responds to change) and the potential magnitude (i.e. size) of change caused by the RTS. The methodology for defining sensitivity and magnitude varies by topic and are defined in the topic sections of our Scoping Report and in Section 14.4 of this chapter.

14.7.1.3 We are committed to including mitigation measures as necessary to address likely significant negative environmental effects as far as reasonably practicable. Both primary and tertiary mitigation are considered to form part of the RTS; those applicable to this topic are set out in Section 14.6. Several of these mitigation measures are still being developed, and therefore as a precaution, the preliminary assessment of effects for our PEIR does not assume full achievement of these in considering if a project effect is likely to be significant (Appendix 4.2 identifies the implementation status of primary and tertiary mitigation for the PEIR assessment). Furthermore, the potential likely significant effects reported within our PEIR have been assessed prior to the implementation of secondary mitigation measures. Those applicable to noise and vibration are set out in Section 14.7.5 below. These secondary mitigation measures are the subject of further development; and given they are still being developed, are not able to be applied to develop a ‘residual’ effects assessment.

14.7.1.4 Our PEIR is based on the latest design and construction parameters and baseline information. As such the findings of the preliminary environmental appraisal presented within our PEIR may be subject to change as the design progresses or as mitigation is further developed or information from baseline noise surveys become available. The final assessment of effects undertaken as part of the EIA and reported within the ES will be based on the latest information available at that time.

14.7.2 Potential Likely Significant Effects

14.7.2.1 Our preliminary assessment of likely significant environmental effects has identified the potential for the following significant effects from construction in relation to noise and vibration:

- Airborne noise causing a temporary disturbance to residential and non-residential receptors near construction areas. This includes noise from project construction activities including piling, material excavation and earthworks, use of materials processing sites, stockpiling of materials, the creation and use of the construction compounds, the movement of construction vehicles and equipment and other general construction activities.
- Vibration from piling activities and demolition of existing structures causing a temporary disturbance to residential and non-residential receptors near to those activities.

14.7.2.2 Our preliminary assessment of likely significant environmental effects has identified the potential for the following significant effects from operation in relation to noise and vibration:

- Airborne noise to residential and non-residential receptors from the use of weirs and flow control structures and from the use of publicly accessible areas and associated operational traffic.

14.7.2.3 Further details of the potential significant effects from construction and operation with respect to receptors, project components and project activities, in relation to noise and vibration can be found in Table 1 and 2 in Appendix 14.2.

14.7.3 Potential Likely Non-Significant Effects

14.7.3.1 Further details of the potential non-significant effects from construction and operation with respect to receptors, project components and project activities, in relation to noise and vibration can be found in Table 3 and 4 in Appendix 14.2.

14.7.3.2 Examples of non-significant noise and vibration effects include disturbance to certain residential or non-residential receptors from construction activities or traffic movements where the change in noise

levels is expected to be below the relevant thresholds for significant effects.

14.7.3.3 Receptors which are not identified within the tables in Appendix 14.2 but are within the study area are likely to be subject to negligible effects or no change from construction and operational noise and vibration.

14.7.4 In-Combination Climate Impact

14.7.4.1 Consideration of 'In-Combination Climate Impact' (ICCI) has been undertaken. The preliminary environmental assessment has considered a future climate scenario and has determined that the potential likely significant environmental effects identified for this topic are unlikely to be exacerbated further by climate change. Further consideration of ICCI will be included in the ES.

14.7.5 Secondary Mitigation

14.7.5.1 As noted in Section 14.7.1.3, primary and tertiary mitigation are still being developed, and therefore as a precaution, the preliminary assessment of effects for the PEIR does not assume full achievement of these in considering if a project effect is likely to be significant. Furthermore, the potential likely significant effects reported within this PEIR have been assessed prior to the implementation of secondary mitigation measures. For the majority of the identified likely significant environmental effects it is considered likely that the primary and tertiary mitigation will be sufficient at ES stage such that no secondary mitigation will be required. Where secondary mitigation is already under consideration for potential significant environmental effects this is detailed below

14.7.5.2 In order to reduce the magnitude of significant effects, the following secondary mitigation is currently being considered:

- During construction, additional location-specific best practicable means and/or receptor-specific noise mitigation will be implemented. Site specific measures may include management techniques such as carrying out noisy activities at less sensitive times, physical mitigation such as barriers or monitoring;
- During construction, the use of alternative piling methods that reduce noise and vibration where practicable will be investigated. A further Noise and Vibration Assessment will be carried out to inform the ES

and will identify whether alternative quieter piling methods should be considered. If they are considered practicable, they will form part of the construction design (embedded mitigation). Alternative piling methods could include consideration of hydraulic jack piling, rotary piling or hydraulic push piling.

- To mitigate operational noise from activities in new green open spaces and noise associated with weir and / or fish passage operation and maintenance, operational noise mitigation may be required to avoid significant effects e.g. restricted hours of operation, screening or limitations on operation of noise generating activities.

14.8 Further Work for the EIA

14.8.1.1 The assessment of noise and vibration effects will be undertaken following the methodology set out in Section 14.7 of our EIA Scoping Report and clarified in Section 14.3.2.1 above. This has been informed by the PINS Scoping Opinion and other consultation feedback on baseline, methodology and effects scoped into the assessment.

14.8.1.2 The assessment of noise and vibration will be informed by any additional baseline information from surveys, noise and vibration modelling, assessments, and planned engagement known to be required for the ES and further information received during the statutory consultation process.

14.8.1.3 The ES will state the predicted significance of effects, provide further detail of relevant mitigation, and document the subsequent residual effects. We consider that the further development of the project design and mitigation measures which will be reflected in the ES and DCO application, will enable reduction in the scale of identified negative likely significant effects set out in this chapter.

15 Socio-Economics

15.1 Introduction

15.1.1.1 This chapter of our Preliminary Environmental Information Report (PEIR) considers the effects from construction and operation of the River Thames Scheme (RTS) ('the project') in relation to socio-economics. Within this chapter we have included topic specific sections on:

- Legislation, policy and guidance (noting any changes since Environmental Impact Assessment (EIA) scoping);
- Engagement with consultees, including responses to comments received on the RTS EIA Scoping Report;
- The assessment methodology for this topic (again noting any changes or updates since EIA scoping);
- Key environmental considerations and opportunities,
- Primary and tertiary mitigation;
- Our preliminary assessment of effects;
- Secondary mitigation; and
- Future work for this topic of our EIA.

15.1.1.2 For a summary of the key baseline elements associated with socio-economics see Section 5.11.

15.1.1.3 The study area for the assessment of socio-economic effects consists of the project boundary for the EIA PEIR plus a 500 metre buffer combined with the area within the 1 in 100-year floodplain that is expected to experience a change in flood risk as a result of the project. This is the same rationale used to define the study area used for the Socio-Economic chapter of the RTS EIA Scoping Report (Environment Agency and Surrey County Council, October 2022) ('the EIA Scoping Report'). However, the study area is slightly different to that presented in our EIA Scoping Report due to minor changes in the project boundary for EIA PEIR compared to the project boundary for EIA Scoping (see Chapter 3 and Figure 5.24 for further information).

15.1.1.4 This chapter of our PEIR considers the effects from construction and operation of the project on local communities, businesses, recreational facilities and the local economy.

15.1.1.5 The assessment of socio-economic effects overlaps with the following other topics and utilises similar baseline information: Chapter 6: Air Quality, Chapter 10: Flood Risk, Chapter 11: Health, Chapter 12: Landscape and Visual Amenity, Chapter 13: Materials and Waste, Chapter 14: Noise and Vibration, Chapter 17: Traffic and Transport and Chapter 18: Water Environment.

15.2 Legislation, Policy and Guidance

15.2.1.1 A summary of the key legislation, policy and guidance relevant to socio-economics is provided in Appendix M of the EIA Scoping Report. Since the publication of our EIA Scoping Report in October 2022, the National Policy Statement for Water Resources Infrastructure (NPS) (Defra, 2023a) has been finalised and was designated in September 2023. No notable changes to the NPS from the draft NPS (published in 2018) have been identified as relevant to this chapter. There has been no other new relevant legislation, policy or guidance published since the submission of the EIA Scoping Report.

15.2.1.2 In the absence of definitive guidance or methodology for assessing socio-economic effects, Design Manual for Roads and Bridges (DMRB) LA 112 Population and Human Health (Highways England, 2020c) provides a steer in relation to some socio-economic receptors.

15.3 Engagement

15.3.1 Responses to EIA Scoping

15.3.1.1 Table 15-1 below summarises the comments and responses received on our EIA Scoping Report following formal submission to the Planning Inspectorate (PINS) EIA Scoping Opinion (dated 15 November 2022) ('the PINS Scoping Opinion') and any key comments received from statutory consultees. Full consultee comments on our EIA Scoping Report and our responses to these comments are provided in Appendix 4.1.

Table 15-1: Responses to comments received on the EIA Scoping Report

Consultee or Organisation	Summary of Comment	Project Response
Planning Inspectorate (PINS)	PINS did not agree to scope out construction effects associated with the influx of site personnel on community cohesion as not enough evidence was provided. PINS stated that the Environmental Statement (ES) should provide quantitative estimates of the number of construction staff required throughout the construction programme and describe how they would be accommodated. The ES should assess significant effects where they are likely to occur.	The number of site personnel required throughout the construction programme is not known at this time. Therefore this effect will now be scoped in. Further detail on indicative numbers of site personnel required will be provided in the ES and assessed as appropriate.
PINS	PINS agreed that in the absence of direct effects on Common Land, an assessment of such effects may be scoped out. The ES should address the potential for indirect effects to arise, where they are likely to be significant.	Indirect effects such as reduced flood risk to areas of Common Land (including Runnymede Common, Staines Common and Thames Meadow) will be assessed within the wider assessment of the project on socio-economic receptors.
PINS	PINS agreed that on the basis that the Flood Risk Assessment (FRA) and ES demonstrate that flood risk is reduced in Common Land areas during operation such effects can be scoped out.	No further action is required. As described above, the reduction of flood risk to common land will be assessed within the wider assessment of the project on socio-economic receptors.
PINS	PINS agreed to scope out impacts from transportation and handling of hazardous waste from the major road network to placement at appropriate facilities offsite, on the basis that waste will be handled by a licensed waste carrier and will be disposed of in line with relevant permits.	Noted. No further action required.
PINS	PINS agreed that, considering the nature and potential extent of the impact, that disturbance effects	Noted. No further action required.

Consultee or Organisation	Summary of Comment	Project Response
	from operation of new green open spaces on businesses is not likely to lead to significant effects and can be scoped out.	
PINS	PINS agreed that the permanent effect from the loss of residential land can be scoped out as only a small number of private residential dwellings will need to be acquired. However PINS requested that the ES should quantify and locate the properties to be acquired and describe whether this is to be achieved through agreement or compulsory acquisition.	Details of number and method of acquisition of residential dwellings will be provided in the ES.
PINS	The EIA Scoping Report paragraph 15.5.2.1 states that provision of new road bridges is not likely to be a significant enhancement to the current network. PINS stated that the ES should explain how the provision of new accesses to communities and businesses will affect the operation of the existing road network.	The provision of new road bridges is not likely to be a significant enhancement to the current network as new road bridge locations will reinstate the existing road network over the new channels reducing potential for severance but not enhancing traffic connections. Any existing accesses to local communities or businesses which would be disrupted by the project would be reinstated or reconnected to the existing road network. No new accesses to local communities or businesses are anticipated to be included as part of the project design.
PINS	The EIA Scoping Report states that 17 locations where Non-Motorised Users (NMUs) are either intersected or affected by the Proposed Development have been used for survey counts however, these locations are not identified. The ES should identify the locations of these surveys on a Figure.	An NMU Survey Report, including all details requested, has now been completed and is provided in Appendix 15.2.

Consultee or Organisation	Summary of Comment	Project Response
Local Planning Authority (LPA) Project Group	2011 Census data is cited as being one of the data sources used to inform the socio-economic baseline. The Socio-Economic assessment in the PEIR/ES should ensure that the 2021 Census data is used, if published and available at the time of writing.	Since the publication of the Scoping Report, detailed data from the 2021 Census has been released and this has been used to inform our PEIR and will be used for our ES.
LPA Project Group	Need to ensure that the most up to date baseline data is used in the assessment. For example, Gross Value Added (GVA) data for the year 2016 is reported in the EIA Scoping Report. This is not the latest data available. Similarly, population data is reported from the 2011 Census. Mid- Year Population Estimates (MYPE) published by the Office for National Statistics (ONS) or 2021 Census data should be used as the source of population data.	The baseline will be reviewed and updated for the ES using the most up to date data sources available. As noted above the data from the 2021 Census has informed the baseline for our PEIR. While more up to date GVA data is available the proportion of the economy of south east England made up by Surrey remains at 16% as reported in 15.3.1.11 of the EIA Scoping Report.
LPA Project Group	Total resident population is reported. The assessment should also consider the age profile of the population to identify key life stage cohorts in the Study Area's population (for example, children, working age and older persons).	The baseline will be reviewed and updated for the ES and this detail will be added.
LPA Project Group	Figure 15-1 of the EIA Scoping Report identifies the socio-economic receptors. For the PEIR/ES details of the individual receptors should be incorporated (i.e. in table format) and the distance of each individual receptor from the RTS reported. This will enable quantification of the number of places of worship, education establishments etc. that have the potential to be affected.	This would result in a significant dataset (approximately 45,000 residential and 2,500 non-residential receptors within the study area) and therefore we considered that this would not provide a proportionate way of representing the data. Appendix 15.1 does however provide an overview and quantification of different receptor types within the study area.
LPA Project Group	The future population of the Study Area should be reported in the	Further consideration of population projections and associated

Consultee or Organisation	Summary of Comment	Project Response
	future baseline using the ONS Sub-National Population Projections (ONS, 2020).	demographics will be provided within the ES.
LPA Project Group	The future baseline currently presented references different years (mid-2030, 2039 and 2045). The future baseline should be consistent and represent the completion year where possible.	The baseline will be reviewed and updated for the ES. Where possible future baseline years will be consistent and in line with year of completion.

15.3.2 Other Engagement

15.3.2.1 No other formal engagement with stakeholders has taken place in the preparation of this PEIR chapter. Meetings with certain landowners and businesses within the project boundary for EIA PEIR have taken place throughout the period since the publication of the EIA Scoping Report.

15.4 Methodology

15.4.1 Introduction

15.4.1.1 This section should be read in conjunction with Chapter 4 'Approach to the Environmental Assessment' which sets out relevant information on the design parameters and information that has informed our PEIR assessment, and how we have approached various aspects of the assessment including:

- The scope of the assessment;
- The methodology (including the approach to defining the baseline environment, topic study areas, and assessment methodology and criteria);
- The approach to mitigation; and
- The approach to cumulative effects.

15.4.2 Assessment methodology

15.4.2.1 The assessment methodology used for the socio-economic assessment in our PEIR and to be used in our ES is presented in Section 15.7 of our EIA Scoping Report.

15.4.2.2 The preliminary environmental assessment for our PEIR has been informed by desk based research and where appropriate specific site surveys. To date a desk based appraisal of land use has been completed (see Appendix 15.1) and a survey on the use of Public Rights of Way (PRoW) has been carried out (see Appendix 15.2). Further to this a questionnaire survey of lake ownership and use of lakes within the project boundary for EIA PEIR is to be completed, which will inform the socio-economic assessment for our ES.

15.4.2.3 As noted in Table 15-1 the PINS EIA Scoping Opinion included the requirement to scope in the potential effect of an influx of site personnel during construction upon community cohesion and the nature of communities, due to changes in population characteristics. The inclusion of this additional effect within the socio-economic assessment does not alter the methodology detailed within Section 15.7 of our EIA Scoping Report.

15.5 Key Environmental Considerations and Opportunities

15.5.1.1 The key considerations with respect to socio-economics are:

- The study area is dominated by urban development, with large numbers of residential properties, community facilities, businesses, industries and services. The function and operation of these are sensitive to disruption from changes in traffic volumes, air quality, noise and visual amenity;
- Many of the residential and commercial properties in the study area are at risk of flooding and therefore sensitive to activities that may exacerbate this;
- There is an extensive network of PRoW and other recreational facilities (including public open spaces) within the study area, the use of which are sensitive to disruption, closures and/or diversions and access restrictions;
- Businesses providing recreational facilities at lakes within the study area are sensitive to changes in lake processes and water quality which could effect the commercial viability of businesses; and
- Water utility businesses operating within the study area are reliant on the availability of water for surface water and groundwater abstraction. Currently, there is no capacity for additional consumptive licences without restrictions (Environment Agency, 2019a). Water suppliers face significant pressure to meet demands during drought

conditions where water level is low and turbidity of surface water is high.

15.5.1.2 The key opportunities with respect to socio-economics are:

- Reducing flood risk to the local population, including residential properties, businesses, industries and services, and community infrastructure including recreational facilities;
- Creation of jobs and training opportunities associated with construction and operation, and provision of educational and recreational facilities;
- Improving local community access to quality natural spaces through the development of the landscape and green infrastructure design; and
- Facilitation of economic growth as a result of the above mentioned opportunities, along with the regeneration of derelict and brownfield sites and enhanced recreational opportunities (including active travel).

15.6 Primary and Tertiary Mitigation

15.6.1 Primary Mitigation

15.6.1.1 The following primary mitigation is proposed in relation to socio-economic effects. For further detail of these measures see Chapter 2 Project Description.

- Infill of connection between Manor Lake and Fleet Lake to limit nutrient inputs to Manor Lake and altering the water level control structure from St Ann's Lake to Abbey Lake to divert floodwater and limit nutrient inputs. These will mitigate effects on water quality and associated potential effects on the use of lakes for recreation (e.g., angling, boating or open water swimming).
- The provision of the augmented flow of up to 1.0m^3/s along the flood channel (when not being operated with a larger flow during major flooding), aims to avoid nutrient enrichment of existing lakes which thereby limits effects on water quality and the associated potential negative effects on the use of lakes for recreation.
- The potential to manage and adapt the augmented flow during periods of low flow is currently being considered to mitigate for

reductions in the flows within the River Thames that are required for abstraction by water utility companies.

- Sustainable Urban Drainage Systems (SuDS) are to be designed to manage flood risk through construction and operation of the project to ensure no increase in surface water flooding to socio-economic receptors.
- The Sequential Approach to design reduces flood risk posed to socio-economic receptors from the project as the proposed project components (including construction compounds and materials processing sites) will be appropriately located in the areas of lowest flood risk where feasible, and as the uses of the project components adhere to what is appropriate in the different flood zones based on their National Planning Policy Framework (NPPF) vulnerability classification. Chapter 10: Flood Risk provides further information in relation to flood risk tests.
- An integrated landscape design process is being pursued, which aims to sensitively integrate all project components within the existing landscape. This will reduce the potential negative effects from construction of disruption associated with visual amenity, on residential, commercial and community infrastructure, and further enhance the existing recreational infrastructure (PRoW network and public open spaces) within the study area.

15.6.2 Tertiary Mitigation

15.6.2.1 The following tertiary mitigation is proposed in relation to the socio-economic effects assessed within our PEIR. Many of these measures will also serve as mitigation for other environmental effects including air quality; flood risk; materials and waste; noise; traffic; and water in respect of other EIA topics:

- Stakeholder Engagement Plan will include engagement with residents, businesses and other members of the public to keep them informed about the proposed construction works (e.g. locations, timing, duration, any impacts on access etc.) to minimise disturbance.
- A Construction PRoW Management Plan will include details of temporary PRoW stopping up and diversion processes, management measures and restoration. This will reduce potential negative effects on land-based recreation from reduced access to the PRoW network and severance of communities.

- Reinstatement of land that is only required temporarily during construction will mitigate effects from the loss of residential and commercial land used for construction compounds, materials processing sites and material storage sites.
- Application of the Waste Hierarchy, which includes reducing the generation of waste, reuse of arisings and treatment of waste to make it suitable for reuse, will reduce the need to transport material and thereby reduce potential negative effects on local communities from disruption, reduced accessibility and/or severance.
- Standard construction practices for air quality and the production of an Air Quality Management Plan (see Chapter 6 Air Quality for details of what these include) will reduce potential negative effects of disruption to residential properties, businesses and community infrastructure caused by the operation of construction compounds, and materials processing and material storage sites.
- Construction Surface Water Management Plan, and Construction flood protocol / Construction Emergency Planning (see Chapter 10 Flood Risk for details of what these include) will seek to manage potential negative effects from construction associated with increasing flood risk and changes in water quality of lakes leading to potential likely significant effects on the use of lakes for recreation (e.g. angling, boating or open water swimming).
- Standard construction practices in respect of waste and materials management, and the production of a Site Waste Management Plan, and Materials Management Strategy (see Chapter 13 Materials and Waste for details of what these include) will reduce potential negative effects of disruption to residential properties, businesses and community infrastructure caused by the operation of construction compounds, and materials processing and material storage sites. The Materials Management Strategy will also ensure that there is a provision of raw materials (sharp sands and gravel) to the wider economy thereby contributing to this positive potential effect.
- Best Practicable Means Noise and Vibration mitigation (see Chapter 14 Noise and Vibration for details of what this includes) will reduce effects of disruption to residential properties, businesses and community infrastructure caused by the operation of construction compounds, and materials processing and material storage sites.
- Construction Traffic Management Plan, Construction Logistics Plan and Construction Travel Plan (see Chapter 17 Traffic and Transport

for details of what these include) will reduce potential negative effects on local communities from disruption, reduced accessibility and/or severance.

- An Operational Travel Plan (see Chapter 17 Traffic and Transport for details of what this includes) aims to proactively manage and influence employee (and visitor) travel to and from facilities being provided at the New Green and Blue Open Spaces, to encourage the use of sustainable travel methods and reduce network disruption locally to these facilities and other public open spaces nearby.
- Standard construction practices for water (see Chapter 18 Water Environment for details of what this includes) will ensure that all waste water produced on site is disposed of appropriately and cannot enter watercourses and that all liquids are appropriately stored to prevent spillage. This will reduce the likelihood of negative effects on water quality of lakes thereby reducing the likelihood of potential negative effects on the use of lakes for recreation (e.g. angling, boating or open water swimming).

15.6.2.2 The details of these tertiary mitigation measures will continue to be developed as the assessment of socio-economic effects is further defined. Where location or receptor specific mitigation is identified this will be captured within the relevant management plans and measures for construction and operation where required and reported within our ES.

15.7 Preliminary Assessment of Likely Significant Effects

15.7.1 Introduction

15.7.1.1 Our PEIR adopts a precautionary approach. Assessments reported within this chapter are a preliminary assessment of potential likely significant environmental effects based on the design parameters set out in Chapter 2: Project Description. This precautionary approach has been taken for the PEIR as there is some information on the project that is currently incomplete and the parameters within Chapter 2 are high level and account for a range of uses and allowance for design development within a boundary that could possibly be refined once this work has been completed. For example, some designs, construction and mitigation details (and therefore also land requirements) or baseline information is still required from further surveys, assessments and/or consultation feedback.

15.7.1.2 In making a determination of likely significant effects, we have considered the sensitivity of receptors (a receptor being a feature of the environment that responds to change) and the potential magnitude (i.e. size) of change caused by the RTS. The methodology for defining sensitivity and magnitude varies by topic and are defined in the topic sections of our Scoping Report and in Section 15.4 of this chapter.

15.7.1.3 We are committed to including mitigation measures as necessary to address likely significant negative environmental effects as far as reasonably practicable. Both primary and tertiary mitigation are considered to form part of the RTS; those applicable to this topic are set out in Section 15.6. Several of these mitigation measures are still being developed, and therefore as a precaution, the preliminary assessment of effects for our PEIR does not assume full achievement of these in considering if a project effect is likely to be significant (Appendix 4.2 identifies the implementation status of primary and tertiary mitigation for the PEIR assessment). Furthermore, the potential likely significant effects reported within our PEIR have been assessed prior to the implementation of secondary mitigation measures, those applicable to this topic are set out in Section 15.7.5. These secondary mitigation measures are the subject of further development; and given they are still being developed, are not able to be applied to develop a 'residual' effects assessment.

15.7.1.4 Our PEIR is based on the latest design and construction parameters and baseline information. As such the findings of the preliminary environmental appraisal presented within our PEIR may be subject to change as the design progresses, as mitigation is further developed or information from further studies becomes available, such as our work to develop an adaptive augmented flow, identify PRoW requiring temporary or permanent diversions or closures and refine measures for management during construction. The final assessment of effects undertaken as part of the EIA and reported within our ES will be based on the latest information available at that time.

15.7.2 Potential Likely Significant Effects

15.7.2.1 Our preliminary assessment of likely significant environmental effects has identified the following potential likely significant positive effects from construction in relation to socio-economics:

- Temporary positive effect to the economic and social development of the area through the extraction of natural resources (e.g. sharp sands and gravels) which could contribute to the provision of raw materials and employment opportunities to the wider economy.
- Temporary positive effect to local businesses in the study area due to the influx of site personnel.
- Temporary positive effect to the local unemployed, underemployed or under-skilled construction workforce through the generation of employment opportunities and the potential for the project to provide social development through additional skills and training.

15.7.2.2 Our preliminary assessment of likely significant environmental effects has identified the potential for the following potential likely significant negative effects from construction in relation to socio-economics:

- Temporary negative effects to businesses within the study area due to disruption and reduced accessibility from temporary road closures and diversions associated with the construction of new road bridges.
- Temporary negative effects to pedestrian, cyclist and/or equestrian receptors from reduced accessibility or severance to local communities along routes for Heavy Goods Vehicles (HGVs) transporting excavated materials due to an increase in HGV movements along these routes.
- Temporary negative effects to lake-based businesses and recreational facilities with a hydraulic connectivity to the project due to changes in water quality, water level, hydromorphology, flow regime and/or sediment processes which may impact the ability of the business/resource to operate.
- Temporary negative effects to areas close to construction from increased flood risk, particularly in areas where land levels will change for site compounds and material processing and storage sites.
- Temporary negative effect to residential dwellings from loss of land required for construction working areas.
- Temporary negative effects from disturbance (e.g. air quality, noise, visual) to residential amenity within the study area.
- Temporary negative effect from construction to social and community infrastructure, from disturbance (e.g. air quality, noise, visual) including their viability and functionality.

- Temporary negative effects on businesses from loss of land or waterbodies required for construction working areas.
- Temporary negative effects on businesses from construction disturbance (e.g. air quality, noise, visual).
- Temporary negative effects on community cohesion and the nature of communities due to changes in population characteristics from an influx of site personnel, resulting in increased demand for local housing and public services.
- Temporary negative effects on access and use of some land-based recreational facilities (including the Thames Path, national/local cycle network, local PRoW network and public open spaces within the study area) due to the presence of construction working areas, resulting in reduced visibility of resources, severance of communities and/or reduced access to public amenities.
- Temporary negative effects on access and use of water-based recreational facilities (e.g. angling, boating or open water swimming) due to the presence of construction working areas and works within the River Thames and lakes, resulting in reduced visibility of resources, severance of communities and/or reduced access to public amenities.

15.7.2.3 Our preliminary assessment of likely significant environmental effects has identified the potential for the following likely significant positive effects from operation in relation to socio-economics:

- Permanent positive effect on residential properties, businesses and community infrastructure from reduction in flood risk and associated economic damages, allowing businesses to continue operating and providing improved safety and wellbeing of local communities.
- Permanent positive effect on the local economy from the creation of opportunities for businesses to establish new ventures in and around the potential areas of new green and blue open space and areas of enhanced public connection.
- Permanent positive effect on some existing recreational facilities from the change in access to the local area through the provision of active travel routes, pedestrian and cycle bridges across the River Thames, and upgrades to the Thames Path, the national cycle network, and the local PRoW network.
- Permanent positive effect upon local communities from improved provision of recreational facilities.

15.7.2.4 Our preliminary assessment of likely significant environmental effects has identified the potential for the following likely significant negative effects from operation in relation to socio-economics:

- Permanent negative effect on the water environment arising from the introduction of River Thames water to previously unconnected lakes, thereby affecting the commercial viability of businesses operating at these and/or their recreational use.
- Permanent negative effect on businesses (such as farming and lake-based businesses) from loss or disturbance of land or waterbodies due to the existence of the flood channel and other project components.
- Permanent negative effect on businesses (such as farming and lake-based businesses) as a result of changes to land drainage due to the existence of the flood channel and other project components.
- Permanent negative effect to water utility businesses from potential changes in the availability of water for surface or groundwater abstraction due to the diversion of water away from the River Thames and potential changes to groundwater levels and groundwater fed lakes.

15.7.2.5 Further details of the potential likely significant effects from construction and operation with respect to receptors, project components and project activities, on socio-economics can be found in Table 1 and 2 in Appendix 15.3.

15.7.3 Potential Likely Non-Significant Effects

15.7.3.1 Further details of the non-significant effects from construction and operation with respect to receptors, project components and project activities, on socio-economics can be found in Table 3 and 4 in Appendix 15.3.

15.7.3.2 Some examples of socio-economic non-significant effects include (this is not an exhaustive list) are as follows:

- Temporary negative effects from construction on access and use of some land-based recreational facilities (including the local PRoW network, public open spaces, and permissive non-designated paths within the study area) due to the presence of construction working areas, resulting in reduced visibility of resources, severance of communities and/or reduced access to public amenities.

- Permanent positive effects on local communities further away from the project from improved provision of recreational facilities during the operational stage.

15.7.4 In-Combination Climate Impact

15.7.4.1 Consideration of 'In-Combination Climate Impact' (ICCI) has been undertaken. The preliminary environmental assessment has considered a future climate scenario and has identified certain potential likely significant environmental effects for this topic which may be exacerbated by predicted climate change. Further consideration of ICCI will be included in the ES.

15.7.5 Secondary Mitigation

15.7.5.1 As noted in Section 15.7.1.3, primary and tertiary mitigation are still being developed, and therefore as a precaution, the preliminary assessment of effects for our PEIR does not assume full achievement of these in considering if a project effect is likely to be significant. Furthermore, the potential likely significant effects reported within our PEIR have been assessed without the implementation of secondary mitigation measures. For the majority of the identified likely significant environmental effects it is considered likely that the primary and tertiary mitigation will be sufficient at ES stage such that no secondary mitigation will be required. Where secondary mitigation is already being considered for potential significant environmental effects, this is detailed below.

15.7.5.2 In order to further reduce the magnitude of likely significant effects, the following secondary mitigation is being considered:

- Water quality monitoring (during construction) will be used to assess if changes to water quality could occur as a result of construction works and therefore if subsequent remedial activities are required to reduce potential likely significant effects on lake based businesses and the use of lakes for recreation. Further action could include (if required) deploying silt traps or other proprietary equipment to filter any detected pollutants.
- Water quality monitoring (operation) will be used to assess if the RTS could affect water quality of lakes connected to the flood channels and therefore if subsequent remedial activities are required to reduce potential likely significant effects on lake based businesses and the

use of lakes for recreation. Further action could include (if required) deploying silt traps or other proprietary equipment to filter any detected pollutants.

15.7.5.3 Once the results of the flood risk assessment (FRA) are known any recommendations necessary to be made to mitigate effects from construction associated with increased flood risk on socio-economic receptors will be determined.

15.7.5.4 Where there is a legal requirement to provide compensation to businesses and landowners due to loss of earnings and/or loss of land (temporary or permanent) this will be undertaken either by upfront agreement or through the compensation measures in the DCO. The use of compensation is not considered to be mitigation for the purposes of EIA, however where potentially required this has been identified in Table 1 and 2 in Appendix 15.3.

15.8 Further Work for the EIA

15.8.1.1 The detailed assessment of socio-economic effects to inform the ES will be undertaken following the methodology set out in Section 15.7 of our EIA Scoping Report, having been informed by the PINS Scoping Opinion and other consultation feedback on baseline, methodology and effects scoped into the assessment.

15.8.1.2 To further the preliminary assessment presented in our PEIR, the following will be undertaken as part of the detailed socio-economic assessment for our ES:

- Where necessary, identify more specific receptors upon which to assess effects and allow for more targeted mitigation measures.
- Obtain additional information where available to inform the assessment including for example, lake ownership and usage, agricultural land quality and community feedback obtained through consultation events.
- Update the baseline set out in our EIA Scoping Report where there is more updated information available.
- Continued interaction with assessments on Air Quality, Flood Risk, Health, Landscape and Visual Amenity, Materials and Waste, Noise and Vibration, Traffic and Transport, and Water Environment.

15.8.1.3 We consider that the further development of the project design and mitigation measures which will be reflected in the ES and DCO application, will enable a reduction in the scale of identified negative likely significant effects set out in this chapter.

16 Soils and Land

16.1 Introduction

16.1.1.1 This chapter of our Preliminary Environmental Information Report (PEIR) considers the effects from construction and operation of the River Thames Scheme (RTS) ('the project') in relation to soils and land. Within this chapter we have included topic specific sections on:

- Legislation, policy and guidance (noting any changes since Environmental Impact Assessment (EIA) scoping);
- Engagement with consultees, including responses to comments received on the RTS EIA Scoping Report;
- The assessment methodology for this topic (again noting any changes or updates since EIA scoping);
- Key environmental considerations and opportunities,
- Primary and tertiary mitigation;
- Our preliminary assessment of effects;
- Secondary mitigation; and
- Future work for this topic of our EIA.

16.1.1.2 For a summary of the key baseline elements associated with soils and land see Section 5.12.

16.1.1.3 For the purposes of soils and land the study area encompasses the full extent of the area within the project boundary for EIA PEIR. For the purposes of land potentially affected by contamination, the study area encompasses the extent of the area within the project boundary for EIA PEIR and extends an additional 250 metres from the soils and land study area outlined above.

16.1.1.4 This is the same definition of the study area that was used for the soils and land chapter of the RTS EIA Scoping Report (Environment Agency and Surrey County Council, October 2022) ('the EIA Scoping Report'), see Section 16.2.3 of the Scoping Report. However, the study area will be slightly different to that presented in the EIA Scoping Report due to minor changes in the project boundary for EIA PEIR (see Chapter 3 and Figure 5.28, for further information).

16.1.1.5 This chapter describes the proposed scope of the assessment on soils and land. It outlines the likely effects of the project and the avoidance or mitigation measures proposed to alleviate these.

16.1.1.6 The assessment of soils and land effects overlaps with the following other topics and utilises similar baseline information: Chapter 10: Flood Risk, Chapter 11: Health, Chapter 13: Materials and Waste, and Chapter 18: Water Environment. The scope of agricultural soils in this chapter is limited to the quality of farmland (in the context of Agricultural Land Classification (ALC)). Any socio-economic aspects of agriculture and commercial businesses are covered in Chapter 15: Socio Economics. The potential effects associated with contamination and changes in soil structure to ecological receptors is included in Chapter 7: Biodiversity. The carbon aspects of soils are included in Chapter 8: Climatic Factors. Potential effects associated with waterborne contamination are discussed in Chapter 18: Water Environment.

16.2 Legislation, Policy and Guidance

16.2.1.1 A summary of the key legislation, policy and guidance relevant to soils and land is provided in Appendix M of the EIA Scoping Report. Since publication of the EIA Scoping Report in October 2022, the National Policy Statement for Water Resources Infrastructure (NPS) has been updated and finalised (Defra, 2023a). No notable changes to the NPS from the draft NPS (published in 2018) have been identified as relevant to this chapter. There has been no other new relevant legislation, policy or guidance published since the submission of the EIA Scoping Report. In August 2023 CIRIA published guidance on Sustainable management of surplus soil and aggregates from construction (CIRIA, 2023). This has not been considered in the PEIR but will be considered in the Environmental Statement (ES).

16.3 Engagement

16.3.1 Responses to EIA Scoping

16.3.1.1 Table 16-1 below summarises the comments and responses received on our EIA Scoping Report following formal submission to the Planning Inspectorate (PINS) including the PINS EIA Scoping Opinion (date 15 November 2022) (‘the PINS Scoping Opinion’) and any key comments

received from statutory consultees. Full consultee comments on our EIA Scoping Report and our responses to these comments are provided in Appendix 4.1.

Table 16-1: Responses to comments received on the EIA Scoping Report

Consultee or Organisation	Summary of Comment	Project Response
Planning Inspectorate (PINS)	PINS considered that not enough standard practice information was presented at scoping to scope out effects associated with general construction activities causing damage to soils and compactions.	General construction activities have been scoped in to our PEIR.
PINS	Mitigation such as bank protection works and profiling of channels to safe measurements and support from sheet piling is proposed to reduce the potential for operational failures occurring. An emergency plan for operational failures should also be submitted with the Environmental Statement (ES). On the basis these measures are described in the ES and secured through the DCO, the Inspectorate is content to scope this matter out.	An emergency plan for operational failure will be produced and included within the ES and secured through the DCO.
PINS	Although the sediment regimes are anticipated to return to normal once the weir structures are in place, there is potential for a time lag for this to take effect. The ES should confirm if this is the case and assess the potential for significant effects to occur due to an altered regime.	Sediment regimes, including in relation to weir structures, are being considered in Chapter 18: Water Environment and will be included in the ES
PINS	Section 16.7.2 of the Scoping Report does not include agricultural land as a receptor (including best and most versatile) although the grading is reported in paragraph 16.3.1.22. The ES should assess the potential for significant effects due to agricultural land take.	Temporary and permanent effects on agricultural land are scoped in under Section 15.4.1.1 bullet 5 and Section 16.4.2.1 bullet 2 of the EIA Scoping Report and have been considered in the PEIR.
PINS	Considering the reprofiling of land has potential to cause land instability, the ES	Land instability from earthworks, creation

Consultee or Organisation	Summary of Comment	Project Response
	should assess significant effects where they are likely to occur.	of site compounds, temporary material processing sites and temporary storage of excavated material etc. have been scoped in and included within the PEIR.
PINS and Local Planning Authority (LPA) Project Group	The Scoping Report does not set out the methodology by which any assessment of soils and agricultural land will be undertaken, and we advise that this must be completed in accordance with standard practice and measures to protect soil resources should be in accordance with the 'Construction Code of Practice for the Sustainable Use of Soils on Construction Sites' (Defra 2009). This should include an assessment that takes account of the ecosystem services they provide as a resource.	Soils as a resource are assessed in the PEIR and will be assessed in the ES. Adherence to the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites' is considered tertiary mitigation and will also be used to inform the assessment in the ES. A project specific Natural Capital Assessment is being undertaken that considers the ecosystem services that soil provides and will be reported on alongside the ES.
LPA Project Group	The Geology and Soils chapter of the EIA Scoping Report does not make any reference to land stability and/or geological hazards. It is advised that a preliminary land stability risk assessment should be undertaken, with the findings used to inform the EIA.	The effects of the project on structure and stability of soils are assessed in our PEIR and will also be assessed in the ES. A Preliminary Land Stability Risk Assessment will inform the ES.

16.3.2 Other Engagement

16.3.2.1 Briefings have been held with the LPA Project Group in 2023 to provide updates on our approach to materials and waste management, including a summary of our ground investigations (GI). We have also met with the Environment Agency National Infrastructure team to discuss consenting requirements in relation to materials management, waste and permitting requirements, and this will continue as the project progresses.

16.4 Methodology

16.4.1 Introduction

16.4.1.1 This section should be read in conjunction with Chapter 4 'Approach to the Environmental Assessment' which sets out relevant information on the design parameters and information that have informed the PEIR assessment, and how we have approached various aspects of the assessment including:

- The scope of the assessment;
- The methodology (including the approach to defining the baseline environment, topic study areas, and assessment methodology and criteria);
- The approach to mitigation; and
- The approach to cumulative effects.

16.4.1.2 The assessment methodology used for the soils and land assessment in this PEIR and to be used in the Environmental Statement (ES) is presented in Section 16.7 of the EIA Scoping Report, including defining categories for the sensitivity of receptors and the magnitude of effects. No changes to the methodology were required in response to the Planning Inspectorate (PINS) EIA Scoping Opinion. Following additional feedback from engagement with the LPA Project Group, at the ES stage further analysis of natural capital consideration will be undertaken in the soil assessment in accordance with A New Perspective on Land and Soil in Environmental Impact Assessment (IEMA, 2022d).

16.4.2 Assessment Method for the PEIR

16.4.2.1 The baseline presented in Section 5.12 of the PEIR and Section 16.3 of the EIA Scoping Report was informed by previous GI data. No further GI

data or interpretive reporting has been considered for the PEIR assessment. Additional GI data is currently being processed, this data will supplement the older data and be used to create a detailed conceptual ground model, the detail of which will be discussed with the relevant stakeholders as part of on-going engagement. The conceptual ground model will only be available at the ES stage. Therefore, for the PEIR we have completed our assessment based on professional judgement utilising the available baseline information and applying a precautionary approach to provide a robust assessment.

16.4.2.2 Our evaluation of significance and analysis of consequences is based on established EIA assessment approaches and expert professional judgement. We have relied on industry approved standards, guidelines, and current legislation to support the assessment (see Appendix M of the EIA Scoping Report). There is potential for various likely significant effects on soil and land to arise from the construction and operation of the project, and we have assessed these effects according to relevant guidance.

16.4.2.3 We have assessed the significance of possible contamination in the study area by considering the probability and severity of the following factors combined:

- A source of contamination is present;
- There is a pathway or route that the contaminant can travel along; and
- Along the pathway is a receptor – a specific part of the natural or human environment that is negatively affected by the contaminant.

16.4.2.4 We have assessed the effects that could arise due to placement of materials on land. This could result in compression of historical landfill waste under the new green open spaces and priority areas for habitat creation, enhancement or mitigation, leading to the release of contamination. We have also evaluated the potential for contamination to infiltrate into groundwater should a pathway exist or if there is a possibility of one or more being created. Based on this assessment, we have established the likelihood of any significant effects upon groundwater (and any other identified receptors) in the future and identify the necessary control measures.

16.4.3 Assessment Method for the ES

16.4.3.1 The assessment methodology will be as described for the PEIR above with the following additions:

16.4.3.2 The assessment of effects undertaken as part of the EIA and to be reported within the ES will be based on the latest information available at that time and will include details from GI interpretive reports, ground modelling and associated risk assessments.

16.4.3.3 A ground model is being developed for the project and will inform the ES by identifying sources, pathways, and receptors of potential effects.

16.4.3.4 The project design is currently being developed and will include strategies and measures to prevent negative effects on receptors by avoiding (or minimising the effects of) the creation of new sources, removing the source contaminants, or breaking the source-pathway-receptor linkage by severing the pathway.

16.4.3.5 In areas where excavation of materials is required, we will assess their physical and chemical properties for suitability for placement elsewhere within the study area. This information will be reported in the ES. The chemical properties will be assessed to ensure suitability for the proposed public open green spaces or parkland as well as adjacent controlled waters (see Chapter 18: Water Environment). Physical properties such as the soil's ability to be compacted and used as general fill without significant future settlement or instability will also be evaluated to ensure suitability for placement in public open spaces.

16.5 Key Environmental Considerations and Opportunities

16.5.1.1 The key considerations with respect to soils and land are:

- The small areas of moderate and high-quality agricultural land within the study area are sensitive to land use changes such that agricultural land is lost;
- There are numerous historical and authorised landfill sites and other areas of potentially contaminated land within the study area. These are a risk to identified receptors from the creation of new pollutant pathways;

- Soil structure, quality and quantity is sensitive to compaction, degradation and pollution from land use changes such as the construction of major infrastructure projects.

16.5.1.2 The key opportunities with respect to soils and land are:

- A reduction in flood risk for land use assets (e.g. agricultural land within the soils and land study area); and
- There are likely to be opportunities for use of excavated wastes and materials within the project, incorporated into the landscape and green infrastructure design (subject to approval).

16.6 Primary and Tertiary Mitigation

16.6.1 Primary Mitigation

16.6.1.1 The following primary mitigation is proposed in relation to soils and land effects. For further detail of these measures see Chapter 2 Project Description:

- The Sequential Approach to flood risk ensures that the areas of site of lowest flood risk are appropriately allocated for activities that are particularly sensitive to uncontrolled flooding. This will mitigate effects associated with, for example, for the potential damage or loss of topsoil and subsoil stockpiles, and uncontrolled release of contaminants into flood waters at materials processing sites; and
- Silt monitoring and channel maintenance will be required at the entrances to the intake structures and at interconnecting waterbodies to prevent the build-up of sediment reducing the effectiveness of the flood channel and therefore avoiding negative effects associated with flooding of contaminated land.

16.6.2 Tertiary Mitigation

16.6.2.1 The following tertiary mitigation is proposed in relation to the soils and land effects assessed within this PEIR. Many of these measures will also serve as mitigation in respect of other EIA topics:

- Apply standard construction practices in relation to handling of soils to mitigate against effects associated with the damage to soils

(geochemically and geotechnically), to minimise reduction of quality, for example:
    - Topsoil stripping, storage, and replacement to preserve and protect the soil resource from further deterioration during construction.
    - Limiting construction traffic to delineated routes and away from riverbanks to prevent damage to soils.
    - Placement of granular layers of hardcore with geotextile at construction compounds and material processing sites to minimise ground compaction.
- Soil handling measures will be undertaken to mitigate effects on soils in accordance with the following good practice guidance documents (this is not an exhaustive list):
    - Good Practice Guide for Handling Soils in Mineral Workings (The Institute of Quarrying (IQ), 2021.
    - BS4428:1989 British Standard code of practice for general landscape operations.
    - BS3882:2007 British Standard specification for topsoil and requirements for use.
    - Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (Defra, 2009).
    - Site Specific Soil Resource Plan.
- Develop a Construction Surface Water Management Plan to mitigate effects from damage to soils and land and spread of potential contamination by leaching due to interaction with surface water. This could include measures such as (this is not an exhaustive list):
    - Design of stockpiles sized and orientated to not obstruct storm surface water flowpaths, to prevent deterioration of soils from washout, and the management of stockpile water runoff.
    - Design of the sequencing and timing of works to optimise storm water storage and prevent saturation of stockpiled soils.
    - A suitable plan for the treatment and discharge of collected water from construction activities such as dewatering and road sweeping.
- Develop a Materials Management Strategy. We are developing the strategy in parallel to the Development Consent Order (DCO) process and it will include measures to protect soils through:
    - Efficient management proposals for processing and recovery of waste and placement of materials generated by the project, using

specific criteria based on risk assessments to ensure geochemical and geotechnical suitability for minimal acceptable effect on environmental receptors. This reduces the need to import materials from off-site, and minimises the volume of unsuitable materials requiring off-site disposal including soils.
    - Being implemented in line with relevant permitting requirements and protocols such as CL:AIRE Definition of Waste: Code of Practice (DoWCoP) and various other end of waste protocols such as the Waste and Resources Action Programme (WRAP).
- Develop a Site Waste Management Plan (SWMP) to control the movement, storage and recovery of waste to mitigate against the effects from mixing and pollution of other soils and wastes. The SWMP sets out the amount and type of waste and how it will be recovered, recycled or disposed of in accordance with legislation. The Contractor(s) will adopt the outline SWMP and develop further as required.
- Apply the waste hierarchy. For example, minimise generation of waste, reuse of arisings, treatment of waste to make it suitable for deposit etc. This will aid further with mitigation of the possible effect from pollution of other soils and wastes.
- Undertake GI. We are currently completing geotechnical and geoenvironmental investigations, involving intrusive sampling and testing of the underlying soils, bedrock, groundwater, and ground gas to determine characteristic physical and chemical properties of materials underlying the site. The GI is being completed in accordance with the Water Resources Act 1991 (as amended) and Part 2A of the Environmental Protection Act 1990 supplemented by the Contaminated Land Regulations 2012. Results and interpretation of the GI findings is allowing us to produce a ground model containing relevant geochemical and geotechnical data that will refine our primary, tertiary, and secondary mitigation in relation to management of soil.
- Undertake a Hydrogeological Risk Assessment to a scope to be agreed with host authorities and the Environment Agency to evaluate the environmental risk of pollution of groundwater from contaminated soils, in accordance with the Water Resources Act 1991 (as modified to 2020) and develop control measures to minimise this risk during excavation, treatment, or deposition and therefore reduce effects of

pollution migration to sensitive receptors. The Hydrogeological Risk Assessment will be submitted with the DCO.

- Apply standard construction practices in relation to waste and materials management to mitigate the spread of contaminated soils and waste to receptors. This would include mitigation measures and associated monitoring (such as for groundwater) in accordance with the following good practice guidance documents and legislation (this is not an exhaustive list):
  - Technical Guidance WM3: Waste Classification - Guidance on the classification and assessment of waste (Environment Agency, 2021a).
  - Land Contamination Risk Management (LCRM).
  - Model Procedures for the Management of Contaminated Land (CLR 11).
  - Part IIA of the Environmental Protection Act 1990.
  - Water Framework Directive.
  - Groundwater Regulations 1998 (as amended).
  - Water Resources Act 1991 (as amended).
  - Environmental consents and permitting (Environmental Permitting (England and Wales) Regulations, 2016) – see below.
  - Environment Agency Landfill Gas Guidance (Environment Agency, 2004).
- Obtain and comply with environmental permits for waste in relation to potential spread of contaminants in soil as a result of compression from project components, e.g. new landforms, as well as changes in land use of historical landfills due to the project. Any works within or affecting landfills or involving waste will be subject to the requirement of an environmental permit under the Environmental Permitting (England and Wales) Regulations 2016. For the purposes of this PEIR assessment, environmental permits for waste have been included as mitigation, with the assumption that these are in place. As part of the permitting process, we will be required to:
  - Undertake a range of risk assessments / modelling of landfill leachate and gas migration (based on the outcomes of GI and ground modelling), which will be subject to scrutiny by the Environment Agency's National Permitting Service to ensure that they are robust;
  - Propose and put in place suitable measures to mitigate effects on the environment to an acceptable level, which the Environment

Agency National Permitting Service will review and scrutinise in terms of their adequacy and appropriateness for mitigating the risks and effects identified. An environmental permit will only be granted if the Environment Agency National Permitting Service is satisfied that effects on human health and the environment are acceptable.

- Comply with conditions to limit effects on human health and the environment and ensure that the activities are subject to suitable controls.

16.7 Preliminary Assessment of Likely Significant Effects

16.7.1 Introduction

16.7.1.1 Our PEIR adopts a precautionary approach. Assessments reported within this chapter are a preliminary assessment of potential likely significant environmental effects based on the design parameters set out in Chapter 2. This precautionary approach has been taken for the PEIR as there is some information on the project that is currently incomplete and the parameters within Chapter 2 are high level and account for a range of uses and allowance for design development within a boundary that could possibly be refined once this work has been completed. For example, some designs, construction or mitigation details (and therefore also land requirements) or baseline information is still required from further surveys, assessments and/or consultation feedback.

16.7.1.2 In making a determination of likely significant effects, we have considered the sensitivity of receptors (a receptor being a feature of the environment that responds to change) and the potential magnitude (i.e. size) of change caused by the RTS. The methodology for defining sensitivity and magnitude varies by topic and are defined in the topic sections of our Scoping Report.

16.7.1.3 We are committed to including mitigation measures as necessary to address likely significant negative environmental effects as far as reasonably practicable. Both primary and tertiary mitigation are considered to form part of the RTS; those applicable to this topic are set out in Section 16.6.1 and 16.6.2. Several of these mitigation measures are still being developed, and therefore as a precaution, the preliminary assessment of effects for our PEIR does not assume full achievement of

these in considering if a project effect is likely to be significant (Appendix 4.2 identifies the implementation status of primary and tertiary mitigation for the PEIR assessment). An exception to this is that for the purposes of the soils and land within the PEIR, we have completed our assessment of likely significant effects of the project with the assumption that environmental waste permits are in place as set out in Sections 16.6.2.14 to 16.6.2.16. Furthermore, the potential likely significant effects reported within our PEIR have been assessed prior to the implementation of secondary mitigation measures, those applicable to this topic are set out in Section 16.7.5. These secondary mitigation measures are the subject of further development; and given they are still being developed, are not able to be applied to develop a 'residual' effects assessment.

16.7.1.4 Our PEIR is based on the latest design and construction parameters and baseline information. As such the findings of the preliminary environmental appraisal presented within our PEIR may be subject to change as the design progresses, as mitigation is further developed or information from further studies becomes available, such as on-going Ground Investigation works, risk assessment / modelling of landfill leachate migration and ground gas. The final assessment of effects undertaken as part of the EIA and reported within the ES will be based on the latest information available at that time.

16.7.2 Potential Likely Significant Effects

16.7.2.1 Our preliminary assessment of likely significant environmental effects has identified the potential for the following significant effects from construction in relation to soils and land:

- Permanent negative effect from loss of arable and pasture farm land as a result of creation of the channels (material excavation), new green open spaces and priority areas for habitat creation, enhancement or mitigation.

16.7.2.2 Our preliminary assessment of likely significant environmental effects has identified the potential for the following significant effects from operation in relation to soils and land:

- Positive permanent effect from reduced flood risk of contaminated land causing reduced mobilisation of contaminants into the

Shepperton Gravel Member and the associated principal aquifer, and groundwater abstraction Source Protection Zones.

16.7.2.3 Further details of the potential likely significant effects from construction and operation with respect to receptors, project components and project activities, in relation to soils and land can be found in Table 1 and 2 in Appendix 16.1.

16.7.3 Potential Likely Non-Significant Effects

16.7.3.1 Further details of the non-significant effects from construction and operation with respect to receptors, project components and project activities, in relation to soils and land can be found in Table 3 and 4 in Appendix 16.1.

16.7.3.2 Some examples of soils and land non-significant effects include (this is not an exhaustive list):

- Non-significant positive effects from reduced flood risk of contaminated land, reduced mobilisation of contaminants into geological formation and groundwater.
- Non-significant positive effects to arable and pasture land from reduction in flood risk and control of groundwater levels and the associated reduction in nutrient loss such as nitrates and phosphates by leaching, and erosion of the top layers of soil.

16.7.4 In-Combination Climate Impact

16.7.4.1 Consideration of ‘In-Combination Climate Impact’ (ICCI) has been undertaken. The preliminary environmental assessment has considered a future climate scenario and has identified certain potential likely significant environmental effects for this topic which will be exacerbated further by predicted climate change. Further consideration of ICCI will be included in the ES.

16.7.5 Secondary Mitigation

16.7.5.1 No secondary mitigation has been identified at this PEIR stage. The need for mitigation will be considered further as design and assessment work continues to progress as part of the EIA, and any secondary mitigation developed will be reported in the ES.

16.7.5.2 As noted under 16.6.2, existing ground investigation data is currently being processed to create a detailed ground model and inform risk assessments. Ground investigations are ongoing to aid with development of secondary mitigation measures (such as gas monitoring during construction) in order to refine the magnitude of change and reduce significance on receptors.

16.8 Further Work for the EIA

16.8.1.1 The detailed assessment of effects upon soils and land to inform the ES will be undertaken following the methodology set out in Section 16.7 of the EIA Scoping Report, having been informed by the PINS Scoping Opinion and other consultation feedback on baseline, methodology, mitigation and effects scoped into the assessment.

16.8.1.2 Further to the preliminary environmental assessment presented in this PEIR, the following will be undertaken as part of the detailed assessment of effects upon soils and land for the ES:

- An update will be made to the baseline as set out in the EIA Scoping Report where there is more updated information available, including additional data emerging from the ongoing GI works and review of associated factual reports.
- Data from our GI is being processed to create a detailed ground model. This ground model will feed into risk assessments / modelling of landfill leachate and gas migration that will, in discussion with the Environment Agency National Permitting Service, inform suitable measures to mitigate effects on the environment to an acceptable level (including further iteration of the design where applicable). This will be reported on in the ES.
- We will use the project specific Natural Capital Assessment to inform our assessment of soil as a resource in the ES.

16.8.1.3 We consider that the further development of the project design and mitigation measures which will be reflected in the ES and DCO application, will enable a reduction in the scale of identified negative likely significant effects set out in this chapter..

17 Traffic and Transport

17.1 Introduction

17.1.1 Overview

17.1.1.1 This chapter of our Preliminary Environmental Information Report (PEIR) considers the effects from construction and operation of the River Thames Scheme (RTS) ('the project') in relation to traffic and transport. Within this chapter we have included topic specific sections on:

- Legislation, policy and guidance (noting any changes since Environmental Impact Assessment (EIA) scoping);
- Engagement with consultees, including responses to comments received on the RTS EIA Scoping Report;
- The assessment methodology for this topic (again noting any changes or updates since EIA scoping);
- Key environmental considerations and opportunities,
- Primary and tertiary mitigation;
- Our preliminary assessment of effects;
- Secondary mitigation; and
- Future work for this topic of our EIA.

17.1.1.2 For a summary of the key baseline elements associated with traffic and transport see Section 5.13.

17.1.1.3 Our detailed assessment of likely significant effects for the Environmental Statement (ES) will be informed by our ongoing Transport Assessment, for which we have prepared a Transport Assessment Scoping Report (see Appendix 17.1). The study area for the ES will be informed by the Transport Assessment and defined based on where there will be a significant increase in trips associated with the construction and operation of the project. Nevertheless, as the full details of construction related traffic is currently unknown, the extent of the effects that this traffic will have on the functioning of the transport network cannot be calculated at this stage. Therefore, the traffic and transport study area for the preliminary environmental assessment in our PEIR is as per Section 17.2.4 of our RTS EIA Scoping Report (Environment Agency and Surrey County Council, October 2022) ('the EIA Scoping Report'); this being a

600 metre buffer zone from main roads required to reach the Strategic Road Network (main 'A' roads, M3, M4, M25) from:

- Main compound sites;
- Priority areas for habitat creation, enhancement or mitigation; and
- New green open spaces.

17.1.1.4 Our traffic and transport assessment considers:

- The existing baseline conditions during construction and when the site begins operation;
- The effects that construction traffic will have on the local and strategic highway network as a result of the proposed development; and
- The effects from operation of traffic on the local and strategic highway network as a result of the project.

17.1.1.5 Effects on off-road cycle routes, footpaths, equestrian routes and recreational navigation are covered in Chapter 11: Health (in relation to effects on health to users of these resources) and Chapter 15: Socio-economics (in relation to their use as a recreational resource). Effects on air quality and noise and vibration as a result of changes in traffic are considered in Chapters 6 and 14 respectively.

17.2 Legislation, Policy and Guidance

17.2.1.1 A summary of the key legislation, policy and guidance we have used to prepare our PEIR chapter is provided in Appendix M of our EIA Scoping Report. Since the publication of our EIA Scoping Report in October 2022 the National Policy Statement (NPS) for Water Resources Infrastructure (Defra, 2023a) has been finalised and was designated in September 2023. Furthermore, the Institute of Environmental Management and Assessment (IEMA) have published 'Environmental Assessment of Traffic and Movement' (IEMA, 2023) which has replaced 'Guidelines for the Environmental Assessment of Road Traffic' (IEMA, 1993).

17.2.1.2 Changes to the NPS relevant to traffic and transport since the draft version was released in 2018 are:

- The inclusion of a direct reference to the Department of Transport's Transport Analysis Guidance for guidance in relation to modelling and assessing the impact of traffic and transport.
- That the assessment of impacts on traffic and transport "should adopt a vision led approach that seeks to prioritise modal shift to sustainable modes and supports transport as a principal mechanism by which to mitigate the impact of the scheme" (Paragraph 4.14.5 of NPS).
- The requirement for assessments to consider potential disruption to services and infrastructure such as roads, rail and airports.
- Further details of the needs to consult with Nationals Highways, Network Rail and Highway Authorities as appropriate.
- The NPS sets out the expectation for the applicant to prepare a construction management plan for construction stages and a travel plan for the operational stage of the infrastructure.
- The removal of the specific need to consider temporary closure of Public Rights of Way (PRoW), consideration of using rail and water freight and the utility of management plans to mitigate traffic impacts.
- The removal of the assumption that the effects from operation of such infrastructure would be minimal in terms of traffic and transport impacts.

17.2.1.3 The updated IEMA guidance has not significantly altered the proposed assessment methodology stated within our EIA Scoping Report (see Section 17.7) with the majority of the assessment criteria remaining relevant and unchanged. However, where minor adjustments have been recommended from the revised guidance these have been amended within the Assessment Methodology section of this chapter.

17.2.2 Information Sources

17.2.2.1 The sources we have used to inform our PEIR are detailed in our EIA Scoping Report Section 17.2.2. However, as the 2022 Surrey County Council Traffic Model was unavailable, the 2019 model was used instead. Once the 2022 model is available this will be used to inform our ES.

17.3 Engagement

17.3.1 Responses to EIA Scoping

17.3.1.1 Table 17-1 below summarises the comments and responses received on our EIA Scoping Report following formal submission to the Planning Inspectorate (PINS) including the PINS EIA Scoping Opinion (date 15 November 2022) ('the PINS Scoping Opinion') and any key comments received from statutory consultees. Full consultee comments on our EIA Scoping Report and our responses to these comments are provided in Appendix 4.1.

Table 17-1: Responses to comments received on the EIA Scoping Report

Consultee or Organisation	Summary of Comment	Project Response
Planning Inspectorate (PINS)	PINS did not agree that impacts to traffic and transport from vehicle movements transporting hazardous waste and materials can be scoped out; these movements should be considered as part of the construction traffic vehicle movements in the ES assessment.	These movements will be considered as part of the construction traffic vehicle movements in the ES assessment.
PINS	PINS agreed that construction disruption to river boat traffic on the River Thames can be scoped out on the basis that works to the weirs will be phased and temporary in duration, navigation will be maintained throughout construction, and materials movements will be controlled through a Construction Environmental Management Plan (CEMP) to reduce impacts.	A CEMP with appropriate mitigation measures will be developed for the ES.
PINS	Additional large fowl may be attracted to the area increasing risk of bird strike with aircraft associated with Heathrow Airport. PINS agreed to scope this matter out; evidence of agreement with Heathrow should be provided in the ES.	Evidence of agreement with Heathrow will be provided in the ES.

Consultee or Organisation	Summary of Comment	Project Response
PINS	The ES should explain any assumptions made in the assessment about use of rail or river, including a description of the expected number of movements via these routes and the available capacity within the networks for such movements. The ES should include an assessment of the worst-case scenario for construction phase traffic and transport effects.	The ES will include an assessment of the worst-case scenario for construction phase traffic and transport effects. The continued expectation is that justification for using or not using rail/water will need to be prepared.
PINS	The EIA Scoping Report does not make reference to any potential abnormal indivisible loads (AIL). The ES should confirm whether there will be any AILs and where there are, associated impacts should be assessed where significant effects are likely to occur.	The assessment of AILs and the probability of these loads being involved in a collision will be incorporated into the assessment of effects from construction traffic on both the local and strategic road network. Suitable routes of AILs will be identified and agreed with Surrey County Council. The impact of this will be assessed in the ES Chapter.
Local Planning Authority (LPA) Project Group	Given the position of the project route in Spelthorne adjacent in places to the M3, has the option of having a project specific temporary exit into a compound directly from the M3 not been considered in order to take HGVs directly to the worksites?	A series of options is under investigation for limiting the effects of HGV movements on the local road networks, including conveyor systems under the M3 and short-haul water based transport on the River Thames. The construction duration, cost and land take associated with a temporary motorway junction outweigh the benefits in this instance.
LPA Project Group	Will there be upgrades to any of the existing infrastructure that is identified as congested and thereby contributing to poor air quality such as the Sunbury Cross M3 Junction? As the RTS could potentially attract traffic to visit the amenity areas.	Specific mitigation measures cannot yet be determined until further assessment of the effects has taken place. We would expect the need to do some minor works at some junctions where they have existing capacity pressures

Consultee or Organisation	Summary of Comment	Project Response
		on routes for HGVs transporting excavated materials, but expect these to be within the project boundary.
LPA Project Group	These thresholds are different to those required for air quality modelling, can clarification be given as to whether a separate criteria will apply to the traffic data supplied for screening for air quality assessment purposes?	The relevant data required to undertake the air quality assessment are as detailed within Chapter 6. Air quality thresholds are discussed in paragraphs 6.4.3.5 and 6.4.3.11 to 6.4.3.14 of our PEIR with the Traffic and Transport assessment methodology discussed in Section 17.7 of our EIA Scoping Report and Section 17.4 of this chapter.
LPA Project Group	Mitigation from effects causing congestion and delay to public transport operations would be strongly encouraged.	The need for specific mitigation cannot yet be determined until further assessment of the potential effects has taken place. Any effects will need to be assessed and quantified to understand if there is a significant effect that needs to be mitigated.
LPA Project Group	Is an additional broader approach needed in terms of assessing transport severance geographically given this is a channel and there will be impacts on footpaths, bridleways etc and access to local facilities by those modes also.	It is proposed to assess severance as part of the Traffic and Transport chapter of the ES following the assessment methodology outlined. The Transport Assessment will provide additional assessment of the effect (and benefits) of connectivity created by the project.
LPA Project Group	Many of the existing crossings in Spelthorne rely on pedestrians waiting for vehicles to stop to allow them to cross, that will become harder where traffic flows increase, and alternative crossing facilities may be required.	The extent of likely additional traffic to be generated by the project is yet to be determined. Once this has been developed its effect on pedestrian delay can be assessed and mitigation measures provided if required.

Consultee or Organisation	Summary of Comment	Project Response
LPA Project Group	The RTS could generate pinch points where there are an increased number of cyclists and pedestrians at an entrance point encountering an increased volume of traffic for example on or crossing links on routes to car parks, will this be assessed in terms of physical mitigation to give adequate priority to safety of pedestrians /cyclists?	The Transport Assessment will consider worksite access arrangements and safety requirements. Pedestrian and cycle safety will be paramount.
National Highways	It should be noted that it will be important to assess the Strategic Road Network (SRN) junctions as well as routes to reach the SRN, particularly the M3 and M25.	The extent of junction assessment will be determined by the 5% exceedance threshold (which will also provide the extent of impact in absolute numbers). This will consider all junctions, including those on the SRN. M25 J13 and J14 were also subject to additional traffic surveys in May and June 2022 and will therefore be considered, subject to the results of the trip generation and distribution exercise.
National Highways	National Highways require a robust assessment of additional trip generation and mitigation of impacts for SRN junctions and this will be reviewed in light of the trip generation through SRN junctions in terms of absolute numbers, rather than as a percentage change on existing flows.	The trip generation and distribution will inform whether change in flows exceed the 5% threshold. This percentage change will also be provided in absolute numbers to inform whether junction testing at SRN junctions is required.

17.3.2 Other Engagement since EIA Scoping

17.3.2.1 Section 17.2.3 of our EIA Scoping Report summarises the stakeholder engagement relevant to the traffic and transport topic that was undertaken prior to submission of the EIA Scoping Report.

17.3.2.2 Surrey County Council was invited to comment on the methodology proposed for the preparation of the Transport Assessment (see Appendix

17.1 for our Transport Assessment Scoping Report), which will inform the preparation of mitigation. The response received has been considered and will influence the future preparation of the Transport Assessment.

17.3.2.3 In October 2023 we briefed the LPA Project Group on key aspects of our proposed construction works, including our proposed routes for Heavy Goods Vehicle transporting excavated materials and our proposals for off-site car parking to reduce disturbance to the local road network.

17.4 Methodology

17.4.1 Introduction

17.4.1.1 This section should be read in conjunction with Chapter 4 'Approach to the Environmental Assessment' which sets out relevant information on the design parameters and information that have informed our PEIR assessment, and how we have approached various aspects of the assessment including:

- The scope of the assessment;
- The methodology (including the approach to defining the baseline environment, topic study areas, and assessment methodology and criteria);
- The approach to mitigation; and
- The approach to cumulative effects.

17.4.1.2 The assessment methodology for the traffic and transport assessment is presented in Section 17.7 of our EIA Scoping Report and updated below in Section 17.4.2. The assessment methodology has been refined following the PINS EIA Scoping Opinion, and feedback from the National Highways (as noted in Table 17-1) as well as following updates to policy and guidance stated in Section 17.2.

17.4.1.3 For our PEIR, a preliminary assessment has been undertaken as some information on the project is incomplete. Further project details will be established in order to undertake the assessment to be reported in the ES, this includes refined maximum project parameters in relation to (this is not an exhaustive list):

- Construction vehicle movements, for example associated with staff and materials;

- Construction vehicle types and abnormal indivisible loads (AILs);
- Road and PRoW diversions/closures;
- Use of the River Thames for the transportation of material;
- Vehicle movements and car parking associated with the new green open spaces; and
- Vehicle movements associated with operational maintenance.

17.4.2 Construction and Operation Assessment Methodology

17.4.2.1 The methodology for assessing effects from construction and operation on highway network delay, severance, pedestrian and cyclist delay, and accidents and safety is detailed in our EIA Scoping Report in Section 17.7 along with definitions for magnitude of change, sensitivity of receptors and significance of effects. The amendments to the methodology for pedestrian and cyclist amenity (including fear and intimidation), abnormal indivisible loads (AILs) and hazardous loads are detailed in this section and will be applied to the assessment within the ES.

17.4.2.2 Our preliminary assessment for the PEIR has been undertaken using the definitions for magnitude of change, sensitivity of receptors and significance of effects detailed in Section 17.7 of our EIA Scoping Report. As some information on the project is incomplete, a full assessment using the methodology detailed in the EIA Scoping Report as well as use of the additional assessment methods identified in the following sections has not been completed for the PEIR, but will be undertaken for the ES.

Pedestrian and cyclist amenity

17.4.2.3 Following the 2023 update to the IEMA guidance the thresholds for the criteria used to assess pedestrian and cyclist amenity have been amended. The amended criteria are shown in Table 17-2.

Table 17-2: Fear and Intimidation Criteria

Average traffic flows over 18 hr day (vehicles/hour two-way)	18 hour HGV flow	Average Vehicle Speed over 18 hour day	Degree of hazard score
1,800+	+3000	>40	30
1,200 – 1,800	2,000 – 3,000	30 – 40	20

Average traffic flows over 18 hr day (vehicles/hour two-way)	18 hour HGV flow	Average Vehicle Speed over 18 hour day	Degree of hazard score
600 – 1,200	1,000 – 2,000	20 – 30	10
<600	<1,000	<20	0

17.4.2.4 Within the 2023 guidance a weighting system has been defined to help provide an approximation for the likelihood of pedestrian and cyclist fear and intimidation. A degree of hazard score will be applied to each individual criterion and totalled to provide an overall approximation of the level of fear and intimidation following the recommended methodology. This defined 'hazard score' has been included within Table 17-3.

Table 17-3: Levels of Fear and Intimidation

Level of fear and intimidation	Total hazard score
Extreme	71+
Great	41-70
Moderate	21-40
Small	0-20

Abnormal Indivisible Loads

17.4.2.5 Following consultation with PINS, the assessment of abnormal indivisible loads (AILs) associated with the construction of the RTS and the probability of the loads being involved in a collision has been included for movement on both the local road network and the strategic road network. Suitable routes of AILs will be identified and agreed with Surrey County Council. The potential routes of Heavy Good Vehicles (HGV) associated with the transportation of excavated materials (see Figure 17.1) will in most cases be suitable for AILs, however where weight, height or width restrictions apply there may be a need to identify alternative routes. The effect of AILs will be assessed in the ES Chapter.

Hazardous loads

17.4.2.6 Following consultation with PINS, the assessment on the number of hazardous loads associated with the construction of the RTS and the probability of the loads being involved in a collision has been included for movement on both the local road network and the strategic road network. Hazardous loads will be transported to designated sites under licence. This will be reviewed and agreed with stakeholders, upon completion of the Material Management Strategy (MMS). The impact of this will be assessed in the ES Chapter.

17.4.3 Assumptions and Limitations

17.4.3.1 The latest Surrey County Council traffic model data was unavailable to use as baseline information at the time of preparing our PEIR. We will use the latest traffic model to inform our detailed assessment for our ES.

17.4.3.2 Our preliminary environmental assessment for our PEIR is based on the information available at this stage of the project regarding potential routes of Heavy Good Vehicles (HGV) associated with the transportation of excavated materials (see Figure 17.1 and Appendix 17.2). It is possible that potential routes associated with the transportation of excavated material or indeed other construction vehicles will alter as the project develops and any expansion to the study area due to this will be considered as part of the ongoing EIA, design and consultation process.

17.4.3.3 As noted in Section 4.2.4, since EIA Scoping we have been able to confirm that there is sufficient capacity at licenced waste disposal or recovery sites in proximity to the project boundary. Therefore, the previously scoped in effects from the transportation of non-hazardous materials from the major road network and placement off-site is now proposed to be scoped out of the EIA on the basis that transporting non-hazardous materials to these sites would have been assessed and mitigated as part of their permitting processes. For the purposes of the PEIR therefore, assessments have considered the movement of excavated materials off site to the major and strategic road networks only.

17.5 Key Environmental Considerations and Opportunities

17.5.1.1 The key considerations with respect to traffic and transport are:

- Existing transport infrastructure (especially major motorways, Heathrow Airport and railway lines), which are already congested, are sensitive to further increases in traffic volumes, furthermore the local road network is susceptible to changes in traffic volumes and road/lane closures, which can affect journey times and lengths.
- The River Thames is a popular commercial and recreational waterway and is susceptible to changes in river traffic volumes.
- There is an extensive network of PRoWs within the study area which is well used by commuters and recreational users. Disruption in the form of diversions and/or closures can affect journey times and lengths, and cause severance.

17.5.1.2 The key opportunities with respect to traffic and transport are:

- The creation of new active travel corridors and recreation spaces that will increase accessibility for pedestrians and cyclists; and
- The prevention of, or reduction in, flooding key routes, which will prevent disruption to road, rail, airport and river traffic networks.

17.6 Primary and Tertiary Mitigation

17.6.1 Primary Mitigation

17.6.1.1 The following primary mitigation is proposed in relation to traffic and transport effects, further details on these mitigation measures can be found within Chapter 2 Project Description.

- The Sequential Approach to design of flood mitigation means that the proposed project components will be appropriately located based on National Planning Policy Framework (NPPF) flood risk vulnerability classification to minimise negative effects to the transport network from potential increased flood risk during construction;
- Management of the augmented flow will be via in-channel water level control structures and allow the water level in the flood channels to be varied; this will reduce the potential negative effect of reduced water levels within the River Thames which could cause restrict river navigation;

- The use of off-site car parks during construction will reduce the number of staff car trips to the construction sites, thereby reducing potential congestion and delay on the local road network close to construction areas.

17.6.2 Tertiary Mitigation

17.6.2.1 The following tertiary mitigation is proposed in relation to traffic and transport effects assessed within our PEIR.

- The Construction Traffic Management Plan aims to ensure all highways works are safe, planned and co-ordinated (including with other works/projects in the study area) in order to secure the expeditious movement of traffic on the road network; and to minimise inconvenience to the public. This could include measures such as (this is not an exhaustive list):
  - Modifications to parking restrictions or suspensions (amending existing or implementing new);
  - Bus stop suspensions or relocations;
  - Details of off-site lorry holding arrangements (site management); and
  - How stakeholder and community liaison and co-ordination will be managed.
- The application of the waste hierarchy, as discussed further within Chapter 13: Materials and Waste, will reduce the generation of waste and increase the reuse of natural arisings and the treatment of waste to make it suitable for reuse. This will reduce the amount of materials that needs to be transported off site on the local road network.
- The Construction Travel Plan aims to proactively manage and influence workforce (and visitor) travel to and from worksites to limit traffic movement and reduce disruption in the vicinity of the site. This could include measures such as (this is not an exhaustive list):
  - Details of access arrangements to worksites to facilitate convenient and safe access for pedestrians, cyclists and drivers;
  - Provision of current information on the local transport network (pedestrian, cycle, bus, rail) to enable workers and visitors to make informed decisions on their travel behaviour; and
  - Objectives to be set, monitored and reported against to limit and reduce car travel.

- The Construction Logistics Plan will detail the logistics management arrangements for work sites to minimise impacts on communities and the environment from transportation of construction materials/waste. This could include measures such as (this is not an exhaustive list):
  - Details on standard working hours and any requirements to restrict vehicle movements during certain sensitive periods of the day/month/year;
  - Any commitments on construction vehicle routing e.g. any requirements to avoid certain junctions/routes or particular movements; and
  - Co-ordination with local stakeholders (Local Highway Authority and developers) to minimise collective disruption to operation of the highway from construction works.
- The Construction Surface Water Management Plan, construction flood protocol and construction emergency planning will mitigate the effects of temporary increases in flood risk to the local transport network from the construction phase. Details of this are included in Chapter 10: Flood Risk. In particular, the construction flood protocol will plan the sequencing of construction to enable safe flood response management and associated procedures of working in a floodplain to reduce effects on the transport network.
- The Construction PRoW Management Plan will include details of temporary PRoW stopping up and diversion processes, management measures and restoration. This will be implemented to provide suitable diversions for users when PRoWs are affected by construction works.
- A Navigational Risk Assessment will be prepared to identify environmental and safety risks of using the River Thames to transport materials, and will identify measures to mitigate and respond to these risks.
- The Operational Travel Plan aims to proactively manage and influence employee (and visitor) travel to and from facilities being provided at potential new green and blue open spaces, to encourage the use of sustainable travel methods and reduce network disruption locally. This could include measures such as (this is not an exhaustive list):
  - Details of access arrangements, vehicle/electric vehicle/bicycle parking availability and information on the local transport network

(pedestrian, cycle, bus, rail) to enable employees and visitors to make informed decisions on their travel behaviour;
- Provision of secure and convenient cycle storage and facilities such as changing facilities and lockers; and
- Objectives to be set, monitored and reported against to limit and reduce car travel.

17.7 Preliminary Assessment of Likely Significant Effects

17.7.1 Introduction

17.7.1.1 Our PEIR adopts a precautionary approach. Assessments reported within this chapter are a preliminary assessment of potential likely significant environmental effects based on the design parameters set out in Chapter 2. This precautionary approach has been taken for the PEIR as there is some information on the project that is currently incomplete and the parameters within Chapter 2 are high level and account for a range of uses and allowance for design development within a boundary that could possibly be refined once this work has been completed. For example, some designs, construction and mitigation details (and therefore also land requirements) or baseline information is still required from further surveys, assessments and/or consultation feedback.

17.7.1.2 In making a determination of likely significant effects, we have considered the sensitivity of receptors (a receptor being a feature of the environment that responds to change) and the potential magnitude (i.e. size) of change caused by the RTS. The methodology for defining sensitivity and magnitude varies by topic and are defined in the topic sections of our EIA Scoping Report and in Section 17.4 of this chapter.

17.7.1.3 We are committed to including mitigation measures as necessary to address likely significant negative environmental effects as far as reasonably practicable. Both primary and tertiary mitigation are considered to form part of the RTS; those applicable to this topic are set out in Section 17.6. Several of these mitigation measures are still being developed, and therefore as a precaution, the preliminary assessment of effects for our PEIR does not assume full achievement of these in considering if a project effect is likely to be significant (Appendix 4.2 identifies the implementation status of primary and tertiary mitigation for the PEIR assessment). Furthermore, the potential likely significant effects

reported within our PEIR have been assessed prior to the implementation of secondary mitigation measures, those applicable to this topic are set out in Section 17.7.5. These secondary mitigation measures are the subject of further development; and given they are still being developed, are not able to be applied to develop a 'residual' effects assessment.

17.7.1.4 Our PEIR is based on the latest design and construction parameters and baseline information. As such the findings of the preliminary environmental appraisal presented within our PEIR may be subject to change as the design progresses, as mitigation is further developed or information from further studies becomes available, such as our work to develop a Traffic Management Plan for construction, identify PRoW requiring temporary or permanent diversions or closures, and develop Construction and Operational Travel Plans. The final assessment of effects undertaken as part of the EIA and reported within the ES will be based on the latest information available at that time.

17.7.2 Potential Likely Significant Effects

17.7.2.1 Our preliminary assessment of likely significant environmental effects has identified the potential for the following likely significant negative effects from construction on traffic and transport:

- Temporary negative effects from increased highway traffic congestion, delay and severance, pedestrian, cyclist and equestrian delay, pedestrian and cyclist amenity and accidents and safety, particularly on potential HGV route G (which runs north along Staines Road and Chertsey Lane (A320)), potential HGV route K (which runs east along Renfree Way (B375) and then north along the A244 and west along A308 and A30) and potential HGV route N (which runs west along the B375) due to the influx of site personnel and vehicles transporting material and equipment (see Figure 17.1 and Appendix 17.2 for the potential routes of HGVs associated with transporting excavated material).
- Temporary negative effect of delays to river navigation from using the River Thames to transport materials via barge, including the use of navigation traffic route M (which runs along the River Thames between Desborough Island and Sunbury Depot) for material movements associated with the bed lowering downstream of

Desborough Cut plus other possible movements of materials to and from temporary wharves.

- Temporary negative effect from highway network delay and pedestrian and cyclist delay on certain roads from the construction of new road bridges.
- Temporary negative effect of pedestrian, equestrian and cyclist delay due to PRoW closures and diversions due to the presence of construction working areas.
- Temporary increase in flood risk to local and regionally important roads and rail infrastructure from construction due to temporary changes to land levels and drainage patterns from the use of materials processing and stockpiling sites and temporary changes in hard-standing.

17.7.2.2 Our preliminary assessment of likely significant environmental effects has identified the potential for the following likely significant negative effects from operation in relation to traffic and transport:

- Permanent negative effect on traffic movements on roads, public transport services and existing parking facilities due to changes in areas of public access associated with the creation of potential new green and blue open spaces and the operational traffic they will generate. This may lead to a permanent increase to highway network delay, severance, pedestrian and cycle delay and amenity on certain roads.

17.7.2.3 Our preliminary assessment of likely significant environmental effects has identified the potential for the following likely significant positive effects from operation in relation to traffic and transport:

- Permanent positive effect on traffic movements on roads, public transport services and existing parking facilities from the use of additional active travel connections and an enhanced PRoW network.
- Permanent reduced disturbance (delay) to use of local and regionally important roads, and rail during times of flood.

17.7.2.4 Further details of the potential likely significant effects from construction and operation in relation to traffic and transport can be found in Table 1 and 2 in Appendix 17.3.

17.7.3 Potential Likely Non-Significant Effects

17.7.3.1 Further details of the likely non-significant effects from construction and operation with respect to receptors, project components and project activities, on traffic and transport can be found in Table 3 and 4 in Appendix 17.3.

17.7.3.2 Some examples of likely non-significant traffic and transport effects include (this is not an exhaustive list):

- Temporary negative effects from increased highway network delay, severance, pedestrian, cyclist and equestrian delay, pedestrian and cyclist amenity and accidents and safety on potential HGV route F (which runs north along Chertsey Lane (A320) and The Causeway (A308) before joining the M25 via the A30), potential HGV route H (which runs along Chertsey Road (B375)), potential HGV route I (which runs west along Littleton Lane), Route J (which runs along Thames Side before turning onto Chertsey Bridge Road (B375)) and potential HGV route L (which runs along Thames Side) due to the influx of site personnel and vehicles transporting material and equipment (see Figure 17.1 and Appendix 17.2 for the potential routes of HGVs associated with transporting excavated material).
- Permanent negative effects on the quantity of water within the River Thames leading to changes in water levels and sediment processes and negative effects to river navigation.

17.7.4 In-Combination Climate Impact

17.7.4.1 Consideration of ‘In-Combination Climate Impact’ (ICCI) has been undertaken. The preliminary environmental assessment has considered a future climate scenario and has identified certain potential likely significant environmental effects for this topic which may be exacerbated further by predicted climate change. Further consideration of ICCI will be included in the ES.

17.7.5 Secondary Mitigation

17.7.5.1 As noted in paragraph 17.7.1.3, primary and tertiary mitigation are still being developed, and therefore as a precaution, the preliminary assessment of effects for our PEIR does not assume full achievement of these in considering if a project effect is likely to be significant.

Furthermore, the potential likely significant effects reported within our PEIR have been assessed without the implementation of secondary mitigation measures. For the majority of the identified likely significant environmental effects it is considered likely that the primary and tertiary mitigation will be sufficient at ES stage such that no secondary mitigation will be required. Where secondary mitigation is already under consideration for potential significant environmental effects, this is detailed below.

17.7.5.2 Highway and junction improvements are being considered as secondary mitigation to further reduce the magnitude of the likely significant effect on roads, public transport services and existing parking facilities from vehicles accessing potential new green and blue open spaces. These improvements are subject to further consideration and design following the preparation of the Transport Assessment. The potential junction and highway improvements will be identified within the Transport Assessment and could include the following measures but it should be noted that this is not an exhaustive list:

- Improving/widening of junctions including worksite access points;
- Carriageway widening;
- Provide/improve pedestrian crossings;
- Improve/optimise signalised junctions;
- Pedestrian and cycleway enhancements;
- Parking/loading restrictions;
- Traffic calming features;
- Speed limit alterations;
- Public transport and bus stop improvements;
- Highway lighting improvements;
- Signing and road marking improvements.

17.7.5.3 Further details of the secondary mitigation that we are considering for potential likely significant effects in relation to traffic and transport can be found in Table 1 and 2 in Appendix 17.3.

17.8 Further Work for the EIA

17.8.1.1 For the ES, we will undertake a detailed assessment of the effects from construction and operation of the project on traffic and transport, in accordance with the methodology set out within Section 17.7 of our EIA

Scoping Report and the additional methodology detailed within Section 17.4 of this chapter.

17.8.1.2 Our detailed assessment will account for relevant aspects of the PINS EIA Scoping Opinion and be informed by additional baseline information from:

- A Transport Assessment (see Appendix 17.1 for the Transport Assessment Scoping Report);
- Surrey County Council's Strategic Modelling traffic data;
- Surveys to be undertaken at proxy sites to inform our understanding of the possible trip generation as a result of the new green open spaces;
- Surveys to be undertaken of existing river navigation on the River Thames;
- A Navigational Risk Assessment; and
- Further information we receive about the existing transport network from stakeholders as part of the statutory consultation and ongoing engagement.

17.8.1.3 Our detailed assessment in the ES will state the predicted significance of effects, provide further detail of relevant mitigation and document the subsequent residual effects.

17.8.1.4 We consider that the further development of the project design and mitigation measures which will be reflected in the ES and DCO application, will enable a reduction in the scale of identified negative likely significant effects set out in this chapter.

18 Water Environment

18.1 Introduction

18.1.1.1 This chapter of our Preliminary Environmental Information Report (PEIR) considers the effects from construction and operation of the River Thames Scheme (RTS) ('the project') in relation to surface water and groundwater quality and resources. This chapter should be read in conjunction with the Water Framework Directive (WFD) Compliance Assessment: Preliminary Assessment (Appendix 18.1).

18.1.1.2 Within this chapter we have included topic specific sections on:

- Legislation, policy and guidance (noting any changes since Environmental Impact Assessment (EIA) scoping);
- Engagement with consultees, including response to comments received on the RTS EIA Scoping Report;
- The assessment methodology for this topic (again noting any changes or updates since EIA scoping);
- Key environmental considerations and opportunities,
- Primary and tertiary mitigation;
- Our preliminary assessment of effects;
- Secondary mitigation; and
- Future work for this topic of the EIA.

18.1.1.3 For a summary of the key baseline elements associated with the water environment see Section 5.14.

18.1.1.4 The water environment is closely linked to most of the other topic chapters. Potential effects on Biodiversity as a result of changes in the water environment are discussed in Chapter 7. Potential effects on Health and Socio-economics as a result of changes in the water environment are discussed in Chapters 11 and 15 respectively. Potential effects on the associated topic of Flood Risk are discussed in Chapter 10. Potential effects on land quality and contamination are discussed in Chapter 13: Materials and Waste and Chapter 16: Soils and Land.

18.1.1.5 This chapter is supported by the following figures:

- Figure 5.34: Surface Waterbodies

- Figure 5.35: Water Framework Directive Waterbodies
- Figure 5.36: Groundwater Waterbodies

18.1.1.6 An explanation of the topic study area can be found in Section 18.2 of our RTS EIA Scoping Report (Environment Agency and Surrey County Council, October 2022) ('the EIA Scoping Report'). The study area incorporates all surface and groundwater bodies that lie within the project boundary for EIA PEIR, plus a 500 metre buffer or the area within the 1:100 year floodplain that benefits from the RTS (i.e. the area with a one per cent chance of flooding in any given year), whichever is the greater. The study area is therefore slightly different to that presented in our EIA Scoping Report due to minor changes in the design parameters and project boundary for EIA PEIR.

18.2 Legislation, Policy and Guidance

18.2.1.1 A summary of the key legislation, policy and guidance relevant to the water environment is provided in Appendix M of our EIA Scoping Report. Since publication of our EIA Scoping Report in October 2022, the National Policy Statement (NPS) for Water Resources Infrastructure (Defra, 2023a) has been finalised and was designated in September 2023. Furthermore, there have been updates to the Environmental Permitting (England and Wales) (Amendment) (England) Regulations and the Environmental Targets (Water) (England) Regulations 2022, plus the release of the Environmental Improvement Plan 2023 and the Defra Plan for Our Water 'Our integrated plan for delivering clean and plentiful water' 2023. These revisions to legislation are discussed below.

18.2.1.2 Changes to the NPS since the draft version was released in 2018 that are relevant to the water environment are:

- The inclusion of direct reference of the need to assess measures to protect the water environment for protecting eels and improving fish passage.
- The addition of further details regarding acceptance or refusal of a project, such as “refusal where a project is likely to cause deterioration of a water body or its failure to achieve good status or good potential, unless the conditions to apply the exemption of Overriding Public Interest, as outlined under Regulation 19 of the WFD Regulations, are met. A project may be approved in the

absence of a qualifying Overriding Public Interest test only if there is sufficient certainty that it will not cause deterioration or compromise the achievement of good status or good potential."

18.2.1.3 Updates to the Environmental Permitting (England and Wales) (Amendment) (England) Regulations relevant to the water environment are:

- The addition of further detail to require improved management and protection of groundwater.

18.2.1.4 Updates to the Environmental Targets (Water) (England) Regulations are:

- The regulations added new legally binding targets for water to reduce nitrogen, phosphorus and sediment pollution from agricultural land by 40 per cent; to reduce phosphorus from treated wastewater by 80 per cent; reduce the length of rivers polluted by abandoned metal mines; and reduce water demand on rivers by 20 per cent.

18.2.1.5 The Environmental Improvement Plan 2023 is relevant to the water environment, including:

- Addressing nutrient pollution of rivers from wastewater treatment and agriculture by increasing advice and incentives;
- Restoring rivers and woodlands through Landscape Recovery Projects;
- Introducing water efficiency labelling and reducing leakages; and
- Introducing environmental "Goal 3: Clean and plentiful water".

18.2.1.6 Plan for Our Water 2023:

- Sets out the first steps to reform the programme for the water system which builds on and outlines additional actions to be taken to meet water targets and transform the water system.

18.3 Engagement

18.3.1 Responses to EIA Scoping

18.3.1.1 Table 18-1 below summarises the comments and responses received on our EIA Scoping Report following formal submission to the Planning Inspectorate (PINS) including the PINS EIA Scoping Opinion (date 15 November 2022) ('the PINS Scoping Opinion') and any key comments received from statutory consultees. Full consultee comments on our EIA Scoping Report and our responses to these comments are provided in Appendix 4.1.

Table 18-1: Responses to comments received on the EIA Scoping Report

Consultee or Organisation	Summary of Comment	Project Response
PINS	Operation – capacity improvement impacts resulting in downstream hydromorphological changes: The EIA Scoping Report identifies that such changes are anticipated to be within the scale of natural changes from major flow events based on historic bathymetric surveys and that measures are embedded to avoid main weir pools and maintain operational flow so that weir structures are appropriately designed. These measures are currently not described therefore the Inspectorate does not agree to scope this matter out. The Environmental Statement (ES) should describe the measures to be employed and secured to reduce the potential effects from weir upgrades on downstream hydromorphological change and assess significant effects where they are likely to occur or explain how measures reduce/avoid such effects.	The existing operational regime of the weir structures maintains a standard head water level for navigation; therefore, this dictates normal flow conditions through the weirs. The increased capacity will only come into effect in larger flood events. The new gates at each weir will not be operated until all the existing weir gates have already been fully opened as per the current operational requirements. When they need to be opened, the flood in the River Thames will be well developed and the tailwater level downstream of each weir will be much higher than the normal level in non-flood conditions so the additional water added from opening the new gates will have no impact on non-flood condition levels. The modification of the direction of water flow by the new weir gates when in operation with the new gates, is likely to lead to only subtle changes in the pattern of scour and deposition immediately downstream. These changes are therefore localised and within the scale of changes that already occur during a particularly large flow event. As such, any changes to

Consultee or Organisation	Summary of Comment	Project Response
		hydromorphology are expected to be within the normal range of baseline variance of existing flood flow conditions. Furthermore, the main weir pools at Sunbury and Teddington are upstream of the proposed new structures; therefore, no downstream hydromorphological changes can affect these. Whereas the Molesey main weir pool is approximately 250m downstream of the weir. Effects to hydromorphology at weirs within the section bypassed by the flood channel remain scoped in and will be assessed. In addition, effects from the augmented flow and the depleted water level to flow dependent habitats such as weir pools will be assessed. It should be noted that additional operational effects on aquatic habitat and notable and protected species from the RTS are to be assessed in the EcIA, see Chapter 7: Biodiversity.
PINS	Construction – sediment disturbance and spills affecting waterbodies intersected by the flood channel: Not enough evidence has been provided to demonstrate there are no pathways for sediment and contaminants to enter the water column during construction. The ES should identify the construction activities that have potential to lead to sediment disturbance and spill contamination and explain what mitigation measures will be employed to reduce/avoid effects. These measures should be secured through the Development Consent Order (DCO).	At scoping, there was a lack of known information of the specific activities which may lead to the disturbance of sediment or contaminants. The Materials Management Strategy will contain identification of some of these sources and mitigation. In addition, a land contamination conceptual site model (CSM) will be developed for the project to identify any sources of contamination, ground gas, pathways, and receptors present within the study area. The CSM will assess the likelihood of existing contamination being encountered during the construction process, such that it could cause significant environmental harm or negative health effects if not addressed adequately at the construction and/or operational stages.

Consultee or Organisation	Summary of Comment	Project Response
		Furthermore, any works involving waste will be subject to the requirement for an environmental permit. As part of the permitting process, a range of risk assessments will be undertaken which will be subject to scrutiny by the Environment Agency's National Permitting Service.
PINS and Environment Agency Sustainable Places	Construction – capacity works on weirs: The ES should assess impacts/effects on hydrology from mitigation used during construction e.g. changes in flow from use of coffer dams where significant effects are likely to occur.	The effects of mitigation measures will also be considered for their impacts to hydrology during construction. These will be addressed within the ES. Pertaining to coffer dams, it is noted that PINS comment ID 3.13.4 accepts our proposal to scope out cofferdams where their use is in line with cofferdam guidance and the CEMP.
PINS	Construction and operation – changes in water quality due to bringing lakes 'online' into new river channels: Impacts on water quality and subsequently other receptors (such as ecology) from linking lakes into the riverine system are not proposed to be assessed although this has potential to alter dissolved oxygen and result in pollution transfer into the new channels. The ES should assess significant effects from bringing lakes 'online' during construction and operation where significant effects are likely to occur. This should cross refer to other assessments where they overlap e.g. biodiversity.	This will be included within the ES. This potential effect is included within our EIA Scoping Report under 18.2.4.1 "Introducing an augmented flow and operational water into the flood channel and intersected waterbodies has the potential to result in negative effects in terms of .... water quality of WFD and non-WFD lakes and watercourses from the introduction of River Thames water (in normal conditions and during floods) to previously unconnected waterbodies". This potential effect is considered within this PEIR.
PINS and Environment Agency Sustainable Places	Augmented flow: The ES should demonstrate that augmented flow can be maintained at all times, even in extreme weather conditions e.g. at times of drought and explain	The ES will assess the expected effects of using an augmented flow under extreme weather (flood and drought). The effects of the augmented flow on the lakes and channels is being modelled further under a range of scenarios. It is currently being determined whether augmented flow needs to be maintained

Consultee or Organisation	Summary of Comment	Project Response
	how this may impact on groundwater flows. Significant effects should be assessed in the relevant Chapters where they are likely to occur. Please see the Environment Agency's scoping consultation response for further detail on this matter.	at all times and this will be considered further in the ES.
PINS, Local Planning Authority (LPA) Project Group and Environment Agency Sustainable Places	Sediment: As the augmentation mechanism is currently unknown, the potential for changes in sedimentation is also unknown. The ES must quantify the sediment/silt baseline in lakes and describe how this would change during construction and operation. This must include identification of potential additional inputs/outputs. Where mitigation is required, this should be described in the ES and secured via the DCO.	The ES will include a sediment baseline; modelling has recently been completed to determine sediment movements through the lakes and new channels during operation. Fluvial audits/geomorphological reconnaissance are being undertaken and will also input towards the sediment baseline through identifying potential sources and sinks of sediment and locations for potential mitigations.
LPA Project Group	Can the bed substrate be site-won material?	It is currently not expected that there will be any suitable river bed materials won onsite. Screening of materials is required as it is anticipated there may be contamination and unsuitably sized (for riverbed substrate) materials excavated due to excavations within historic land fill sites. Re-using site won materials for the new river bed will be a future consideration as part of the material management plan and any details included as part of the ES.
LPA Project Group	Modelling has been undertaken / is being carried out, but neither the model or outputs have been provided at this stage.	Modelling will be available for the ES, including integrated groundwater and surface water modelling, adaptive augmented surface water flow modelling, sediment modelling, drought/low flow modelling. Findings will be included within the ES.
LPA Project Group	Modelling of the Jubilee River, a surrogate system, has been	Yes and further monitoring and modelling has been carried out by

Consultee or Organisation	Summary of Comment	Project Response
	undertaken to establish the minimum flow with no detrimental impact on water quality.	UKCEH, building on this study to replicate the RTS and further refine the understanding of the impacts of augmented flows on water quality within the RTS and within the River Thames.
LPA Project Group	Movement of hazardous material has been highlighted to have an adverse impact on the watercourses, however, it is not clear how. Further explanation is required. The assessment should consider impacts to water quality and sediment processes.	The PEIR identifies hydraulic connections with the RTS in place. Further explanation will be provided in the ES.
Natural England	It would be useful for consideration to be given to turbidity in the lakes, their water levels and the general water quality among the other items to be assessed as part of the “Water Environment’ section.	Monitoring is on-going for turbidity, lake levels and water quality, and is a consideration of this PEIR and WFD Assessment. Results will refine the baseline and assessment of likely significant effects and will be reported within the ES.
Environment Agency Sustainable Places	There should be an assessment of the derogated reach as this stretch of waterbody contains 0.4 kilometres where the Spelthorne Channel offtakes before the Runnymede Channel returns, which would leave it without the flows of both channels.	The WFD assessment will include consideration and assessment of effects to the derogated reach.
Environment Agency Sustainable Places	We understand from the report that modelling is ongoing, however; there should be an assessment for the augmentation flow change after the completion of the WFD assessment or evidence as to why this isn’t required. As part of the groundwater modelling process, modelling potential climate change impacts and extreme flood and drought scenarios will be required to support the feasibility of the augmented flow aims. For example, how will groundwater flows be modified in the project area and how will augmented flow balances be delivered under prolonged dry	We have completed integrated groundwater and surface water modelling that has considered groundwater flow paths (this will be reported on in the ES). The effects of the augmented flow on the water environment of lakes and watercourses on the flood channel alignment and on the Thames itself is being modelled and assessed further under a range of scenarios to understand its sustainability. An operating procedure will be developed for the augmented flow, to balance demands.

Consultee or Organisation	Summary of Comment	Project Response
	weather and drought scenarios? Are the augmented flow volumes sustainable, and are they potentially at the cost of baseflow that is needed elsewhere?	
Environment Agency Sustainable Places	Section 4.2.3.2 identifies that 'Groundwater in the landfill areas could potentially be contaminated and require treatment before being discharged into public sewers, river or removed via tanker from site'. In terms of water resources, the groundwater flows in the (shallow) groundwater units are likely to be the most disturbed by the project construction works at a range of flow scales. We welcome that site-specific ground investigations and modelling have been discussed and further assessments will be carried out to improve the geo-environmental understanding of the conditions in the vicinity of the RTS channel and the landfills. During any construction works that disturb, or have the potential to disturb landfills/contaminated land, carefully designed monitoring will be essential to detect any impacts to receptors, in real-time, especially to vulnerable and sensitive controlled waters which border the site works.	Ground Investigations are ongoing; A land contamination conceptual site model (CSM) and risk assessments will be developed for the project using the monitoring data to identify any sources of contamination, ground gas, pathways, and receptors present within the study area. The risk assessment will determine the likelihood of existing contamination being encountered during the construction process, such that it could cause significant environmental harm or negative health effects if not addressed adequately at the construction and/or operational stages. Measures, including the scope of required monitoring, would be identified within the CSM assessment, and secured within the DCO process.
Environment Agency Sustainable Places	With regards to Section 4.1.2.14: Channel Through Existing Lakes, there needs to be an assessment of the quantities of silt in the lakes currently, and the potential for all other sediment inputs. The report does identify potential for increased sediment load from urban development (and construction), agricultural runoff, channel modification and boat wash however, it does not identify burrowing activities of non-native	Silt mitigation is included within the project (channel maintenance to restore the design profile is primary mitigation and siltation management during construction is tertiary mitigation). In addition, modelling is being undertaken to understand sediment processes and effects to the lakes from augmented and flood flows. Results will refine any necessary silt mitigation at operational stage. Findings and assessment of the

Consultee or Organisation	Summary of Comment	Project Response
	crayfish or mitten crabs as a potential fine sediment input. This should inform both a construction silt mitigation plan and an operational silt mitigation plan. As the augmentation mechanism is not clear within the report, it is also unknown if there will be an additional source of sediment entering the system. The report states: 'Introducing an augmented flow and operational flow into the flood channel and intersected waterbodies has the potential for adverse effects on the chemical water quality of WFD and non-WFD lakes from the introduction of river water to previously unconnected lakes containing nutrient rich water and potentially contaminated sediments from sources including increased scour within the existing and new channels'. However, there is currently no suggestion of mitigation.	sources, pathways and sinks will be available within the ES.
Marine Management Organisation (MMO)	If any bespoke sediment sampling is required/undertaken for sediment quality, these should adhere to the MMO guidelines, especially with regard to the selection of a validated laboratory.	We have used accredited laboratories.

18.3.2 Other Engagement since EIA Scoping

18.3.2.1 Section 18.2.2 of our EIA Scoping Report summarises the stakeholder engagement relevant to the Water Environment topic that was undertaken prior to submission of our EIA Scoping Report.

18.3.2.2 We have established an Environmental Modelling Steering Group which includes industry (e.g. water companies). This group has identified the need for and scope of further modelling studies.

18.3.2.3 We held a meeting with the Environment Agency National Infrastructure Team in October 2023 to discuss the phased approach the RTS is taking to the WFD compliance assessment, the outcomes of the Preliminary WFD Compliance Assessment, and the extensive ongoing environmental modelling.

18.4 Methodology

18.4.1 Introduction

18.4.1.1 This section should be read in conjunction with Chapter 4 'Approach to the Environmental Assessment' which sets out relevant information on the design parameters and information that have informed our PEIR assessment, and how we have approached various aspects of the assessment including:

- The scope of the assessment;
- The methodology (including the approach to defining the baseline environment, topic study areas, and assessment methodology and criteria);
- The approach to mitigation; and
- The approach to cumulative effects.

18.4.1.2 The assessment methodology we have used for the Water Environment topic in this PEIR, and to be used in the Environmental Statement (ES), is presented in Section 18.7 of our EIA Scoping Report and is expanded and updated by the information in Section 18.4.2.

18.4.2 EIA Methodology

18.4.2.1 To aid the preliminary assessment of likely significant effects, we have assigned sensitivity to the features of each waterbody (i.e. the receptors) as per the assessment methodology (this is provided in Appendix 18.2).

18.4.2.2 Our assessment is based on the design for the project as described in Chapter 2: Project Description. The sensitivity of water environment receptors has been defined using published data sources, data obtained from stakeholders, data collected from site surveys and computer modelling.

18.4.2.3 The information we have gathered to date (including the environmental baseline surveys we have completed so far, summarised in Appendix 5.1) is considered sufficient to provide the basis for the preliminary assessment set out in this chapter.

18.4.2.4 At this stage, surveys and modelling are still on-going and the data from these will be used to inform our more detailed assessment of effects on the water environment within the ES. The ES assessment will also draw on the outcomes of our WFD compliance assessment, the methodology for which is summarised in section 18.4.3.

18.4.2.5 For the purposes of our PEIR assessment of effects on the water environment, we have assumed that environmental permits for waste management (and the mitigation measures that they would secure) will be in place as tertiary mitigation. However, where a baseline element associated with the water environment is in its lowest class, this level may not be acceptable under the WFD Regulations and therefore a precautionary approach has been taken in determining the likely significant effect upon these particular elements.

18.4.3 WFD Compliance Assessment

18.4.3.1 We are undertaking a WFD Compliance Assessment in accordance with guidance from PINS, the Environment Agency, UK Technical Advisory Group (UKTAG) and the European Commission. This guidance is referenced in the accompanying WFD Compliance Assessment: Preliminary Assessment (Appendix 18.1).

18.4.3.2 The WFD was transposed into national law in the UK by means of the Water Environment Regulations 2003 (England and Wales). The Water Environment Regulations 2017 (England and Wales) updated the previous regulations of 2003. The 2017 Regulations are currently in force in England following the departure of the UK from the European Union under the provisions of the European Union (Withdrawal Agreement Act 2020) but as amended by the Flood and Water (Amendment etc.) (EU Exit) Regulations 2019 (hereafter referred to as the WFD Regulations).

18.4.3.3 The methodology for WFD Compliance Assessments follows a standard three staged process:

- Stage 1 – WFD Screening: to determine if there are any activities associated with the RTS that don't require further consideration. For the RTS, we completed this alongside our EIA Scoping Report in 2022 (Appendix K to that report and also appended to our WFD Compliance Assessment: Preliminary Assessment in Appendix 18.1 of this PEIR).
- Stage 2 – WFD Scoping (Preliminary Assessment): to identify risks of the RTS's activities to receptors based on the relevant waterbodies and their water quality elements (including information on status, objectives, and the parameters for each water body). For the RTS we have completed this during the PEIR stage based on the design parameters and project boundary we set for this (as set out in Chapter 2). As design development is ongoing, and is being informed by consultation, technical surveys and assessments, an understanding of the potential likely significant effects of the RTS upon the water environment is still underway and the information provided within the WFD scoping assessment is preliminary only. At the ES stage, this preliminary WFD compliance assessment will be reviewed and potentially refined to take account of any developments in the project.
- Stage 3 – WFD Impact Assessment (Compliance Assessment): a detailed assessment of waterbodies and their quality elements that are considered likely to be affected by the RTS, identification of any areas of noncompliance; consideration of mitigation measures, enhancements, and contributions to the River Basin Management Plan (RBMP) objectives which is to be carried out at ES Stage.

18.4.3.4 We screened a total of 36 WFD waterbodies (34 surface and two ground) to identify which could be affected by the RTS. Of this, a total of 22 waterbodies (20 surface and two ground) were screened into the preliminary assessment. This screening assessment (i.e. Stage 1) was completed in September 2022 and at the time of writing did not include several design components that are now part of the PEIR parameters. These changes include River Thames bridges, and temporary wharves. These design changes are not considered to affect the screening conclusion, and in addition are assessed within the preliminary assessment (i.e. Stage 2). The preliminary assessment identified 14 waterbodies (12 surface and two ground) as requiring further detailed assessment (i.e. Stage 3), which is currently ongoing. Following this, we

will review the need for the development of Regulation 19 documentation if the RTS cannot meet the environmental objectives of the WFD Directive and Regulations (if required, this would be Stage 4 of the WFD Compliance Assessment).

18.5 Key Environmental Considerations and Opportunities

18.5.1.1 The key considerations with respect to the water environment are:

- There are 22 main rivers and approximately 73 lakes or (lake groups) and reservoirs of varying sizes within the study area. These comprise 36 WFD waterbodies (19 river waterbodies, 15 lake waterbodies and two groundwater bodies); the project must comply with the WFD and consider whether the works will lead to a deterioration of individual elements or overall WFD status or potential, or, if it may prevent any WFD objectives being delivered;
- Many of these lakes in the study area are man-made, created from former gravel pits and are a valuable resource for biodiversity. These lakes are stable lentic environments and therefore sensitive to nutrient influx from the River Thames, which could decrease water quality and lead to potential algal blooms and eutrophication;
- Several lakes and sections of rivers in the study area are important for recreation and the local economy. Influx of poor-quality water and changes to water level and flow will affect their usability;
- The depth and movement of water along the River Thames has been controlled by a series of weirs and locks for over a century. These structures present obstructions to the natural movement of sediment, causing build-up of course material immediately behind weirs and deeper pools in areas of scour immediately downstream. The pools are an important habitat, and therefore sensitive to changes in flow characteristics at the weir structures;
- The proposed works are underlain by a series of principal aquifers within Groundwater Source Protection Zones (SPZs). Water quality needs to be maintained to prevent deterioration or reduction in quality such as at ground water abstractions;
- There are numerous landfill and contaminated sites within the study area which are a risk to sensitive groundwater aquifers as the aquifers may be affected by leachate; and

- There are multiple licensed abstractions from surface waters and groundwater in the study area, 52 abstraction points in total, 18 of which are of public water supply. Currently, there is no capacity for additional consumptive licences without restrictions (Environment Agency, 2019a). These water supplies face significant pressures during drought conditions where water level is low and turbidity is high; operation of the RTS may exacerbate these issues.

18.5.1.2 The key opportunities with respect to the water environment are:

- Improvements to features of some of the waterbodies in the study area, including delivery of RBMP measures and WFD enhancements;
- Enhancement opportunities for the multiple surface waterbodies that interact with the RTS project such as aquatic habitat and riparian habitat installations, regrading lake margins and diversifying bed and bank morphology;
- Treatment and removal of Invasive Non-Native Species (INNS); and
- Fish pass installation and improvement: The weir and lock structures within the River Thames present a barrier to fish migration, and the RTS offers greater freedom of movement beyond these barriers.

18.6 Primary and Tertiary Mitigation

18.6.1 Primary Mitigation

18.6.1.1 We have included primary mitigation in relation to the water environment within the project design. As part of the design and EIA process this is being further refined; it includes:

- The provision of fish passes on flow control structures along the new flood channel to prevent trapping of fish;
- Channel morphology and structure improvements to existing rivers and lakes and within the Spelthorne and Runnymede channels to mitigate for changes to hydromorphology;
- Flow devices will control ground and surface water within the new channels to maintain a minimum water level and flow. This will prevent over-conveyance of groundwater and prevent drawdown of water from aquifers into the new channel;

- The provision and management of augmented flow along the flood channel when not in operation during flooding, to prevent water stagnation in the flood channel (including lakes), provide continued sediment and nutrient transport, reduce the risk of algal blooms and eutrophication and assist in the movement of fish through the system;
- Application of the mitigation hierarchy for habitats and species to reduce impacts from water quality decline at surface and groundwater dependent terrestrial ecosystems;
- Habitat creation, enhancement or mitigation for other effects on habitats or species;
- Enhancement of habitats immediately downstream of three weirs on the River Thames in the reach bypassed by the flood channel (at Penton Hook, Chertsey and Shepperton) to address potential effects on habitats as a result of changes in water quantity. There will be a watching brief and implementation of any enhancements will be subject to the EIA confirming effects on these habitats from diverting water along the flood channel;
- Undertake ongoing silt monitoring and maintenance of the flood channel to restore the design profile and therefore ensure it can continue to function effectively and reduce effects upon hydromorphology; and
- Within the Thorpe Park Lakes WFD water body, the existing connection between Manor Lake and Fleet Lake will be infilled to limit the nutrient inputs from the River Thames reaching Manor Lake. Similarly, the water level control structure between St Ann's Lake and Abbey Lake will isolate St Ann's Lake (part of the Southwest London Waterbodies Special Protection Area (SPA)) from the flood channel, again limiting nutrient inputs from the River Thames. These measures will mitigate for effects upon water quality of these lakes and hydraulically connected waterbodies.

18.6.2 Tertiary Mitigation

18.6.2.1 We are proposing the following tertiary mitigation in relation to water environment effects:

- A construction surface water management plan will include measures to limit water quality and hydromorphology effects associated with

site drainage and run off, manage existing flow paths and storm water;

- Standard construction practices for handling of soils will include a site specific soil resource plan containing mitigation measures in accordance with standard practice guidance documents as detailed in Chapter 13: Materials and Waste. These measures will reduce indirect effects on the water environment, such as from runoff of sediment into waterbodies;
- Application of the waste hierarchy. This will include the consideration to minimise the generation of waste such as from within channels or lakes, ensure reuse of arising and treatment of waste to make it suitable for reuse such as for within channels where practicably possible. These measures will reduce indirect effects on the water environment, such as from contamination;
- A Site Waste Management Plan (SWMP) will set out the amount and type of waste and how it will be reused, recycled or disposed (see Chapter 13: Materials and Waste). Likely measures in the plan relating to the water environment include for example keeping materials a safe distance from waterbodies, covering materials to avoid spillages or wind blown sediments entering waterbodies, and ensuring reused materials are suitable for use in or near waterbodies;
- An Emergency Response Plan will be prepared and be location specific to deal with contamination, spillages to the water environment or onset of flooding through deployment of suitable measures to contain, avoid or otherwise minimise effects;
- Standard construction practices for waste and materials management will be adhered to. This would include mitigation measures and associated monitoring (such as for groundwater) in accordance with good practice guidance documents and legislation as detailed in Chapter 13: Materials and Waste. Any works within or affecting landfills or involving waste will be subject to the requirement for an environmental permit under the Environmental Permitting (England and Wales) Regulations 2016. As part of the permitting process, a range of risk assessments will be required, which will be subject to scrutiny by the Environment Agency's National Permitting Service to ensure that they are robust. Suitable measures to mitigate effects on the environment to an acceptable level will be proposed and put in place, which the Environment Agency's National Permitting Service

will review and scrutinise in terms of their adequacy and appropriateness for mitigating the risks and impacts identified. An environmental permit will only be granted if the Environment Agency's National Permitting Service is satisfied that effects on the environment (and human health) are acceptable. The environmental permits will include appropriate permit conditions to limit effects on the environment (and human health) and ensure that the activities are subject to suitable controls;

- Hydro(geo)logical Risk Assessment will evaluate the environmental risk of pollution of groundwater from contaminated soils, in accordance with the Water Resources Act 1991. This will be submitted with the DCO application;
- Results of geotechnical and geoenvironmental investigations will inform development of primary, tertiary, and secondary mitigation for effects upon the water environment that will influence the design;
- A terrestrial INNS management plan would include measures to avoid, limit or eradicate INNS spread within the water environment (see Chapter 7: Biodiversity for details);
- Standard Construction Practices for Water - this would include mitigation measures to reduce effects on the water environment in accordance with Construction Industry Research and Information Association (CIRIA) C762 Environmental good practice on site. This is likely to include measures such as (this is not an exhaustive list):
  - Site drainage to include cut-off ditches and settlement ponds as required;
  - All wastewater produced on site is disposed of appropriately and cannot enter watercourses before treatment (in compliance with water quality standards);
  - All liquids are appropriately stored to prevent spillage; and
  - Geomorphological supervision.
- A Materials Management Strategy - the Strategy is being developed in parallel to the Development Consent Order (DCO) process. See Chapter 13: Materials and Waste. The strategy will include measures to reduce indirect effects on the water environment, such as from contamination; and
- Risk assessment / modelling of landfill leachate migration. This will include desk based assessments using ground investigation data to model/estimate the potential effects of contamination upon water

quality. This will inform further development of primary, tertiary, and secondary mitigation as required.

18.7 Preliminary Assessment of Likely Significant Effects

18.7.1 Introduction

18.7.1.1 Our PEIR adopts a precautionary approach. Assessments reported within this chapter are a preliminary assessment of potential likely significant environmental effects based on the design parameters set out in Chapter 2. This precautionary approach has been taken for the PEIR as there is some information on the project that is currently incomplete and the parameters within Chapter 2 are high level and account for a range of uses and allowance for design development within a boundary that could possibly be refined once this work has been completed. For example, some designs, construction and mitigation details (and therefore also land requirements) or baseline information is still required from further surveys, assessments and/or consultation feedback.

18.7.1.2 In making a determination of likely significant effects, we have considered the sensitivity of receptors (a receptor being a feature of the environment that responds to change) and the potential magnitude (i.e. size) of change caused by the RTS. The methodology for defining sensitivity and magnitude varies by topic and are defined in the topic sections of our Scoping Report.

18.7.1.3 We are committed to including mitigation measures as necessary to address likely significant negative environmental effects as far as reasonably practicable. Both primary and tertiary mitigation are considered to form part of the RTS; those applicable to this topic are set out in Section 18.6. Several of these mitigation measures are still being developed, and therefore as a precaution, the preliminary assessment of effects for the PEIR does not assume full achievement of these in considering if a project effect is likely to be significant (Appendix 4.2 identifies the implementation status of primary and tertiary mitigation for the PEIR assessment). Furthermore, the potential likely significant effects reported within this PEIR have been assessed prior to the implementation of secondary mitigation measures, those applicable to this topic are set out in Section 18.7.5. These secondary mitigation measures are the

subject of further development; and given they are still being developed, are not able to be applied to develop a ‘residual’ effects assessment.

18.7.1.4 The PEIR is based on the latest design and construction parameters and baseline information. As such the findings of the preliminary environmental appraisal presented within this PEIR may be subject to change as the design progresses, as mitigation is further developed or information from further studies becomes available, such as our ongoing work to refine the augmented flow through scenario testing in different flow conditions. The final assessment of effects undertaken as part of the EIA and reported within the ES will be based on the latest information available at that time.

18.7.2 Potential Likely Significant Effects

18.7.2.1 Our preliminary assessment of likely significant environmental effects has identified the potential for the following temporary negative effects from construction on the water environment:

- Potential negative effects to some main rivers and ordinary watercourses and lakes including:
  - Water quality (physico-chemical, biological and chemical) effects - from movement and use of contaminated materials, aquatic INNS and pathogen management (such as biocide treatments), contaminated or sediment laden run off from stockpiles or temporary wharfs, excavation or bed and bank lowering particularly within areas of landfill or contamination.
  - Hydromorphology effects - from bed and bank lowering, dewatering or long term over pumping, aquatic INNS and pathogen management (such as dewatering or drawdown treatments).
  - Water supply effects - resulting in loss of water quality or quantity (i.e. deployable output) from movement and use of contaminated materials, aquatic INNS and pathogen management (such as biocide treatments or dewatering), contaminated or sediment laden run off from stockpiles or temporary wharfs, excavation or bed and bank lowering particularly within areas of landfill or contamination.
  - Recreation effects - from reuse of excavated materials, excavation and movement of contaminated materials, use of

temporary wharfs resulting in water quality or hydromorphological changes affecting use of the water body.
    - Effects on surface water dependent habitats - from movement and use of contaminated materials, aquatic INNS and pathogen management (such as biocide treatments), contaminated or sediment laden run off from stockpiles or temporary wharfs, excavation or bed and bank lowering particularly within areas of landfill or contamination.
- Potential negative effects to two groundwater bodies (the Lower Thames Gravel Aquifer and Chobham and Bagshot Aquifer) including:
    - Changes in aquifer quality or quantity - from excavation within landfill or areas of contamination, sheet piling installation or means of creating or altering pathways for migration of water into and out of the aquifer.
    - Effects on groundwater dependent habitats - from excavation within landfill or areas of contamination, sheet piling or means of creating or altering pathways for migration of water into and out of the aquifer resulting in quality or quantity changes within connected groundwater dependent habitats.

18.7.2.2 Our preliminary assessment of likely significant environmental effects has identified the potential for the following permanent positive and negative effects from operation on the water environment:

- Potential positive effects to:
    - Water quality - consisting of WFD biological quality and physico-chemical quality elements from installing fish passes and improving habitats within existing channels, lakes and within priority areas for habitat creation, enhancement or mitigation.
    - Surface water dependent habitat – including certain watercourses and lakes (including certain SPA waterbodies and supporting waterbodies) from improving habitats within existing channels, lakes and within priority areas for habitat creation, enhancement or mitigation that are hydraulically connected.
- Potential negative effects to some main rivers, ordinary watercourses and lakes including:

  - Water quality (physico-chemical, biological and chemical) - from mixing of river and lake waters containing nutrients and pollutants and alteration to residence times.
  - Hydromorphology - from augmented flow altering flow dynamics, sediment transport and water levels altering physical characteristics and hydraulic connectivity across their catchments.
  - Water supply - resulting in loss of quality or water quantity (i.e. deployable output) from augmented flow creating a depleted reach and mixing of river and lake water altering water quality and turbidity in areas of abstraction.
  - Recreation effects - from existence of the new channels and introduction of augmented flow resulting in water quality or hydromorphological changes affecting use of the water body.
  - Surface water dependent habitats (such as SPAs) - reliant on flow regime and water quality to maintain the habitat from augmented flow and mixing of river and lake waters.
- Potential negative effects to two groundwater bodies (Lower Thames Gravel Aquifer and Chobham and Bagshot Aquifer) including:
  - Changes in quality or quantity of aquifer for supply – through changes in groundwater movement and levels caused by the presence of the flood channel and other project components, altering or creating new pathways for contaminant migration.
  - Effects on groundwater dependant biodiversity - as a result of contamination and changes in groundwater movement and levels through the presence of the flood channel and other project components altering or creating new pathways for migration of water into and out of the aquifer, resulting in quality or quantity changes within connected groundwater dependent habitats.

18.7.2.3 This preliminary assessment has identified that, in total, 26 surface water receptors have potential to experience temporary likely significant environmental effects from construction to one or more of their features, of which 12 receptors will experience negative effects and 14 receptors experience both positive and negative effects. In total 17 receptors have potential to experience permanent likely significant environmental effects from operation to one or more of their features, of which 15 will experience negative effects and two will experience both positive and

negative effects. A summary of this information is provided below in Table 18-2 for surface water receptors.

18.7.2.4 We have prepared a map (Figure 18.1) to demonstrate the potential changes in hydraulic connections between waterbodies once the flood channel is in place. Waterbodies have been grouped into the following categories:

- Lake within flood channel (new connection or enhanced direct permanent connection);
- Offline lake with continued flooding in <1:20 flood (i.e. five per cent chance of flooding in any given year);
- Offline lake with indirect connection to flood channel;
- Lake with a removed connection to other previously linked waterbodies (e.g. Manor Lake will no longer be connected to the other Thorpe Park lakes). No flooding in <1:20 flood (i.e. five per cent chance of flooding in any given year);
- Online watercourse (new connection or enhanced direct permanent connection); and
- Other watercourses.

18.7.2.5 Further details of the potential likely significant effects from construction and operation with respect to receptors, project components and project activities, in relation to the water environment can be found in Table 1 and 2 in Appendix 18.3.

18.7.3 Potential Likely Non-Significant Effects

18.7.3.1 Further details of the effects from construction and operation that are considered to be non-significant with respect to receptors, project components and project activities, in relation to the water environment can be found in Table 3 and 4 in Appendix 18.3.

18.7.3.2 Some examples of non-significant effects on the water environment include (this is not an exhaustive list):

- Positive effects of habitat enhancement works on water quality and hydromorphlogy in watercourses with moderate hydromorphology sensitivity such as the River Thames – Egham to Teddington, Mead Lake Ditch and Abbey River during operation of the RTS; and

- Positive effects on flows in the Burway Ditch in terms of recreation – the augmented flow would provide additional water quantity into Burway Ditch which is normally dry. This additional water quantity would allow for more recreation/wet use of the water body permanently.

18.7.4 In-Combination Climate Impact

18.7.4.1 Consideration of 'In-Combination Climate Impact' (ICCI) has been undertaken. The preliminary environmental assessment has considered a future climate scenario and has identified certain potential likely significant environmental effects for this topic which may be exacerbated further by predicted climate change. For example, the RTS impact to water levels and availability for public water supply during the future climate scenario of more frequent droughts and low flow conditions. Further consideration of ICCI will be included in the ES.

Table 18-2: Summary of surface water receptors with potential to experience likely significant effects (blank cell means no potential likely significant effect, positive or negative)

Receptor	Receptor	Hydromorphology - Construction	Hydromorphology - Operation	Surface water dependent biodiversity - Construction	Surface water dependent biodiversity - Operation	Water Quality - Construction	Water Quality - Operation	Water Supply - Construction	Water Supply - Operation	Recreation - Construction	Recreation - Operation
Datchet Common Brook	Surface water										
Colne Brook	Surface water			Negative		Negative					
New Cut	Surface water										
County Ditch	Surface water							Negative		Negative	
Bonehead Ditch	Surface water			Negative							
River Thames - Cookham to Egham	Surface water					Negative		Negative		Negative	
River Colne	Surface water			Negative		Negative					
Wraysbury River	Surface water			Negative		Negative					
Mead Lake Ditch	Surface water	Negative			Negative	Negative	Negative				Positive
The Moat	Surface water			Negative		Negative					
Chertsey Bourne	Surface water			Negative		Negative				Negative	
Abbey River	Surface water		Negative		Negative		Negative/ Positive	Negative	Negative	Negative	Negative
Burway Ditch	Surface water		Negative					Negative	Negative		
Pool End Ditch	Surface water				Negative		Negative/ Positive				
Engine River	Surface water							Negative			
The Chap	Surface water							Negative		Negative	
River Thames - Egham to Teddington	Surface water	Negative	Negative	Negative	Negative/ Positive	Negative	Negative/ Positive	Negative	Negative	Negative	Negative/ Positive
River Ash	Surface water			Negative		Negative				Negative	
River Mole	Surface water	Negative				Negative				Negative	

Receptor	Receptor	Hydromorphology - Construction	Hydromorphology - Operation	Surface water dependent biodiversity - Construction	Surface water dependent biodiversity - Operation	Water Quality - Construction	Water Quality - Operation	Water Supply - Construction	Water Supply - Operation	Recreation - Construction	Recreation - Operation
(unnamed) ordinary watercourses and land drains	Surface water										
Transitional Thames Upper and Thames Middle	Surface water				Negative		Negative				
Blenheim Lake	Still Water										
Heron Lake	Still Water										
Hythe End East	Still Water										
The Moor Gravel Pit	Still Water										
Egham Hythe Pond	Still Water										
Meadlake	Still Water										
Lake South of Green Lane	Still Water	Negative	Negative/ Positive	Negative	Negative/ positive	Negative	Negative/ positive	Negative	Negative	Negative	Negative
Lake South of Norlands Lane 1	Still Water		Negative/ Positive		Negative/ positive		Negative/ positive		Negative		Negative
Thorpe Park Lakes: Fleet Lake, Manor Lake, Abbey Lake, St Ann's Lake	Still Water		Negative/ Positive		Negative/ Positive		Negative/ Positive				Negative/ Positive
Abbey 1	Still Water		Negative		Negative						
Abbey 2	Still Water		Negative/ Positive		Negative/ Positive		Negative/ Positive		Negative		Positive
Penton Hook Marina	Still Water		Negative						Negative		Negative
Littleton North	Still Water		Negative/ Positive		Negative/ Positive		Negative/ Positive		Negative		Negative/ Positive
Littleton South	Still Water		Negative		Negative				Negative		Negative
Littleton East	Still Water		Negative/ Positive		Negative/ Positive		Negative/ Positive		Negative		Negative/ Positive
Sheepwalk East (F)	Still Water		Negative		Negative		Negative		Negative		Negative

Receptor	Receptor	Hydromorphology - Construction	Hydromorphology - Operation	Surface water dependent biodiversity - Construction	Surface water dependent biodiversity - Operation	Water Quality - Construction	Water Quality - Operation	Water Supply - Construction	Water Supply - Operation	Recreation - Construction	Recreation - Operation
Sheepwalk West 1	Still Water		Negative		Negative		Negative		Negative		Negative
Sheepwalk West 2	Still Water		Negative		Negative		Negative/ Positive		Negative		Negative/ Positive
Sheepwalk West 3	Still Water		Negative		Negative		Negative		Negative		Negative
Black Ditch Pond	Still Water										
Manor Farm Lake	Still Water										
Ferry Lane Lake 1	Still Water										
Ferry Lane Lake 2	Still Water		Negative								
Ferry Lane Lake 3	Still Water		Negative								
Ferry Lane Lake	Still Water		Negative		Negative		Negative/ Positive		Negative		Negative/ Positive
Queen Mary Reservoir	Still Water		Negative				Negative		Negative		
Lockwood Reservoir	Still Water										
Banbury Reservoir	Still Water										
Queen Elizabeth 2 Storage Reservoir	Still Water						Negative				
Knight Reservoir	Still Water						Negative				
Bessborough Reservoir	Still Water						Negative				
Island Barn Reservoir	Still Water						Negative				

18.7.5 Secondary Mitigation

18.7.5.1 As noted in paragraph 18.7.1.3, primary and tertiary mitigation are still being developed, and therefore as a precaution, the preliminary assessment of effects for our PEIR does not assume full achievement of these in considering if a project effect is likely to be significant. Furthermore, the potential likely significant effects reported within our PEIR have been assessed prior to the implementation of secondary mitigation measures. For the majority of the identified likely significant environmental effects it is considered likely that the primary and tertiary mitigation will be sufficient at ES stage such that no secondary mitigation will be required. Where secondary mitigation is already under consideration for potential significant environmental effects, this is detailed below.

18.7.5.2 In order to reduce the magnitude of significant effects, the following secondary mitigation is currently under consideration in relation to the water environment:

- Water quality monitoring during construction and operation and subsequent remedial activities where these are required that will aid with development of bespoke mitigation measures, which may include for example deployment of proprietary equipment to filter any detected pollutants.
- An Aquatic INNS Management Plan will be prepared that may include measures such as eradication of INNS before commencement of construction and monitoring for spread and implementation of treatment measures to avoid colonisation that would lead to effects upon surface water dependent habitats.
- An Aquatic Pathogen Management Plan will be prepared that may include measures to reduce transfer of fish parasites in either direction between the River Thames and surrounding fisheries. In addition, there will be monitoring for pathogen spread and implementation of treatment measures where required to avoid colonisation that would lead to effects upon surface water dependent habitats.
- Further design will need to be undertaken to mitigate effects on the water environment following results of further studies and on-going monitoring (outlined in Section 18.7). For example, water quality

impacts on lake recreation will need to be analysed in order to determine effects on water chemistry and effect on bathing water use. On-going water quality monitoring and subsequent analysis will investigate potential effects and identify potential areas for mitigation. Mitigation will also be developed following focused study of modelling outputs.

- Further operational design will also be undertaken following additional environmental modelling to mitigate effects upon the water environment during drought / low flows.
- Further environmental mitigation may be required as a result of the WFD compliance assessment and the EIA, such as in relation to water quality, for physico-chemical elements or chemicals, and is yet to be developed.

18.8 Further Work for the EIA

18.8.1.1 We will undertake a detailed assessment of the effects from construction and operation on the water environment of the project for the ES in accordance with the methodology set out Section 18.3 above. The assessment will be completed alongside the WFD Compliance Assessment for the project.

18.8.1.2 Our assessment for the ES will be based on the effects scoped into the assessment. It will take into account:

- The comments received in our EIA Scoping Opinion, as explained in Appendix 4.1, including identifying the construction activities that have potential to lead to sediment disturbance and spill contamination, and explain what mitigation measures will be employed to reduce/avoid effects, as requested by PINS.
- Further development of the design of the project and its accompanying secondary mitigation measures.
- Any additional baseline information that will become available from on-going surface and groundwater quality and level monitoring, ecological surveys, sediment sampling, geomorphological (fluvial) reconnaissance, integrated groundwater and surface water modelling, adaptive augmented surface water flow modelling, drought/low flow modelling, hydro(geo)logical assessment and a detailed WFD assessment.

- On-going engagement with Thames Water and Affinity Water, in addition to the Environmental Modelling Steering Group, which will inform the scope of the modelling, assessment work and potential mitigation.
- In addition, the assessment will also be informed by any further information received during the statutory consultation process.

18.8.1.3 Our assessment for the ES will state the predicted significance of effects, provide further detail of relevant mitigation and document the subsequent residual effects. We consider that the further development of the project design and mitigation measures which will be reflected in the ES and DCO application, will enable a reduction in the scale of identified negative likely significant effects set out in this chapter.

19 Cumulative Effects Assessment

19.1 Introduction

19.1.1.1 This chapter sets out our approach to the Cumulative Effects Assessment (CEA) including initial findings and proposed actions to be completed as part of our ongoing Environmental Impact Assessment (EIA).

19.1.1.2 Our CEA will identify and characterise the potential for both inter-project and intra-project effects, and then assess the significance of these effects. These effects are defined as:

- Inter-project effects: This form of cumulative effect occurs as a result of the impacts of the proposed development interacting with the impacts of other developments in the vicinity.
- Intra-project effects: These effects occur between different environmental topics within the same proposal, as a result of that development's direct effects (IEMA, 2011).

19.1.1.3 Inter-project and intra-project effects result from multiple actions on receptors and resources over time. These can be:

- Additive – caused by other past, present or reasonably foreseeable actions together with the project itself; and/or,
- Interactive/Synergistic – the reaction between effects of a development on different aspects of the environment (IEMA, 2020c).

19.1.1.4 In this chapter, we do not present a full CEA as this can only be undertaken once the environmental topic assessments are complete as part of the Environmental Statement (ES). Instead we present an update of stages 1a and 1b of the inter-project effects assessment completed as part of our EIA Scoping Report (see Section 19.3.1 for further details).

19.1.1.5 Similarly, stages 2-4 of the intra-project effects assessment can only be undertaken once the environmental topic assessments are complete as part of the ES, so definitive intra-project effects cannot be identified at this PEIR stage and we only go as far as identifying a list of ‘shared receptors’ that have the potential to be changed by more than one topic/effect (see Section 19.3.2 for further details). The further work that will be completed for the CEA as part of the ES is summarised in Section 19.5.

19.2 Legislation, Policy and Guidance

19.2.1.1 We have used the following legislation, policy framework and guidance to inform the scope and content of this chapter and will further refer to these in the Environmental Statement (ES).

- Infrastructure Planning (Environmental Impact Assessment) Regulations 2017;
- National Policy Statement for Water Resources Infrastructure (Defra, 2023a);
- The Planning Inspectorate (2019) Advice Note Seventeen: Cumulative Effects Assessment;
- The Planning Inspectorate (2019) Advice Note Seven: Environmental Impact Assessment: Process, Preliminary Environmental Information and Environmental Statements;
- The Planning Inspectorate (2019) Advice Note Nine: Rochdale Envelope;
- The Institute of Environmental Management & Assessment (IEMA) (2011) Special Report – The State of Environmental Impact Assessment Practice in the UK; and
- IEMA (2020) Demystifying Cumulative Effects, Thought Pieces from UK Practice. Impact Assessment Outlook Journal, Volume 7: July 2020.

19.2.1.2 Furthermore, the professional judgement and knowledge of qualified EIA specialists is required for the CEA as the assessment is necessarily qualitative, in keeping with the need to ensure that it is proportionate.

19.3 Methodology

19.3.1 Approach to Assessing Inter-project Effects

19.3.1.1 Our methodology for assessing inter-project effects will follow the approach set out in Section 19.2 of the RTS EIA Scoping Report (Environment Agency and Surrey County Council, October 2022) (‘the EIA Scoping Report). Since the EIA Scoping Report, Stage 1a (establishing the project’s Zone of Influence) and Stage 1b (identifying the long list of ‘other developments’) have been revisited and updated and the results of this work are reported here.

19.3.1.2 **Stage 1a:** The Zones of Influence (ZOIs) which have been updated for this Preliminary Environmental Information Report (PEIR) have been defined by using the study area for each topic. The ZOIs are defined in the topic sub-sections of Chapter 5: Site Description and shown in the associated study area figures in Volume 3.

19.3.1.3 Topic study areas have been updated since the EIA Scoping Report to reflect the design parameters and project boundary for the EIA PEIR (see Section 2.4), although the resulting changes to topic study areas (and ZOIs) are minimal (see Chapter 5 'Site Description'), with the exception of Biodiversity.

19.3.1.4 For Biodiversity the 10, 20 and 30 kilometre study areas that were included in the EIA Scoping Report have been removed from the ZOI. These study areas covered Special Protection Areas (SPA), Special Area of Conservation (SAC) and Ramsar sites only. Effects on these sites will be assessed within the in-combination assessment of the Habitat Regulation Assessment (HRA), not within the main CEA for the project, which the ES will reference. This is in accordance with PINS Advice Note Seventeen which states that '*Where an Applicant is required to submit a Habitats Regulations Assessment (HRA) alongside an ES. The Applicant should ensure that information is not duplicated between assessments. The use of shared datasets is recommended.'*

19.3.1.5 The topic ZOIs were combined to identify a single, reasonable worst-case ZOI that represents the maximum spatial extent of the ZOI of the RTS (see Figure 19.1). This worst-case ZOI was used to identify the relevant 'other developments'.

19.3.1.6 Although long lists of 'other developments' are not being identified per topic at this stage, this approach to identifying the ZOI is a reasonable and precautionary worst case since it assumes that the identified effects will cover a larger area than is anticipated. The ZOIs used for the ES will be refined based on the outcome of the technical assessments, and in most cases will likely reduce in spatial extent, which may reduce the number of 'other developments' being considered and thereby reduce the scope of the inter-project effects assessment.

19.3.1.7 **Stage 1b:** The long list of 'other developments' has been revisited since the EIA Scoping Report. The criteria used to identify relevant 'other

developments' is set out in Section 19.2.3.3 of the EIA Scoping Report. The data on 'other developments' was collected within the worst-case ZOI from the relevant Local Planning Authority (LPAs) planning portals, the Planning Inspectorate's list of projects, consultation with the LPA Project Group and from the RTS Committed Development Register. The cut-off date for collating 'other development' information for the PEIR was 12th May 2023 (the RTS Committed Development Register was last reviewed on the 13th June 2023, although this did not result in any more 'other developments' being identified). This will be updated to inform the completion of the ES.

19.3.1.8 'Other developments' identified as part of the CEA that are expected to be completed before construction of the RTS will be considered within the ES as part of the future baseline within the environmental topic construction and operational assessments.

19.3.1.9 Stages 2-4 of the inter-project effects assessment will be completed and reported in the ES.

19.3.2 Approach to Assessing Intra-project Effects

19.3.2.1 Our methodology for assessing intra-project effects will follow the approach set out in Section 19.3 of the EIA Scoping Report.

19.3.2.2 As explained in paragraphs 19.3.1.2 – 19.3.1.4 of this chapter, the ZOIs have been updated for the PEIR, and were used for assessing intra-project effects.

19.3.2.3 **Stage 1** (individual assessments undertaken by topic assessments) were completed at a preliminary level for the PEIR and are reported in Chapters 6-18.

19.3.2.4 Stages 2-4 can only be completed once the environmental topic assessments are complete as part of the ES, so definitive intra-project effects cannot be identified at this PEIR stage.

19.3.2.5 **Stage 2** (using the topic assessment of effects to highlight receptors/resources changed by more than one topic/effect) of the intra-project effects assessment has been completed at a preliminary level for the PEIR, and was used to identify a list of 'shared receptors' that have the potential to be changed by more than one topic/effect.

19.3.2.6 **Stage 3** (using the receptor / resource groups, and the topic chapter assessments to identify the potential for intra -project effects) and **Stage 4** (assess the likelihood of the potential for the individual effects to interact to create a different or greater effect that could alter the assessment of significance) will be completed as part of the ES.

19.3.3 Stakeholder Engagement

19.3.3.1 Our proposed CEA methodology, and our preliminary approach described above (i.e. Stage 1a – establishing the project's ZOI; and Stage 1b – identifying the long list of 'other developments') were provided within the EIA Scoping Report for consultation.

19.3.3.2 As set out in Section 4.2 of this PEIR, the Planning Inspectorate (PINS) provided and adopted their EIA Scoping Opinion (dated 15 November 2022) ('the PINS Scoping Opinion') on behalf of the Secretary of State. We have considered the PINS Scoping Opinion when preparing this CEA for the PEIR and we will use it to inform the CEA for the ES.

19.3.3.3 Table 19-1 below summarises the comments and responses received on our EIA Scoping Report following formal submission to PINS and key comments received from statutory consultees. Full consultee comments on our EIA Scoping Report and our responses to these comments are provided in Appendix 4.1.

Table 19-1: Responses to comments received on the EIA Scoping Report

Consultee or Organisation	Summary of Comment	Project Response
PINS	No matters have been proposed to be scoped out of the assessment.	Correct, in the Scoping Report we did not propose matters to be scoped out of the CEA.
LPA Project Group	The Project Group has no comments to make at this stage of the process on the proposed scope of the cumulative effects assessment (CEA) as set out the EIA Scoping Report. The proposed approach appears consistent with that recommended in Advice Note 17 for Nationally Significant Infrastructure Projects (NSIPs). The Project Group is content that the schemes listed in Appendix L as major developments for which planning applications has been sought is accurate at this time. The Project Group will engage with the Applicant to ensure that the CEA captures all relevant schemes as the project progresses.	Noted. We have engaged with the LPA Project Group to update the long-list of 'other developments' as part of the PEIR stage CEA.
LPA Project Group	Potential cumulative impacts could occur with the traffic related to the operation of the recent Shepperton Studios development. Filming tends to involve Heavy Good Vehicles (HGVs) for materials/supplies, welfare and to bring in sets and catering.	Shepperton Studios Development application reference 7210693 / 18/01212/OUT has been included on the long list of 'other developments' for consideration in the CEA.
Environment Agency	We are pleased to see that there is a discussion of fluvial and tidal interactions, and that modelling will look at effects downstream of Teddington Lock. The applicant should consider whether plans on other parts of the River Thames could impact on the RTS. For example, changes implemented as part of the Thames Estuary 2100 Plan (TE2100) are likely to impact the RTS, including alterations to the flood defences and Thames Barrier operations and location.	This will be covered in the flood risk assessment (FRA). TE2100 has been included on the long list of 'other developments' for consideration in the CEA.

19.3.4 Assumptions and Limitations

19.3.4.1 To ensure transparency within the EIA process, we have identified the following assumptions and limitations:

- The long list of 'other developments' collated for the inter-project CEA is based on publicly available data which it is not possible to verify and is limited in some cases e.g. when reviewing and updating the long list some of the projects identified only had EIA Screening requests available in the public domain, which do not provide a full project description, only a brief summary;
- To enable a precautionary CEA, it is assumed where planning permission for 'other developments' has been applied for but documentation/information could not be found on the project timeframes, that these 'other developments' could be constructed at the same time as the project, thus giving potential construction-related cumulative effects. The status of all 'other developments' will be reassessed at ES stage to ensure that the CEA is based on the most recent information available; and
- Proposed 'other developments' which are assessed as part of the CEA may be based on a different methodology which is not consistent with this project. This has the potential to cause variance / discrepancies.

19.3.4.2 Our preliminary environmental assessment for the PEIR is based on the best information available at this stage of the project. Further work will be required as the design develops between the PEIR and ES, and once the topic assessments are complete for the ES.

19.3.4.3 Cumulative greenhouse gas (GHG) emissions will be addressed in more detail in the ES, within the Climatic Factors ES chapter. This cumulative assessment will be set out separately from the cumulative assessments being carried out by other topics, given that GHG emissions do not have a local geographical limit, and therefore there is no basis for selecting any particular (or more than one) cumulative project that has GHG emissions for assessment over any other.

19.4 Assessment of Effects

19.4.1 Inter-project Effects Assessment

19.4.1.1 The long list of ‘other developments’ has been updated for the PEIR, and details of each development are presented in Appendix 19.1. Plate 19-1 displays the approximate timelines for the long list of ‘other developments’ (where this information was available) against the RTS timeframes for construction and operation, demonstrating the potential for inter-project effects. Where it has not been possible to obtain timeframes for ‘other developments’, the rows have been left blank.

Construction and Operation Timeframes

Construction | Operation | Estimated Start of Operation

		2022				2023				2024				2025				2026				2027				2028				2029				2030				2031				2032				2033				2034				2035			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
	RTS Project Timeline																																																			
		2022				2023				2024				2025				2026				2027				2028				2029				2030				2031				2032				2033				2034				2035			
ID	Other developments and Planning Reference where applicable	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1	Western Rail Link to Heathrow - PINS - 129088-JAC-REP-EMF-000001 Rev A02																																																			
2	Expansion of Heathrow Airport - PINS - TR020003																																																		
3	Shepperton Studios Expansion - SCC Ref 18/01212/OUT																																																		
4	Surrey County Hall - SCC Ref 21/03939/FUL / PP-10416630																																																		
5	Stroude Road Extraction - Surrey CC Ref 2009/0015																																																		
6	Whitehall Farm Extraction - Surrey CC Ref 2021/0023																																																		
7	Queen Mary Quarry - Surrey CC Ref 2021/0030, 2021/0013, 2020/0052																																																		
8	Queen Mary Quarry - Surrey CC Ref 2012/0061																																																		
9	Queen Mary Quarry - Surrey CC Ref 2019/0099, 2020/0049																																																		
10	Manor Farm Quarry - Surrey CC Ref 2021/0141																																																		
11	Longcross Garden Village - RU.22/0393																																																		
12	Animal and Plant Health Agency Scheme - RU.23/0292																																																		
13	Norlands Lane landfill - RU.23/0470 and SCR/23/03																																																		
14	Norlands Lane residential - RU.23/0374 and RU.18/0703																																																		
15	Retirement Community - ELM - 2022/2127																																																		
16	Brooklands College Redevelopment - ELM - 2022/2327																																																		
17	St George Business Park - ELM - 2022/1392																																																		
18	Weylands Old Treatment Works - ELM - 2022/1444																																																		
19	Redevelopment at Sawyer Close - W&M - 23/00650/EIASCR																																																		
20	Maidenhead Golf Course - W&M - 22/02683/EIASCO																																																		
21	Land North And South Gays Lane Maidenhead - W&M - 22/02796/EIASCR																																																		
22	Site B Open Field North of Lower Mount Farm - W&M - 22/03403/EIASCR																																																		
23	Thames Valley Flood Scheme																																																		
24	Datchet to Hythe End Flood Improvement Measures																																																		
25	River Severn to River Thames Water Transfer																																																		
26	South East Strategic Reservoir Option																																																		
27	Teddington Direct River Abstraction																																																		
28	Mogden Water Recycling Scheme																																																		
29	Surrey Minerals Plan Primary Aggregates Development Plan 2009 - 2026																																																		
30	Thames Estuary 2100																																																		

Plate 19-1: Construction and Operation timeframes for the long list of 'other developments' compared to the RTS timeframes showing the construction (green) and operation (diagonal hatch) phases of development. The horizontal line represents the estimated start of operation for some of the developments.

19.4.1.2 Our updates to the long list of 'other developments' since the EIA Scoping Report include removal of the following projects because they now fall outside of the reasonable worst-case ZOI:

- North London Heat and Power Project; and
- HS2 London to Birmingham.

19.4.1.3 Further updates since the EIA Scoping Report include removal of the below projects from the long list because they are due to be complete before construction of the RTS starts (and therefore will be treated as 'future baseline' projects – see paragraph 19.3.1.8 above):

- Silvertown Tunnel;
- Southampton to London Pipeline Project;
- M25 Junction 10/A3 Wisley Interchange;
- M4 Junctions 3 to 12 Smart Motorway;
- Thames Tideway Tunnel;
- Thorpe Park (RU.22/0374 & RU.22/1814);
- Twickenham Riverside Scheme;
- King George VI Reservoir (Surrey CC Ref 2019/0215);
- Watersplash Farm Quarry (Surrey CC Ref 2012/0173); and
- Shepperton Quarry, Littleton Lane, Shepperton (Surrey CC Ref 2021/0124).

19.4.1.4 We considered the following projects for inclusion on the long list but they were not included because they are due to be complete before construction of the RTS starts (and therefore will be treated as 'future baseline' projects – see paragraph 19.3.1.8 above):

- Slough Multifuel Extension Project; and
- Homer Farm sand and gravel extraction (Spelthorne 13/00141/SCA1 & 20/01214/SCC).

19.4.1.5 We identified the following additional projects through consultation with relevant LPAs for inclusion on the long list at PEIR stage:

- Longcross Garden Village (RU.22/0393);
- Animal and Plant Health Agency Scheme (RU.23/0292);
- Norlands Lane Landfill (RU.23/0470); and
- Norlands Lane Residential (RU.23/0374).

19.4.1.6 We identified the following additional projects through desk-based research of LPA planning portals for inclusion on the long list at PEIR stage:

- St George Business Park (2022/1392);
- Weylands Old Treatment Works (2022/1444);
- Retirement Community (2022/2127);
- Brooklands College Redevelopment (2022/2327);
- Development at Maidenhead Golf Course (22/02683/EIASC);
- Land North and South Gays Lane, Maidenhead (22/02796/EIASC);
- Site B, open field north of Lower Mount Farm (22/03403/EIASC); and
- Redevelopment at Sawyers Close (23/00650/EIASC).

19.4.1.7 We identified the following additional projects through desk-based research for inclusion on the long list at PEIR stage:

- Thames Valley Flood Scheme;
- Datchet to Hythe End Flood Improvement Measures;
- River Severn to River Thames Water Transfer;
- South East Strategic Reservoir Option;
- Teddington Direct River Abstraction; and
- Mogden Water Recycling Scheme.

19.4.1.8 We identified the following additional plan through desk-based research for inclusion on the long list at PEIR stage:

- Thames Estuary 2100.

19.4.2 Intra-project Effects Assessment

19.4.2.1 The combined effects of different environmental impacts from project activities on a single ‘shared receptor’ are known as ‘intra-project effects’. There is the potential for both positive and negative intra-project effects from construction and operation of the RTS.

19.4.2.2 We will undertake a full assessment of intra-project effects (Stages 2 to 4) and report on it in the ES, once the environmental assessments for the separate environmental topics have been completed for the ES.

19.4.2.3 Based on the outcome of the technical topic assessments completed for this PEIR, we have undertaken an initial scoping of intra-project effects of

the RTS; using the revised project ZOIs (see paragraph 19.3.1.5) and covering all construction and operation stage activities resulting in potential environmental effects (significant and non-significant) on 'shared receptors'.

19.4.2.4 Due to the preliminary assessment of likely significant environmental effects in the PEIR being based on the use of parameters (see Chapter 2) it has not been possible in the topic assessments to specify the effects on individual receptors, in many cases receptors are grouped together. Therefore it was not possible to scope intra-project effects on individual receptors, and instead the potential for likely significant effects on groups of receptors has been identified. This approach will be reviewed and updated at the ES stage.

19.4.2.5 To identify the 'shared receptors' at this preliminary PEIR stage, all receptors identified in the topic specific assessments have been collated into 16 shared receptor groups, as shown in Table 19-2. Table 19-2 shows how the receptor groups (left column) were defined by analysing similar types of receptors (middle column) identified in the topic assessments (right column), and grouping them together.

Table 19-2: List of Receptors that form the Shared Receptor Groups

Shared Receptor Group	Receptor name used in Topic Assessment	Topic Assessment that receptor originates from
Ecological receptors	Habitats	Biodiversity
Ecological receptors	Protected and priority species	Biodiversity
Ecological receptors	Invertebrates	Biodiversity
Ecological receptors	Notable plants	Biodiversity
Ecological receptors	Ecological receptors	Air Quality
Ecological receptors	National Planning Policy Framework (NPPF) Categories (Water-compatible development)	Flood Risk
Designated Sites (Biodiversity)	Statutory protected sites	Biodiversity
Designated Sites (Biodiversity)	Local Nature Reserves	Biodiversity
Designated Sites (Biodiversity)	Sites of Nature Conservation Interest	Biodiversity
Designated Sites (Biodiversity)	Local Wildlife Sites	Biodiversity

Shared Receptor Group	Receptor name used in Topic Assessment	Topic Assessment that receptor originates from
Designated Sites (Biodiversity)	Nature conservation sites prized for their tranquillity	Noise and Vibration
Designated Sites (Biodiversity)	NPPF Categories (Water-compatible development)	Flood Risk
Designated Sites (Biodiversity)	Ecological receptors	Air Quality
Designated Assets (Cultural Heritage)	Designated Scheduled Monuments	Cultural Heritage
Designated Assets (Cultural Heritage)	Designated Conservation Areas	Cultural Heritage
Designated Assets (Cultural Heritage)	Designated Registered Park & Garden	Cultural Heritage
Designated Assets (Cultural Heritage)	Designated Listed Buildings	Cultural Heritage
Non-Designated Assets (Cultural Heritage)	Non-designated assets	Cultural Heritage
Palaeoenvironmental	Palaeoenvironmental	Cultural Heritage
Soils	Topsoil and subsoil	Materials and Waste / Soils and Land
Soils	Soil structure and chemistry	Materials and Waste
Soils	Soil structure	Soils and Land
Soils	Soil stability	Soils and Land
Soils	Agricultural soils	Soils and Land
Soils	Arable and pasture land	Soils and Land
Soils	NPPF categories (Water compatible development, Less Vulnerable)	Flood Risk
Landscape Receptors	RTS Landscape Character Area (LCA)	Landscape and Visual
Landscape Receptors	Green Belt	Landscape and Visual
Landscape Receptors	Regional park	Landscape and Visual
Landscape Receptors	LCA	Landscape and Visual
Landscape Receptors	National Character Area	Landscape and Visual
Landscape Receptors	NPPF Categories (Water-compatible development)	Flood Risk
Materials	Mineral resources	Materials and Waste / Soils and Land
Materials	Preferred future mineral extraction sites	Materials and Waste
Materials	Natural resources	Materials and Waste
Materials	Material resources	Materials and Waste

Shared Receptor Group	Receptor name used in Topic Assessment	Topic Assessment that receptor originates from
Materials	Active mineral extraction sites	Materials and Waste
Materials	Restoration sites	Materials and Waste
Materials	NPPF Categories (Water compatible development, Less Vulnerable)	Flood Risk
Waste	Active Inert Landfill sites	Materials and Waste
Waste	Active waste treatment centres	Materials and Waste
Waste	Active hazardous landfill sites	Materials and Waste
Waste	Historic landfill sites	Materials and Waste
Waste	Industrial Land Areas of Search	Materials and Waste
Waste	Future landfill site	Materials and Waste
Waste	NPPF Categories (More/Less Vulnerable)	Flood Risk
Residential	Residents at home	Landscape and Visual
Residential	Residential dwellings	Noise and Vibration
Residential	Residential houseboats	Noise and Vibration
Residential	Residential - care home	Noise and Vibration
Residential	Residential areas	Socio-Economic
Residential	Residents	Health
Residential	Human receptors	Air Quality / Soils and Land
Residential	Sensitive site with vulnerable groups	Health
Residential	Local communities	Socio-Economic
Residential	Construction route	Traffic and Transport
Residential	Workers	Health
Residential	Users of Public Highway	Landscape and Visual
Residential	Local Highway Network	Traffic and Transport
Residential	Transport network	Traffic and Transport
Residential	Users of the motorway and the railway line	Landscape and Visual
Residential	Buildings	Soils and Land
Residential	NPPF Categories (Highly Vulnerable (basement dwellings) /More Vulnerable (all other residential types))	Flood Risk
Non-Residential	Hotel	Noise and Vibration
Non-Residential	Offices	Noise and Vibration
Non-Residential	Community hall / training centre	Noise and Vibration
Non-Residential	School	Noise and Vibration

Shared Receptor Group	Receptor name used in Topic Assessment	Topic Assessment that receptor originates from
Non-Residential	Preschool/Nursery	Noise and Vibration
Non-Residential	Marina	Noise and Vibration
Non-Residential	Community centre	Noise and Vibration
Non-Residential	Camping and Caravanning Site	Noise and Vibration
Non-Residential	Human receptors	Air Quality/ Soils and Land
Non-Residential	Human receptors (Non-residential)	Air Quality
Non-Residential	People at their places of work	Landscape and Visual
Non-Residential	Sensitive site with vulnerable groups	Health
Non-Residential	Buildings	Soils and Land
Non-Residential	Local communities	Socio-Economic
Non-Residential	Workers	Health
Non-Residential	Users of Public Highway	Landscape and Visual
Non-Residential	Users of the motorway and the railway line	Landscape and Visual
Non-Residential	Transport Network	Traffic and Transport
Non-Residential	Construction route	Traffic and Transport
Non-Residential	Local Highway Network	Traffic and Transport
Non-Residential	Businesses	Socio-Economic
Non-Residential	NPPF Categories (Essential Infrastructure, Highly/More/Less Vulnerable)	Flood Risk
Recreation	Recreational facilities	Socio-Economic
Recreation	Public Rights of Way	Traffic and Transport
Recreation	Equestrian centre	Noise and Vibration
Recreation	Sailing centre	Noise and Vibration
Recreation	Recording studio	Noise and Vibration
Recreation	Leisure centre	Noise and Vibration
Recreation	Users of Public Bridleway	Landscape and Visual
Recreation	Users of Public Footpath, public cycle route and leisure users of the River Thames	Landscape and Visual
Recreation	Users of Public Open Space	Landscape and Visual
Recreation	Users of Thorpe Park	Landscape and Visual
Recreation	Users of a Regional Park	Landscape and Visual
Recreation	Regional Park	Landscape and Visual
Recreation	Users of the recreational facility	Landscape and Visual
Recreation	Health club	Noise and Vibration
Recreation	River Navigation	Traffic and Transport

Shared Receptor Group	Receptor name used in Topic Assessment	Topic Assessment that receptor originates from
Recreation	Members of the public	Cultural Heritage
Recreation	Visitors	Health
Recreation	Human	Soils and Land
Recreation	Sensitive site with vulnerable groups	Health
Recreation	Workers	Health
Recreation	Users of the motorway and the railway line	Landscape and Visual
Recreation	Transport Network	Traffic and Transport
Recreation	Businesses	Socio-Economic
Recreation	NPPF Categories (Essential Infrastructure, Water compatible development, More/Less vulnerable)	Flood Risk
Economy (Socio-Economic)	Surrey economy	Socio-Economic
Groundwater	Aquifer - Bedrock	Soils and Land
Groundwater	Aquifer - Superficial	Soils and Land
Groundwater	Source Protection Zones	Soils and Land
Groundwater	Bedrock geology	Soils and Land
Groundwater	Superficial geology	Soils and Land
Groundwater	Groundwater body	Water Environment
Groundwater	Groundwater dependent terrestrial ecosystem	Water Environment
Surface Water	Statutory Main River surface water body	Water Environment
Surface Water	Ordinary Watercourse surface water body	Water Environment
Surface Water	Surface water dependent habitat	Water Environment
Surface Water	Lakes hydraulically connected with the RTS	Water Environment
Surface Water	Lakes hydraulically connected with the RTS supporting surface water dependent habitat	Water Environment
Surface Water	Lakes not hydraulically connected with the RTS	Water Environment

19.4.2.6 Our intra-project assessment then considered where effects identified in the topic specific assessments act upon the same shared receptor groups; this is represented by the ticks in Table 19-3 and

19.4.2.7 Table 19-4. For example, in Table 19-3, ‘Ecological Receptors’ is the shared receptor group being affected and the ticks under the Air Quality, Biodiversity, Flood Risk, Noise and Vibration and Water Environment EIA Topics record that these topics have been identified as having a potential likely significant effect on that receptor group. Therefore, in this example, we are identifying the potential for intra-project effects from construction on the shared receptor group of ‘Ecological Receptors’.

19.4.2.8 We have determined that there is potential for intra-project effects on the shared receptor groups in Table 19-3 and

19.4.2.9 Table 19-4 that have more than one tick against different EIA topics. Where a shared receptor group only has one tick, this means that we have not identified the potential for intra-project effects at this stage. This will be reviewed and updated at the ES stage.

Table 19-3: Table of potential intra-project effects from construction of the RTS

Shared Receptor Group Affected	Air Quality	Biodiversity	Climatic Factors	Cultural Heritage	Flood Risk	Health	Landscape and Visual Amenity	Materials and Waste	Noise and Vibration	Socio-Economic	Soils and Land	Traffic and Transport	Water Environment
Ecological Receptors	✓	✓			✓				✓				✓
Designated Sites (Biodiversity)	✓	✓			✓				✓				✓
Designated Assets (Cultural Heritage)				✓			✓						
Non-Designated Assets (Cultural Heritage)				✓			✓						
Palaeoenvironmental				✓	✓								✓
Soils								✓			✓		
Landscape Receptors					✓		✓						
Materials								✓			✓		
Waste								✓					
Residential	✓				✓	✓	✓		✓	✓	✓	✓	
Non-Residential	✓				✓	✓	✓		✓	✓	✓	✓	✓
Recreational	✓				✓	✓	✓		✓	✓	✓	✓	✓
Economy (Socio-Economic)								✓		✓			
Groundwater					✓			✓			✓		✓
Surface Water					✓								✓

Table 19-4: Table of potential intra-project effects from operation of the RTS

Shared Receptor Group Affected	Air Quality	Biodiversity	Climatic Factors	Cultural Heritage	Flood Risk	Health	Landscape and Visual Amenity	Materials and Waste	Noise and Vibration	Socio-Economic	Soils and Land	Traffic and Transport	Water Environment
Ecological Receptors	✓	✓			✓								✓
Designated Sites (Biodiversity)		✓			✓				✓				✓
Designated Assets (Cultural Heritage)				✓	✓		✓						
Non-Designated Assets (Cultural Heritage)				✓	✓		✓						
Palaeoenvironmental					✓								✓
Soils					✓						✓		
Landscape Receptors					✓		✓						
Materials					✓			✓			✓		
Waste								✓					
Residential	✓				✓	✓	✓		✓	✓	✓	✓	
Non-Residential	✓				✓	✓	✓		✓	✓	✓	✓	✓
Recreational	✓			✓	✓	✓	✓		✓	✓	✓	✓	✓
Economy										✓			
Groundwater					✓			✓			✓		✓
Surface Water					✓								✓

19.4.2.10 The shared receptor groups that we have identified as most likely to experience intra-project effects from construction are:

- Ecological Receptors;
- Designated Sites (Biodiversity);
- Designated Assets (Cultural Heritage);
- Non-Designated Assets (Cultural Heritage);
- Palaeoenvironmental;
- Soils;
- Landscape Receptors;
- Materials;
- Residential;
- Non-Residential;
- Recreational;
- Economy (Socio-Economic);
- Groundwater; and
- Surface Water.

19.4.2.11 The shared receptor groups that we have identified as most likely to experience intra-project effects from operation are:

- Ecological Receptors;
- Designated Sites (Biodiversity);
- Designated Assets (Cultural Heritage);
- Non-Designated Assets (Cultural Heritage);
- Palaeoenvironmental;
- Soils;
- Landscape Receptors;
- Materials;
- Residential;
- Non-Residential;
- Recreational;
- Groundwater; and
- Surface Water.

19.4.2.12 As mentioned above, it is difficult to detail the anticipated intra-project effects arising from the project at this preliminary assessment stage, but

some examples based on an early prediction and using professional judgement are provided below:

- Potential negative intra-project effects from construction on residential receptors may arise because of increased odour and dust arising from earthworks combined with a potential decrease in air quality as a result of increased traffic on the road network, as well as noise and vibration from construction activities. Residential receptors that are in closer proximity to the main project components (e.g. the flood channels, construction compounds and temporary material processing sites) have a higher likelihood of significant negative intra-project effects.
- A potential positive intra-project effect from operation on residential receptors may arise because of the reduction in flood risk to properties and local community infrastructure combined with an associated positive effect on health from a reduction in health risks such as anxiety and physical injury.

19.4.3 Mitigation

19.4.3.1 Our CEA will be undertaken assuming that primary (embedded), secondary (additional) and tertiary (standard practice) mitigation specified in the topic assessments are in place. Currently all topics are scoped in for assessing cumulative effects. If the CEA undertaken as part of the ES indicates that additional mitigation is required, this will be recommended and assessed.

19.5 Further Work for the EIA

19.5.1 Inter-project Effects Assessment

19.5.1.1 The long list of ‘other developments’ is subject to continued review and update. Any new developments, from the time of writing, will be scoped into the assessment if they meet the criteria provided in Section 19.2.3.3 of our EIA Scoping Report.

19.5.1.2 We welcome comments from statutory and non-statutory consultees on the revised long-list of ‘other developments’ compiled for the PEIR which can be found in Appendix 19.1.

19.5.1.3 Stages 2-4 of the inter-project effects assessment will be completed and reported in the ES.

19.5.2 Intra-project Effects Assessment

19.5.2.1 We welcome comments from statutory and non-statutory consultees on the preliminary assessment carried out for Stage 2 for the PEIR.

19.5.2.2 We will revisit Stages 1 and 2 of the intra-project effects assessment for the ES, and Stages 3 and 4 will be completed.

20 Stakeholder Engagement

20.1 Introduction

20.1.1.1 Consultation with public bodies, businesses and residents has been ongoing since 2009 when the Lower Thames Flood Risk Management Strategy (LTFRMS) set out recommendations for the River Thames Scheme (RTS) ('the project').

20.1.1.2 Since before the Secretary of State's Direction under section 35 of the Planning Act 2008 (PA2008) in December 2020, the Environment Agency and Surrey County Council embarked on a strategy to 'consult regularly, welcome feedback and provide clear evidence of how this was used in our design'. This strategy included a 'working with others' approach to ensure effective engagement on the project by working through the following iterative steps:

- WHAT do you want to achieve?
- WHY work with others?
- WHO do you need to work with?
- HOW will you involve them?
- DELIVER – let's do it!
- EVALUATE - how did it go and what did we learn?

20.1.1.3 Following a direction from the Secretary of State for the Department of Environment, Food and Rural Affairs (Defra), the Scheme has been designated a project of national significance for which development consent is required. As such, the Environment Agency and Surrey County Council will be required to submit an application for a Development Consent Order (DCO).

20.1.1.4 The Scope and design of the project that will be submitted for the DCO application and assessed in the Environmental Statement (ES), will be shaped by technical, environmental and economic factors alongside feedback from engagement with stakeholders and received through pre application non-statutory and statutory consultation, further to the applicant's duties under sections 42 to 49 of the PA2008.

20.1.1.5 This chapter provides an overview of:

- Pre-application Consultation; and
- Development Engagement

20.2 Pre-application Consultation

20.2.1.1 During the pre-application stage of the DCO process, the project has undertaken two phases of non-statutory consultation (in 2016 and 2022) with prescribed stakeholders and communities on the plans for the RTS.

20.2.1.2 The second public consultation on the RTS was undertaken for six weeks from 8 November 2022 to 20 December 2022 (hereafter referred to as 'the second public consultation'). This gave stakeholders and communities an opportunity to learn about the RTS and provide input. Ten public information events were held at locations close to the RTS and an additional seven virtual events were held for those who could not attend the public information events in person; including a specific virtual event for the island communities. The public information events and supporting virtual events attracted approximately 1,180 attendees. 487 responses were received during the consultation period, with responses covering a range of topics including access related matters, design suggestions and further consideration to be given towards technical aspects such as reduction of flood risk and improvements to flood flows. The summary report for this consultation can be found on the project website www.riverthamesscheme.org.uk. The key findings from the summary report include for example:

- The majority of respondents supported the idea of lowering the riverbed near Desborough Cut, (55 per cent agreed/strongly agreed, 20 per cent neither agreed nor disagreed, 18 per cent indicated they did not know and 4 per cent disagreed/strongly disagreed).
- Asked to rank their preferences for access to green spaces, connection to wildlife and a more sustainable travel network, most respondents viewed access to new green spaces as most important, with connection to wildlife second.
- There were also several open questions about proposals for Desborough Cut, access, connecting with wildlife and sustainable travel networks within the project area; as well as how to balance these factors and the approach to construction.

20.2.1.3 In line with the statutory requirements of the PA2008, its associated regulations and Planning Inspectorate (PINS) Advice Notes Two, Three and Fourteen this current statutory consultation will ensure:

- Section 42(1)(a) prescribed consultees are consulted. These consultees are those set out in Schedule 1 of the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 where they are identified by name or by category;
- Section 42(1)(b) local authorities (categories A, B, C and D) are consulted.
- Section 42(1)(c) - the Greater London Authority is consulted;
- Section 42(1)(d) - all land interests in the categories listed in section 44 of PA2008 which have been identified by the project are written to; and
- Non-statutory consultees have been identified with ongoing engagement and collaborations happening with them.

20.2.1.4 The project has over 250 organisations identified as stakeholders, and thousands of affected individuals from a range of interests. These include statutory authorities, landowners and operators, environmental groups and businesses.

20.2.1.5 As required by s47 PA2008, we have published a Statement of Community Consultation (SoCC). It sets out how we propose to consult people living in the vicinity of the land about the proposed application. The content of the SoCC is summarised in Section 21.1 of our PEIR.

20.2.1.6 All comments from statutory consultation will be reviewed and analysed to understand key themes and concerns. They will be incorporated into the Consultation Report, which will be submitted with the DCO application (in accordance with s37(3)(c) PA2008). The report will state how changes have been made in response to feedback received and where this information can be found in the DCO application documentation (in the ES for example). It will also explain why it has not been possible to make the changes suggested, where applicable. This report will be made available on the project website The River Thames Scheme.

20.3 Development Engagement

20.3.1.1 Section 20.3 of the RTS Environmental Impact Assessment (EIA) Scoping Report (Environment Agency and Surrey County Council, October 2022) ('the EIA Scoping Report') details past engagement through the development phases of the RTS, including a summary of the broad range of engagement methods used.

20.3.1.2 Topic specific engagement that occurred prior to EIA Scoping is summarised in the individual topic chapters of the EIA Scoping Report.

20.3.1.3 Stakeholder engagement relevant to individual environmental topics that has occurred since EIA Scoping is covered in individual topic chapters of this Preliminary Environmental Information Report (PEIR).

20.3.1.4 Substantial engagement has continued with multiple stakeholders across a range of topics prior to, during and since our EIA Scoping Report including:

- Online EIA Scoping briefing sessions were held with statutory consultees such as Historic England, Natural England, Affinity Water, Thames Water, LPAs and the Marine Management Organisation in September and October 2022.
- The Planning Inspectorate (PINS) EIA Scoping Opinion (dated 15 November 2022) ('the PINS Scoping Opinion'), included feedback from several statutory consultees (see Appendix 4.1 of our PEIR). A meeting was held between the project team and PINS in December 2022 to clarify some points in relation to the PINS Scoping Opinion.
- Landscape and Green Infrastructure design optioneering workshops were held in person with LPA Technical Officers, LPA Councillors, and special interest groups in February 2023, and follow up workshops were held with the LPA Technical Officers in August 2023 to inform the ongoing design work.

20.3.1.5 Targeted engagement on specific topics has also continued since EIA scoping. This engagement is described in the relevant subsection of each topic chapter (sections Air Quality 6.3.2 to Water Environment 18.3.2). Certain examples include:

- Liaison on the nature and effects of the proposed augmented flow is ongoing with key interests including Thames Water and Affinity Water.
- The design and management of structures that cross the flood relief channel is being developed through meetings with National Highways, local highway authorities, Network Rail and private landowners.
- Whilst water quality assessments are ongoing, an optioneering study is also being undertaken to consider alternative solutions (if needed) for the routing of the Spelthorne Channel given the use of Ferry Lane Lake (also known as Ferris Meadow Lake) for open water swimming.
- Since the second public consultation, regular monthly coordination meetings are held with the LPA Project Group, to provide updates on the programme and discuss issues. These have been supplemented throughout 2023 with a series of additional meetings focusing on specific topics including materials, design, Landscape and Green Infrastructure consultation.
- Community engagement has been undertaken via responses to email enquiries, face to face and virtual meetings and with key community stakeholder groups via Community Working Groups. The purpose of the community engagement has been to engage key stakeholder groups ahead of this statutory consultation. This engagement focused on facilitating engagement and activate debate, with the aim of increasing understanding amongst the groups themselves and providing feedback on their issues to the project. There was no fundamental change to the assessment methodology of the PEIR because of comments received and discussed in the community engagement.

20.3.1.6 Stakeholder engagement to date has informed the proposed design, construction and operation of the RTS. These are set out in section 4.5 and 20.4 of the EIA Scoping Report and in the relevant subsection x.3.2 of each topic chapter of our PEIR.

21 Next Steps

21.1 Consultation during the DCO Process

21.1.1.1 Under the Planning Act 2008 (PA2008) we have an obligation to consult with statutory and non-statutory consultees. Statutory consultation forms part of the pre-application stage of the Development Consent Order (DCO) application process. We have produced this Preliminary Environmental Information Report (PEIR) for the River Thames Scheme (RTS) to allow consultees to develop an informed view of the project and its potential likely significant environmental effects.

21.1.1.2 For major infrastructure projects, the Environmental Impact Assessment (EIA) process is governed by the Infrastructure Planning (EIA) Regulations 2017 (the EIA Regulations). These regulations make the pre-application publicity and consultation requirements for the EIA process consistent with those of the Planning Act.

21.1.1.3 Regulation 12 of the EIA Regulations requires that the applicant's Statement of Community Consultation (SoCC) prepared under section 47 of the PA2008 must set out whether the development for which development consent is being sought is EIA development and, if it does, how the applicant intends to publicise and consult on the preliminary environmental information.

21.1.1.4 As required by section 47 of the PA2008, we published a SoCC. It set out how we proposed to consult people living in the vicinity of the land about the proposed application, including this PEIR.

21.1.1.5 Our SoCC set out:

- When the consultation will take place and the length of the consultation;
- What proposals we will be consulting on;
- Who we will consult;
- How we will consult (including where people can view documents, request information, attend both in-person and online events);
- How people can respond to the consultation; and
- What happens after consultation ends.

21.1.1.6 We are consulting on our proposals for the RTS, including the new green and blue open spaces, priority areas for habitat creation, enhancement or mitigation, the proposed channel sections and weirs, and our approaches to materials management and construction.

21.1.1.7 The RTS is an ‘EIA development’ under the EIA Regulations. As a result, we are also consulting on preliminary environmental information as part of this consultation. Our full PEIR and a non-technical summary of this are available on the project website for this purpose.

21.1.1.8 Following the close of this consultation, the feedback will be reviewed and analysed to understand key themes and concerns. This will be summarised and presented in a consultation feedback report, which will be made available on the project website.

21.1.1.9 When finalising the proposed application, we will have regard to all relevant feedback received from this consultation which will be set out in a Consultation Report.

21.1.1.10 If our application for a DCO is accepted by the Planning Inspectorate (PINS), on behalf of the Secretary of State, an Examining Authority will review the application. During the six-month examination stage, anybody with an interest in the project can participate and make representations in writing, or verbally at hearings.

21.1.1.11 After the end of examination, the Examining Authority will have up to three months to report its recommendation to the Secretary of State, who has a further three months to make a final decision whether or not to grant a DCO for the project.

21.1.1.12 Further information about the DCO application process can be found on the PINS website: The process | National Infrastructure Planning

21.1.1.13 The PINS website will also provide updates on the project's application process, including providing access to the submitted DCO application documents.

21.2 Environmental Impact Assessment

21.2.1 Engagement and Further Work to Inform the ES

21.2.1.1 Feedback from statutory consultation and ongoing engagement with designated stakeholders and the public will inform our continuing development of the project design and EIA.

21.2.1.2 In addition, the EIA will be supported by several further detailed studies, including for example (this is not an exhaustive list):

- Habitats Regulations Assessment;
- Water Framework Directive compliance assessment;
- Lighting Impact Assessment;
- Completing a study of project effects upon the setting of historic assets;
- Use of results from ground investigations to refine predicted amounts and types of materials to be dug;
- Computer modelling of water quality effects;
- A flood risk assessment; and
- A transport assessment.

21.2.1.3 The collection of baseline data will also continue in 2023 and 2024 to inform the EIA, including for example (this is not an exhaustive list):

- Archaeological investigations;
- Traffic surveys;
- Air quality monitoring;
- Water quality monitoring;
- Habitat and species surveys;
- Summer and winter viewpoint photography; and
- Ground investigations.

21.2.1.4 The detailed studies and continued baseline data collection will inform the detailed environmental topic assessments within the Environmental Statement (ES). The ES will be prepared through 2024 and early 2025, and this will be submitted as part of the DCO application.

21.2.2 Proposed Structure of the ES

21.2.2.1 The structure of the ES will broadly follow the same order of chapters that are presented within this PEIR, however changes may need to be made to address the requirements of the EIA Regulations, consultation feedback or the evolution of the project.

21.2.2.2 The indicative outline structure of the ES is as follows:

- Non-Technical Summary;
- Details of the applicant team and statement of competence;
- Chapter 1: Introduction;
- Chapter 2: Legislation and Policy Context;
- Chapter 3: Project Description and Alternative Options Considered;
- Chapter 4: Stakeholder engagement;
- Chapter 5: EIA Assessment Methodology;
- Chapters 6 – 18: Technical Topic Chapters;
- Chapter 19: Cumulative Effects Assessment;
- Chapter 20: Summary; and
- Chapter 21: Environmental Action Plan.

21.3 Find Out More and Have Your Say

21.3.1.1 The following materials have been developed for the statutory consultation to help people understand the proposals for the project and provide their feedback:

- **Consultation brochure** - The consultation brochure provides an overview of the proposals, including maps and information on key design elements of the project.
- **Preliminary Environmental Information Report (PEIR)** - This report provides information on our preliminary assessment of the likely significant environmental effects of the project.
- **Non-technical summaries** - The suite of consultation documents includes non-technical summaries of the PEIR and flood modelling report.
- **Map book and flood maps** - Supporting paper and online interactive maps detailing the project and key elements. These maps are available in their full technical formats sourced from the technical reports and simplified formats.

- **Project website** - The project website the River Thames Scheme has been updated with the Statutory Consultation materials.
- **Feedback form** - The consultation feedback form allows stakeholders and the public to formally respond to the consultation.

21.3.1.2 We are providing information on our project website, and also in hard copy, available at deposit locations and also on request. We are also hosting in-person and virtual events to allow attendees to explore the proposals and ask questions.

21.3.1.3 Copies of selected consultation documents are available for reference at Information Points (local libraries and community centres)

21.3.1.4 A series of around 10 public information events are being held for communities to find out information about the project and the consultation and talk to representatives from the project team in person.

21.3.1.5 We are seeking feedback from consultees on the proposed design and approaches. The feedback form provides a series of questions that request information on particular elements of our proposals. However, all feedback will be considered.

21.3.1.6 Feedback can be submitted in the following ways:

- **Online feedback form**: hosted on Citizen Space with a direct link included in the project website The River Thames Scheme.
- **Paper feedback form**: available for collection at information events, information points or upon request. Completed forms are to be sent to the address set out below.
- **Written feedback**: other written feedback can be sent to either the freepost address or email address set out below.
- **FREEPOST address**: FREEPOST RTUK – RBLY – XUBT, RIVER THAMES SCHEME.
- **Email address:** enquiries@riverthamesscheme.org.uk

21.3.1.7 The deadline for submitting responses to the statutory consultation is 11:59pm on the last day of the consultation on Monday 4th March 2024.

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23 List of Abbreviations

Abbreviation	Full text
AADT	Annual Average Daily Traffic
ADMS	Atmospheric Dispersion Modelling System
AEoI	Adverse Effect on Integrity
AHAP	Areas of High Archaeological Potential
AIL	Abnormal Indivisible Loads
ALC	Agricultural Land Classification
AMCT	Annual Mean Concentration Target
APIS	Air Pollution Information System
AQMA	Air Quality Management Area
AQN	Air Quality Neutral
AQO	Air Quality Objectives
AQS	Air Quality Standards
ASR	Annual Status Report
BNG	Biodiversity Net Gain
BoCC	Birds of Conservation Concern
BS	British Standard
CCR	Climate Change Resilience
CEA	Cumulative Effects Assessment
CEMP	Construction Environment Management Plan
CIBSE	Chartered Institute of Building Service Engineers
CIEEM	Chartered Institute of Ecology and Environmental Management
CIRIA	Construction Industry Research and Information Association

Abbreviation	Full text
CL:AIRE	Contaminated Land: Applications in Real Environments
CLR11	Contaminated Land Report 11
CSM	Conceptual Site Model
DBA	Desk Based Assessment
DCO	Development Consent Order
Defra	Department for Environment, Food and Rural Affairs
DLUHC	Department for Levelling Up, Housing and Communities
DMRB	Design Manual for Roads and Bridges
DoWCoP	Definition of Wastes Code of Practice
EBC	Elmbridge Borough Council
EcCoW	Ecological Clerk of Works
EcIA	Ecological Impact Assessment
EHO	Environmental Health Officer
EIA	Environmental Impact Assessment
EMS	Environmental Management System
EqIA	Equality Impact Assessment
ES	Environmental Statement
EU	European Union
FCS	Flow Control Structure
FRA	Flood Risk Assessment
GCN	Great Crested Newts
GHG	Greenhouse Gases
GI	Ground Investigation
GVA	Gross Value Added

Abbreviation	Full text
ha	Hectare
HDV	Heavy Duty Vehicle
HEMP	Historic Environment Management Plan
HER	Historic Environment Records
HGV	Heavy Goods Vehicle
HIA	Health Impact Assessment
HPI	Habitat of Principal Importance
HRA	Habitat Regulations Assessment
HUDU	Healthy Urban Development Unit
IAQM	Institute of Air Quality Management
ICCI	In-Combination Climate Impacts
IEMA	Institute of Environmental Management and Assessment
INNS	Invasive Non-Native Species
IT	Interim Targets
LBRUT	London Borough of Richmond upon Thames
LBT	Legally Binding Targets
LCA	Landscape Character Area
LCRM	Land Contamination Risk Management
LGV	Light Goods Vehicle
LLFA	Lead Local Flood Authority
LNR	Local Nature Reserve
LPA	Local Planning Authority
LSE	Likely Significant Effect(s)
LTFRMS	Lower Thames Flood Risk Management Strategy

Abbreviation	Full text
LVIA	Landscape and Visual Impact Assessment
LWS	Local Wildlife Site
mAOD	metres Above Ordnance Datum
MCA	Multi Criteria Assessment
MMO	Marine Management Organisation
MMP	Materials Management Plan
MMS	Materials Management Strategy
MSA	Minerals Safeguarding Area
MSOA	Middle Layer Super Output Areas
MYPA	Mid Year Population Estimates
NAP3	Third National Adaptation Programme
NGOS	New Green Open Spaces
NH_3	Ambient Ammonia
NIT	National Infrastructure Team
NMU	Non-Motorised User
NNR	National Nature Reserve
NO_2	Nitrogen Dioxide
NO_X	Nitrogen Oxides
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NRMM	Non-Road Mobile Machinery
NSIPs	Nationally Significant Infrastructure Project(s)
ONS	Office for National Statistics
PA2008	Planning Act 2008

Abbreviation	Full text
PC	Process Contributions
PEA	Preliminary Ecological Appraisal
PEC	Predicted Environmental Concentration
PEIR	Preliminary Environmental Information Report (DCO)
PERT	Population Exposure Reduction Target
PHE	Public Health England
PINS	Planning Inspectorate (for England and Wales)
PM_{10}	Fine Particulate Matter 2.5-10 micrometres in diameter
$PM_{2.5}$	Fine Particulate Matter 2.5 micrometres or smaller in diameter
PPG	Planning Practice Guidance
PRoW	Public Right of Way
PSRA	Public Safety Risk Assessment
RBC	Runnymede Borough Council
RBKUT	Royal Borough of Kingston upon Thames
RBMP	River Basin Management Plan
RBWM	Royal Borough of Windsor and Maidenhead
RCP	Representative Concentration Pathway
RTS	River Thames Scheme
SAC	Special Area of Conservation
SBC	Spelthorne Borough Council
SFRA	Strategic Flood Risk Assessments
SM	Scheduled Monument
SNCI	Sites of Nature Conservation Interest
SoCC	Statement of Community Consultation

Abbreviation	Full text
SoS	Secretary of State
SPA	Special Protection Area
SPG	Supplementary Planning Guidance
SPZ	Source Protection Zone
SRN	Strategic Road Network
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Urban Drainage Systems
SWLW	South West London Water bodies
SWMP	Site Waste Management Plan
TA	Transport Assessment
TCAMS	Thames Catchment Abstraction Management Strategy
UK	United Kingdom
UK-AIR	UK Air Information Resource
UKCP	UK Climate Projections
UKCP18	UK Climate Projections from the 2018 Met Office modelling
UKHSA	UK Health Security Agency
UKTAG	UK Technical Advisory Group
ULEZ	Ultra Low Emission Zone
WBi	WSP Binnies Joint Venture
WFD	Water Framework Directive
WHIASU	Wales Health Impact Assessment Support Unit
WHO	World Health Organisation
WRP	Waste Recovery Plan
WSI	Written Scheme of Investigation

Abbreviation	Full text
ZOI	Zone of Influence
ZTV	Zone of Theoretical Visibility (LVIA)

24 Glossary

Term	Definition
Acidification	The process of making something become more acidic.
Active travel	Physically active methods of travel such as walking, running or cycling.
Active travel route	A publicly accessible route used for recreation and commuting. In the context of RTS, the proposed active travel route will connect with the existing Public Right of Way (PRoW) network and public open spaces, along with the new green and blue open spaces.
Aggregate	A broad category of course to medium grained material such as sand, gravel and crushed rock, which is often used in the construction industry.
Agricultural Land Classification (ALC)	A series of six grades classifying soil in terms of its suitability for agriculture, from 1 (excellent quality) to 5 (very poor quality).
Air Quality Management Area (AQMA)	Area defined by the local authority as an area requiring management because air quality levels do not meet national air quality objectives.
Air Quality Management Plan	A comprehensive document describing the motivations for air quality management, qualitative and quantitative findings on the impacts of air pollution on the megacity, and most importantly, targeted actions and a path forward for mitigating sources of air pollution.
Air Quality Objectives (AQO)	Non-statutory limits on the acceptable presence of contaminants in the atmosphere, established to protect human health and the environment.
Air Quality Standards (AQS)	Concentrations recorded over a given time period, which are considered to be acceptable in terms of what is scientifically known about the effects of each pollutant on health and the environment.
Ait	A small island in a river.

Term	Definition
Ancient Woodland	Land continuously wooded since 1600 in England and Wales.
Appropriate Assessment	The second stage of the Habitats Regulations Assessment (HRA) process which must be undertaken in accordance with the Conservation of Habitats and Species Regulations 2017 (as amended) by a competent authority (in the case of the RTS, this will be the Secretary of State) when the potential for likely significant effects on a European designated nature conservation site (e.g. Special Protection Area, Special Area of Conservation or Ramsar site) from a plan or project cannot be excluded in view of the site's conservation objectives (which is the first stage of the HRA process). If this is necessary, the application for the DCO will include a Statement to inform the Appropriate Assessment to be undertaken by the Secretary of State setting out the project's views on the matter.
Aquifer	An underground layer of rock with water storage capability.
Area of High Archaeological Potential (AHAP)	Areas where archaeological artefacts and remains are likely to survive.
Areas of enhanced public connection	Designated areas where new or improved active travel provisions, for pedestrians and cyclists, are proposed. These areas, situated across the flood channel corridor and new green open spaces, are designed to connect with the existing network.
Augmented flow	A small flow required in non-flood conditions to facilitate fish passage at flow and water control structures in the new flood channel.
Authorised landfill	Sites that are currently authorised by the Environment Agency under Environmental Permitting Regulations to receive waste from local authorities.
Background rates	Ambient levels of pollutants not associated with any of the sources explicitly included in the air quality modelling analysis.

Term	Definition
Backwater	A part of a river in which there is little or no current.
Baseline	A description of the present state, used as a starting point for making comparisons, for example in relation to the assessment of environmental or economic impacts.
Bathymetric Survey	A type of hydrographic (water-based) survey that maps the depths and shapes of underwater terrain to illustrate the land that lies below.
Bed lowering	A technique which excavates the river bed in a localised area. Because it works to a greater depth than dredging, which only removes silt material from the riverbed, it is a longer term solution that requires less regular maintenance.
Benthic Invertebrates	Organisms that live on the bottom of a water body (or in the sediment) and have no backbone. They range in size from microscopic (for example microinvertebrates <10 microns) to a few tens of centimetres or more in length (for example macroinvertebrates, >50 centimetres).
Best Practicable Means	Part III of the Environmental Protection Act 1990 defines Best Practicable Means as: 'Practicable' means reasonably practicable in terms of local conditions/circumstances, the current state of technical knowledge, and financial implications. 'Means' refers to the 'design, installation, maintenance and manner and periods of operation of plant and machinery, and the design, construction and maintenance of buildings and structures'.
Biodiversity	Biodiversity is the variety of all life on Earth. It includes all species of animals and plants – everything that is alive on our planet (Biodiversity 2020 Strategy).
Biodiversity Net Gain (BNG)	An approach to development and/or land management, that aims to leave the natural environment in a measurably better state than it was beforehand. It delivers measurable improvements for biodiversity by creating or enhancing habitats in association with

Term	Definition
	development. It can be achieved on-site, off-site or through a combination of on/off-site measures.
Biosecurity	Procedures or measures designed to protect the population against harmful biological or biochemical substances.
Birds Directive	Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (the codified version of the original Council Directive 79/409/EEC). The directive requires all Member States to protect all wild bird species and protect and restore their habitats. For threatened bird species, Member States must classify Special Protection Areas (SPAs) for the species listed in Annex I of the Birds Directive as well as for other migratory birds.
Carbon Management Plan	Defines baseline carbon emissions, targets to reduce emissions and details of mitigation measures.
Catchment	A surface water catchment is the total area that drains into a river. A groundwater catchment is the total area that supplies the groundwater part of the river flow.
Climate Adaptation Plan	A plan setting out a measure to mitigate against the effects of climate change.
Climate change	A change in the state of the global climate, which can be identified by changes in average climate characteristics (e.g. temperature, precipitation, and wind speed) that persist for extended periods - typically decades or longer.
Climate change adaptation	In the context of this PEIR assessment of effects, climate change adaptation refers to extent to which the project can adapt to the effects from projected future climate change on the project.
Climate change mitigation	The extent to which the project can avoid and reduce emissions of heat-trapping greenhouse gases into the atmosphere.

Term	Definition
Cofferdam	A temporary enclosure built within water-filled ground or a body of water to regulate the in-flow and out-flow of water. Typically used to allow works to take place below the normal water level.
Compensation	Where mitigation is not possible or appropriate, compensation is the creation of new (or improvement of existing) features (or a monetary payment) of at least equivalent (often better) value than those lost when considering the impact of the scheme on particular aspects of the environment, economy or society.
Conceptual Site Model (CSM)	The underpinning element of the contaminated land risk assessment process. The conceptual site model identifies the different type of risk and categorises the sources of contamination; potential receptors; and the identification of potential contamination pathways, thus determining and assessing pollutant pathway linkages.
Conservation Area (CA)	An area defined under the Planning (Listed Buildings and Conservation Areas) Act 1990 as being of “special architectural or historic interest, the character or appearance of which it is desirable to preserve or enhance”.
Construction	Any activity involved with the provision of a new structure (or structures), its modification or refurbishment. A structure may include a residential dwelling, office building, embankment, road, etc.
Construction Logistics Plan	The Construction Logistics Plan focuses specifically on construction supply chains and how their impact on the road network can be reduced. The construction supply chain covers all movements of goods, waste and servicing activity to and from site.
Construction Surface Water Management Plan	A plan to ensure that surface water quality and quantity is managed throughout the construction process to mitigate impacts off site.
Construction Traffic Management Plan	A document that outlines the steps that a project needs to follow to manage the flow of traffic around a construction site safely.

Term	Definition
Conveyance	The action or process of transporting or carrying something from one place to another. In the context of the RTS, this primarily relates to the carrying of water along the flood relief channel.
Critical Loads	A quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge.
Cumulative effects	The result of multiple activities whose individual direct impacts may be relatively minor but in combination with others, may result in significant environmental effects. Cumulative effects can either be inter-project or intra-project, see definition for these terms below.
Decarbonisation	The removal or reduction of carbon emissions output into the atmosphere.
Decommissioning	To officially stop using / to remove from service a structure.
Demolition	Any activity involved with the removal of an existing structure (or structures). This may also be referred to as de-construction, specifically when a building is to be removed a small part at a time.
Department for Environment, Food and Rural Affairs (Defra)	The Government department responsible for improving and protecting the environment in England. This includes flood management, biodiversity and green infrastructure policy in England.
Deposit for Recovery	Managed under the Environmental Permitting Regulations, deposit for recovery is the use of waste on land that substitutes the use of non-wastes to perform the same function.
Deposition (air quality)	Compounds of various types of air pollution are deposited on the earth's surface through rain, clouds, snow, fog, or as dry particles.
Desk Study	A desk study collates, analyses and presents existing published data from various sources on a subject to inform baseline assessments and identify the need for

Term	Definition
	further assessment and / or survey. The desk study may involve a simple site walkover survey to confirm and enhance the findings of the research exercise.
Development Consent Order (DCO)	The form of consent that is granted under the Planning Act 2008 for NSIPs and projects of national significance brought into the regime by a Section 35 Direction. Application for a DCO is made to the Planning Inspectorate (PINS) who will consider the application and make a recommendation to the Secretary of State (SoS), who will decide on whether development consent should be granted for the proposed scheme.
Dewatering	The removal of groundwater and/or surface water from a site.
Diffusion Tubes	Diffusion tubes are indicative air quality samplers: they consist of small plastic tubes containing a chemical reagent to absorb the pollutant to be measured directly from the air.
Direct effects	Effects that arise from the impact of activities that form an integral part of the project (e.g. new infrastructure).
Disamenity	The government Planning Portal does not define disamenity, but its literal meaning would be “impaired amenity” and from its definition of amenity could be considered to be a negative element or elements that detract from the overall character or enjoyment of an area.
Disposal	Under Waste Framework Directive 2008/98/EC, any operation to remove waste which is not recovery even where the operation has a secondary consequence such as the reclamation or substances or energy.
Dust Soiling	The effect of deposited dust upon surfaces, which can lead to annoyance.
Earthworks	The removal or placement of soils and rocks such as in cuttings, embankments and environmental mitigation, including the in-situ improvement of soils/ rocks to achieve the desired properties. This also covers the

Term	Definition
	processes of soil-stripping, ground-levelling, excavation and landscaping.
Ecological Impact Assessment (EcIA)	An assessment of the potential effects of a proposed development on species, habitats and statutory and non-statutory designated sites that are of local, national and/or international importance.
Economic Appraisal	A systematic process for examining alternative uses of resources, focusing on assessment of needs, objectives, options, costs, benefits, risks, funding, affordability and other factors relevant to decisions.
Effects from construction	Both positive and negative consequences for receptors from the construction of the project.
Effects from operation	Both positive and negative consequences for receptors from the operation of the project when the development is fully built.
EIA Scoping	The process of deciding the scope or level of detail of an EIA and reported in a Scoping Report. During this stage the key environmental issues (likely significant effects) of a project are identified so that the rest of the process can focus on these issues. Issues may result from the proposal itself or from sensitivities of the site.
EIA Scoping Opinion	Statutory opinion from the competent authority (in this case PINS) as to the effects that should be reported in the Environmental Statement.
Embankment	A wall or bank of earth or stone built to prevent a river flooding an area.
Enabling Works	Preparations to make a site ready for construction or redevelopment.
Environmental Impact Assessment (EIA)	An assessment process applied to development proposals that are likely to have significant effects on the environment. EIA provides a mechanism by which the interaction of environmental effects resulting from development can be predicted, allowing them to be avoided or reduced through the development of mitigation measures.

Term	Definition
Environmental Statement (ES)	The document produced to describe the environmental impact assessment process and results where statutory EIA is required.
Equalities Impact Assessment (EqIA)	An evidence-based approach designed to help organisations ensure that their policies, projects and decision-making processes are fair and do not present barriers to participation, disadvantage individuals or prejudice the interests of groups with protected characteristics when compared to others.
Equestrian	Relating to horse riding.
European Sites	Within the UK, this term refers to the network of Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) within UK territory. Before the UK left the European Union these sites were part of the European Union 'Natura 2000' network of protected areas. Since leaving the EU these form part of a network of protected sites across the UK known as the 'UK national site network' (NSN).
Eutrophication	Excessive plant and algal growth due to the increased availability of one or more limiting growth factors needed for photosynthesis.
Fish Passage	A structure on or around artificial and natural barriers to facilitate fish movements up and downstream.
Flood Channel	A section of engineered channel designed to alleviate flood waters within the River Thames.
Flood Risk Assessment (FRA)	A document that reviews a development project proposal and assesses the flood risk implications of the proposed project risk on all sources of flooding including from groundwater, river (fluvial), tidal surface water (pluvial), estuary/coastal (tidal), or sewers or artificial sources (e.g., canals and reservoirs) during construction, operation, and decommissioning phases of the project. The document will demonstrate how flood risk will be managed now and over the development's lifetime.

Term	Definition
Flood Zones	A guidance tool, produced by the Environment Agency, to demonstrate the probability of river and sea flooding in areas across England.
Flooding	Refers to inundation by water whether this is caused by breaches, overtopping of banks or defences, or by inadequate or slow drainage of rainfall or underlying ground water levels.
Floodway	A flood plain crossing for a road, built at or close to the natural ground level.
Flow Control Structures (FCS)	Devices that will alter the flow of water in the flood channel.
Fluvial	A term that relates to river and streams and the processes that occur within them.
Fluvial flood risk	Risk of the water level in rivers, lakes and streams overflowing and flooding the surrounding area.
Fugitive Dust	Fugitive emissions are those which are not collected and released under controlled physical conditions, e.g. emitted from a stack. On a construction site, dust emissions occur as a result of many site activities and are typically fugitive.
Future baseline	The likely evolution of the baseline environment without implementation of and prior to implementation of the project. Future baseline may differ from the existing baseline as a result of changes to relevant local plans or policies, development that become operational before an assumed construction start date for the project, new legal obligations that may drive change or wider changes to the environment, such as changes in population or climate change.
Geoarchaeology	The application of earth science principles and techniques to the understanding of the archaeological record.
Geochemically	Relating to the chemical composition of the earth and its rocks and minerals.

Term	Definition
Geomorphology	The study of landforms, their processes, form and sediments at the surface of the Earth, includes how processes such as air and water can mould the landscape.
Geotechnically	Relating to practical applications of geological science in civil engineering.
Green and Blue Infrastructure	Green infrastructure includes connected networks of green space, such as parks, open space and woodlands. Blue infrastructure includes ponds, lakes, rivers and streams.
Green belt	A designation for land around some cities and large built-up areas, which aim to keep this land permanently open or largely undeveloped.
Groundwater	Water contained in the void spaces in pervious rocks and also within soil.
Habitat	A place where an organism lives; a type of environment inhabited by a particular species and/or communities; often characterised by dominant plant forms, physical characters, or a combination of these.
Habitats Directive	EC Directive (92/43/EEC) on the Conservation of natural habitats and of wild flora and fauna. The Habitats Directive requires all Member States to establish a strict protection regime for species listed in Annex IV to the directive (European Protected Species). The Directive also requires that Member States designate, protect and manage core areas for habitat types listed in Annex I and species listed in Annex II of the Habitats Directive (Special Areas of Conservation). The resultant network of sites is the 'Natura 2000 network'. The Directive also establishes that Special Protection Areas form part of the Natura 2000 network and are therefore protected in the same way as Special Areas of Conservation.
Habitats Regulation Assessment (HRA)	The process for assessing the potential impacts of a plan or project on a European Site. The process has three stages:

Term	Definition
	1. Screening - to check if the proposal is likely to have a significant effect on the site in view of its conservation objectives (test of Likely Significant Effect; LSE). If there is no LSE then there is no need to go through any further stages 2. Appropriate assessment - to assess the likely significant effects of the proposal in more detail, to identify ways to avoid or minimise any effects, and to determine whether the proposal will have an Adverse Effect on the Integrity (AEoI) on a European Site in view of its conservation objectives. 3. Derogation - to consider if proposals that would have an adverse effect on the integrity of a European Site qualify for an exemption. This comprises three tests: alternative options; whether there are imperative reasons of overriding public interest why the proposal should go ahead; secure compensatory measures.
Habitats Regulations	Conservation of Habitats and Species Regulations 2017 (as amended), SI 2017/1012. These Regulations implement the requirements of the Habitats Directive in England and Wales. The Habitats Regulations were amended by The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019. Most changes involved transferring functions from the European Commission to the appropriate authorities in England and Wales. The Habitats Regulations 2017 (as amended) still require the Secretary of State and Welsh Ministers to secure compliance with the requirements of the Habitats Directive and the Birds Directive. The requirements for the protection of sites or species were not changed.
Hard engineering	Building artificial structures which try to control natural processes. In the case of RTS, concrete flood channels to reduce erosion to banks.
Haul roads	Temporary roads provided within the project boundary to allow for the movement of construction materials, construction machinery and/or construction labour around the site.

Term	Definition
Hazard	A property (of a substance) or situation with the potential to cause harm.
Hazardous waste	Waste which displays one or more hazardous properties as outlined within the Classification, Labelling and Packaging Regulation 1272/2008.
Health Impact Assessment (HIA)	A tool that helps to identify significant effects on health and wellbeing and necessary mitigation measures to make a development acceptable in planning terms.
Heavy Goods Vehicle (HGV)	A commercial carrier vehicle with a gross vehicle weight of more than 3.5 tonnes.
Hectare (ha)	A metric unit of measurement, equal to 2.471 acres or 10,000 square metres.
Historic England (HE)	Government statutory advisor on the historic environment, funded by the government.
Historic landfill	Sites where records exist of waste being received and buried that are now closed or covered.
Hydrogeology	Branch of geology concerned with water within the earth's crust.
Hydrology	The study of water and its dynamics.
Hydromorphology	The physical characteristics of the shape, boundaries and content of a water body.
In-Combination Climate Impact (ICCI)	The ICCI assesses a future climate scenario and determines if that has the potential to exacerbates an effect on an environmental receptor already assessed in another topic.
Indices of Multiple Deprivation	Measure of relative deprivation in England. It is based on seven distinct domains of deprivation; income, employment, health, deprivation and disability, education and skills training, crime, barriers to housing and services, and living environment. These are combined and weighted to form the overall index.
Indirect effects	Effects that arise from the impact of activities not explicitly forming part of the project (e.g. temporary road

Term	Definition
	closures and diversions leading to disruption and reduced accessibility to businesses).
Integrated landscape design process	Integrated landscape design process serves to sensitively integrate all project activities within the existing landscape, with attention to material finishes, form of raised earthworks and green infrastructure planting including screening of elements.
Inter- and intra- project effects	Inter-project effects: occur as a result of the likely impacts of the proposed development (i.e. the RTS) interacting with the impacts of other developments in the vicinity; and Intra-project effects: occur between different environmental topics within the same proposal (i.e. within the RTS), as a result of that development's direct effects.
Interested Party	Individuals or organisations who may participate in the examination of the DCO application for RTS and will receive formal notifications as the Examination progresses. Some people and organisations are automatically Interested Parties and don't need to register to become an Interested Party. Other people and organisations must register to become an Interested Party by making a Relevant Representation to the Planning Inspectorate.
Invasive Non-Native Species (INNS)	Under Part II of Schedule 9 of the Wildlife and Countryside Act 1981, species for which it is a criminal offence in England and Wales to plant or cause to grow in the wild due to their impact on native wildlife.
Landscape Character Area	Distinct and recognisable pattern of elements, or characteristics in the landscape that make one landscape different to another.
Leachate	Leachate is formed when rainwater is contaminated as it passes through landfill wastes or polluted ground. It may contain high levels of organic or inorganic pollutants such as ammonia and heavy metals.
Left / right bank	The descriptive terms 'left bank' and 'right bank'

Term	Definition
	are relative to an observer looking downstream, in which the right bank is to the observer's right and the left bank is to their left.
Listed Building	Buildings (including any object or structure fixed to the building and any object or structure within the curtilage of the building which, although not fixed to the building, forms part of the land and has done so since before 1st July 1948) with special architectural and historic interest that have been listed for protection by Historic England. This is protected under the Planning (Listed Buildings and Conservation Areas) Act 1990.
Local Nature Reserve (LNR)	Nature reserves designated under the National Parks and Countryside Act 1949 for locally important wildlife or geological features. They are controlled by local authorities in liaison with Natural England.
Local Planning Authority (LPA) Project Group	A group of planning officers representing Runnymede, Spelthorne and Elmbridge Borough Councils and Surrey County Council who the project is engaging with in a regulatory capacity.
Local Wildlife Site (LWS)	Wildlife-rich sites selected for their local nature conservation value. They vary in shape and size and can contain important, distinctive and threatened habitats and species. Their designation is non-statutory and their protection comes via the planning system.
Lower Thames Flood Risk Management Strategy	A plan that proposes measures to reduce the risk of flooding to the 15,000 properties which are currently at risk from a 1% flood event in the area from Datchet to Teddington.
Macrophytes	Aquatic plants that grow in or near water which are either emergent, submergent or floating.
Made ground (outside of landfill)	Heterogenous soil or rock composed of naturally occurring and human made materials that has been deposited by human activity.
Made ground (reworked natural)	Natural soil or rock that has been physically disturbed by human activity and redeposited.

Term	Definition
Main River	A watercourse designated by Defra. The Environment Agency has permissive powers to carry out flood defence works, maintenance and operational activities on main rivers. It is intended that the RTS flood channel (including the lakes that form part of it) will be a Main River.
Marginal vegetation	Plants growing along the base of the bank of a watercourse. Marginal vegetation can provide valuable habitat for wildlife and erosion protection for the bank.
Marine Management Organisation (MMO)	An executive non-departmental public body established under the Marine and Coastal Access Act 2009 with responsibilities including marine licensing and working with Natural England and others to manage a network of marine protected areas (marine conservation zones and European marine sites).
Materials Management Plan (MMP)	A plan to ensure compliance with Environment Agency regulations for excavated ground material by those developing a site. It should consider protection of human health and environment, suitability for material with or without treatment, how much material is used and where the material is being used.
Material Management Strategy (MMS)	Details efficient management proposals for processing, recovery, or re-use of materials and waste generated by the project, reducing the need to import materials from off-site, and minimise the volume of unsuitable materials requiring off-site disposal. A mechanism by which those who are developing a site can comply with Environment Agency regulations for excavated ground materials.
Metropolitan Open Land	Metropolitan Open Land is specific to London, and can be applied to open space that contributes to the structure of the city, provides open air facilities for sport and recreation, contains features of historic or biodiversity value, and/or forms part of the green infrastructure network.
Middle Layer Super Output Areas (MSOAs)	Generated automatically by zone-design software using census data from groups of LSOAs. They have a

Term	Definition
	minimum size of 5,000 residents and 2,000 households with an average population size of 7,800. They fit within local authority boundaries.
Mineral Safeguarding Area (MSA)	An area designated by the Minerals Planning Authorities which covers known deposits of minerals which are desired to be kept safeguarded from unnecessary sterilisation by non-mineral development.
Mitigation hierarchy	This is an approach to applying mitigation measures (see 'Mitigation measures' below) that follows three main steps. The first step seeks to avoid significant effects (e.g. by avoiding works in sensitive sites). Where this is not achievable, then impacts will be minimised (e.g. by only undertaking essential works in sensitive sites). Any unavoidable impacts are then mitigated (e.g. measures applied on site) or compensated for (e.g. improvement measures applied elsewhere).
Mitigation measures	Actions that are taken to minimise or prevent negative effects of the project.
Mobile compounds	Compounds required for small scale works, consisting of welfare vans and/or single cabins or mobile pontoon for works within the river. Mobile compounds can move alongside as works progress.
National Character Areas (NCAs)	Areas of England defined by their unique combination of landscape, biodiversity, geodiversity, history and cultural, and economic activity.
National Highways	National Highways, formerly Highways England is a government owned company which plans, designs, builds, operates and maintains England's motorways and major A roads, known as the strategic road network.
National Nature Reserve (NNR)	National Nature Reserves (NNRs) were established to protect some of our most important habitats, species and geology, and to provide 'outdoor laboratories' for research.

Term	Definition
National Planning Policy Framework (NPPF)	A national policy framework which sets out the Government's economic, environmental and social planning policies for England.
Nationally Significant Infrastructure Project (NSIP)	Nationally Significant Infrastructure Projects (NSIPs) are large projects consented by way of a Development Consent Order (DCO). Usually involving energy, transport, water or waste these projects are automatically within the Planning Act 2008 regime.
Natural Capital Assessment	The process of valuing impacts and dependencies upon natural capital (the world's stock of natural resources, such as geology, water, soils, air, fauna and flora) in order to better integrate natural capital into decision-making and so improve natural capital management.
Natural England	Natural England is an Executive Non-departmental Public Body responsible to the Secretary of State for Environment, Food and Rural Affairs. Their purpose is to protect and improve England's natural environment and encourage people to enjoy and get involved in their surroundings. Their aim is to create a better natural environment that covers all of our urban, country and coastal landscapes, along with all of the animals, plants and other organisms that live with us.
Natural ground	Soil or rock deposited by natural geological processes and not previously excavated or disturbed by human activities.
Nature Recovery	Restoring, enhancing, and protecting natural habitats, their plant and animal communities and biodiversity.
Negative effects	Effects that have an adverse influence on receptors or resources.
New green / blue open space	New areas of recreational value for the public that are either land-based (green) or water-based (blue).
Non Road Mobile Machinery (NRMM)	Non Road Mobile Machinery (NRMM) is a broad category which includes mobile machines, and transportable industrial equipment or vehicles which are fitted with an internal combustion engine and not

Term	Definition
	intended for transporting goods or passengers on roads e.g. generators.
Operational Travel Plan	A long term operational management strategy which encourages sustainable travel for new and existing developments.
Optioneering	The consideration of various alternatives and options to find the best or preferred alternative or option.
Ordinary Watercourse	A watercourse not designated as Main River. The local authority or Internal Drainage Board has permissive powers to maintain them.
Palaeochannel	Remnant of an inactive river or stream that has been filled/buried by younger sediment.
Palaeoenvironmental	An environment at a period in the geological past.
Permanent effects	Due to the subjectivity of human receptors to timeframes, those effects that continue for greater than 10 years following construction can be defined as permanent.
Piling	Pilings are wooden, concrete, or metal posts which are pushed into the ground to help form the foundations on which structures are built.
Planning Inspectorate (PINS)	The national authority that deals with planning appeals, nationally significant infrastructure project applications, projects of national significance applications, examinations of local plans and other planning-related and specialist casework in England.
PM_{10}	Particulate matter 2.5-10 micrometres in diameter.
$PM_{2.5}$	Particulate matter 2.5 micrometres or smaller in diameter.
Positive effects	Effects that have a beneficial influence on receptors and resources.
Preliminary Ecological Appraisal (PEA)	Assessment of the ecological features present or potentially present within a study area, to identify ecological constraints to a development.

Term	Definition
Preliminary Environmental Information Report (PEIR)	A report which is prepared to inform consultation with the public and other stakeholders about the likely significant effects of the scheme. The PEIR supports the statutory consultation process under the Planning Act 2008 to comply with Regulation 12 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.
Primary (embedded) mitigation	Modifications to the location or design of the development made during the pre-application phase that are an inherent part of the project, and do not require additional action to be taken.
Priority areas for habitat creation, enhancement or mitigation	These areas will favour the enhancement of existing habitats such as neutral grassland, mixed scrub, broadleaved woodland, ponds, wet woodland and open mosaic. Areas will also seek to create additional high quality habitats such as reedbeds, ditches, hedgerows and lowland meadows.
Project Boundary for EIA PEIR	The boundary within which all construction works will take place and within which the operation of the project will take place. It is based on the design parameters detailed in Chapter 2: Project Description
Project of national significance	The project has been designated a project of national significance and will be consented by way of a Development Consent Order (DCO). Projects of national significance are large scale developments that are brought within the Planning Act 2008 regime by a Section 35 direction given by the Secretary of State.
Protected species	Species of wild plants, birds and animals which are afforded protection through legislative provisions.
Public right of way (PRoW)	A highway where the public has the right to walk. It can be a footpath (used for walking), a bridleway (used for walking, riding a horse and cycling), or a byway that is open to all traffic (including motor vehicles).
Ramsar Site	A wetland site of international importance listed under the Convention on Wetlands of International Importance

Term	Definition
	under the Conservation of Waterfowl Habitat (Ramsar) Convention 1973. It is UK Government policy that Ramsar sites are extended the same protection at a policy level as Special Areas of Conservation and Special Protection Areas.
Receptor	A feature of the environment, such as a person, that responds to change as a result of the proposed development, such as noise.
Recycling	Under Waste Framework Directive 2008/98/EC, any waste recovery operation by which waste materials are reproduced into products, materials or substances whether for the original or other purposes.
Residual effect	Residual effects are those that remain following the implementation of secondary mitigation measures.
Re-use	Under Waste Framework Directive 2008/98/EC, any waste operation by which products or components that are not waste are used again for the same purpose for which they were conceived.
Revetment	A retaining wall or facing of masonry or other materials, supporting or protecting a wall.
Riparian	Area of land or habitat adjacent to rivers and streams.
Rock armour	Human-placed rock or other material used to protect shoreline or bank structures against scour and water, wave, or ice erosion.
Runnymede Channel	The channel section proposed in the project that will start at Egham Hythe and end at Chertsey. The intake to the channel will be on the right bank of the River Thames. It will pass through agricultural fields before heading south across Green Lane and joining the existing course of the Mead Lake Ditch. Passing through five existing lakes, including the Thorpe Park lakes, it will pass under Chertsey Lane (A320) towards Abbey Meads and through the existing Burway Ditch M3 flood culverts, returning to the River Thames just

Term	Definition
	south of the M3 motorway and downstream of Chertsey Weir.
Satellite compounds	Areas that provide office buildings for a limited number of staff associated with the construction works as well as welfare facilities and storage.
Schedule 1 Species	The Wildlife & Countryside Act 1981 gives a list of birds which are protected under the following two parts. Part 1 - Birds and their young, for which it is an offence to intentionally or recklessly disturb at, on or near an 'active' nest. Part 2 - Birds afforded special protection during the close season which is 1 February to 31 August (21 February to 31 August below high water mark) but which may be killed or taken outside this period.
Scheduled Monument	Nationally important historic sites, buildings or monuments identified by Historic England and designated by the Secretary of State for Culture, Media and Sport.
Scoped in	A term used to describe an effect that will be assessed further as part of the EIA process.
Scoped out	A term used to describe an effect that will not be assessed further as part of the EIA process.
Secondary (additional) mitigation	Additional actions that are required to reduce the significance or likelihood of effects where an assessment has indicated they may arise following the application of primary and tertiary mitigation. These may be imposed as part of the DCO consenting process or be identified as necessary through the EIA and therefore included within the ES.
Secondary effects	Effects that arise as a result of an initial effect of the scheme (e.g. reduced amenity of a community facility as a result of construction noise).
Secretary of State (SoS)	The Secretary of State for Environment, Food and Rural Affairs.

Term	Definition
Section 35 Direction	Direction from the Secretary of State under Section 35(1) of the Planning Act bringing a project of national significance into the Planning Act 2008 regime.
Sediment	A solid material that settles at the bottom of a liquid, especially earth and pieces of rock that have been carried along and then left by water.
Sequential Approach	The sequential approach to flood risk is being followed as part of the ongoing design of the RTS. The sequential approach means that the proposed project components will be appropriately located relevant to the different flood zones within the project boundary for the EIA PEIR based on their NPPF vulnerability classification.
Sequential Test	The sequential test compares the site you are proposing to develop with other available sites to find out which has the lowest flood risk.
Shared receptor groups	A preliminary list identified for evaluating effects within the project. These groups experience impacts from different parts of the assessment. The identification of these shared receptor groups aids in recognising potential impacts and determining how they might be mitigated.
Site of Special Scientific Interest (SSSI)	Nationally important sites designated for their flora, fauna, geological or physiographical features under the Wildlife and Countryside Act (1981) (as amended) and the Countryside Rights of Way (CRoW) Act (2000).
Site Waste Management Plan	A plan that details the amount and type of waste that will be produced on a construction site and how it will be reused, recycled or disposed of.
Sites of Nature Conservation Interest (SNCI)	These are sites identified at a local level for their conservation value. They do not have statutory status and their protection relies on local government policy.
Soffit	The underside of an architectural structure such as an arch of a bridge.

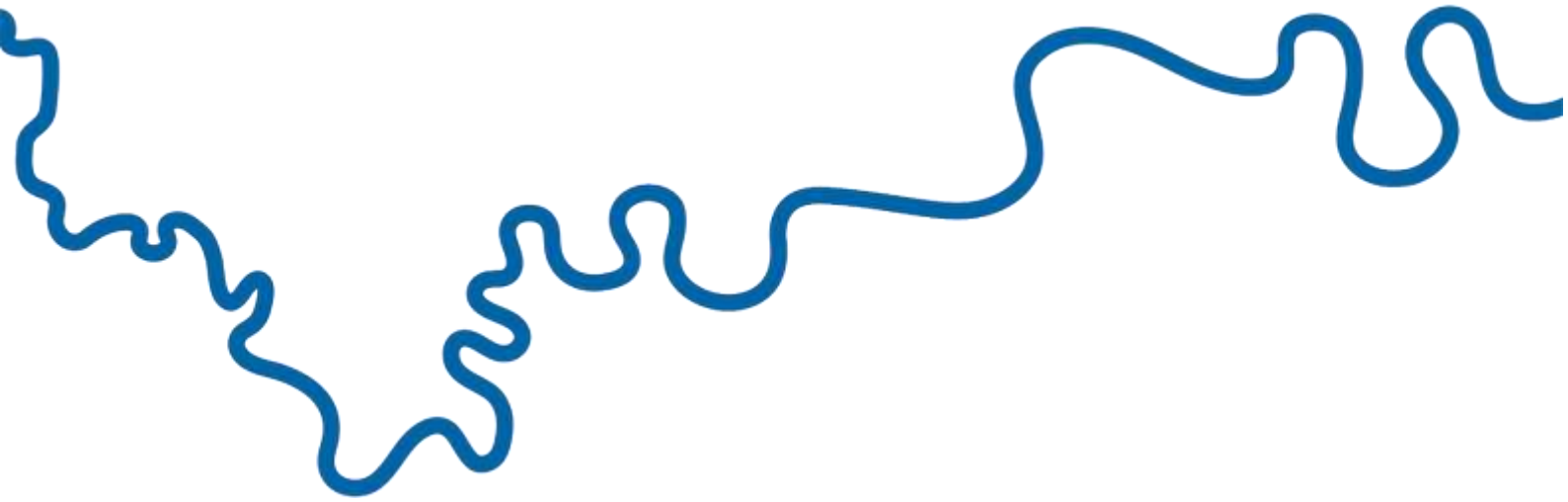
Term	Definition
Soil Resource Plan	A soil management document to be used by contractors. It sets out clear guidance on the methods of recovering, storing and re-using soils whilst minimising a loss in quality and function.
Source Pathway Receptor Model	A model used to identify the sources of environmental pollution, pathways into the environment and the potential receptors affected.
Special Area for Conservation (SAC)	A site that is designated for protection of one or more of the habitat types listed in Annex I and/or species listed in Annex II of the Habitats Directive. They form part of a network of protected sites across the UK known as the 'UK national site network'.
Special Protection Area (SPA)	An area designated for the protection of one or more species of bird listed in Annex I of the Birds Directive, and/or for the protection of other migratory birds. They form part of a network of protected sites across the UK known as the 'UK national site network'.
Spelthorne Channel	The channel proposed in the project that will leave the left bank of the River Thames at Laleham, approximately 0.4km upstream of the outlet of the Runnymede Channel, and north of the M3 motorway. The flood channel will follow in an easterly route through three existing lakes and pass under two local roads before turning south underneath the M3 motorway. The flood channel route continues through areas of grassland and scrub at Sheepwalk and Manor Farm and will pass under a further three local roads and through a lake before re-joining the River Thames opposite D'Oyly Carte Island, just upstream of Desborough Island, and downstream of Shepperton Weir.
Stakeholder	An individual, group or organisation that's impacted by the outcome of a project or a business venture.
Stakeholder Engagement	The process by which an organisation involves individuals or groups who may be affected by the decisions it makes or can influence the implementation of its decisions.

Term	Definition
Statutory Consultee	Organisations and bodies, defined by statute, which must be consulted on relevant planning matters.
Study Area	Each environment topic chapter within our PEIR (Chapters 6 to 19) have defined a specific 'study area' that has been considered in the assessment of likely significant effects. The extent of these study areas differ primarily as a result of the manner and extent to which effects are likely to be propagated for individual topics. Where relevant these include expanded areas such as the areas that will experience a change in flood risk as a result of the project.
Subsoil	Subsoil is the layer of soil under the topsoil on the surface of the ground.
Surface water	Rainwater which is on the surface of the ground and has not entered a watercourse or a drainage system. Includes surface runoff which is the unconfined flow over water over the ground.
Sustainable Drainage Systems (SuDS)	A collection of water management practices that provide a natural approach to drainage. They work by slowing and holding back the water that runs off from a site, allowing natural processes to break down pollutants.
Tailwater	Refers to water located immediately downstream from a hydraulic structure, such as a bridge or culvert.
Temporary effects	Temporary effects can be defined as follows: Short-term: Effect continues during construction and up to one year following construction. Medium-term: Effect continues for one to five years following construction. Long-term: Effect continues five to ten years following construction.
Terrestrial / Aquatic INNS Management Plan	A record of decision making and proactive approach taken in determining comprehensive management of INNS associated within a site. The Plan would primarily comprise the findings from a site survey and provide a summary of factors influencing management.

Term	Definition
Tertiary (standard) mitigation	Actions that would occur with or without input from the EIA feeding into the design process. These include actions that will be undertaken to meet other existing legislative requirements, or actions that are considered to be standard or best practices used to manage commonly occurring environmental effects.
Time-slice	A period of time used by UK Climate Projections from the 2018 Met Office modelling (UKCP18).
Topsoil	The uppermost layer in the soil profile, with a high content of organic matter and is a product of biological processes.
Trackout	The transport of dust and dirt from the construction/ demolition site onto the public road network, where it may be deposited and then resuspended by vehicles using the network. This arises when heavy duty vehicles (HDVs) leave the construction/demolition site with dusty materials, which may then spill onto the road, and/or when HDVs transfer dust and dirt onto the road having travelled over muddy ground on site.
Transboundary effects	Any significant effect on the environment resulting from human activity, the physical origin of which is situated wholly or in part within an area under the jurisdiction of another country.
Truncation	The act of making something shorter especially by removing the end of it.
UK Habitat Survey	UK Habitat Survey is a relatively new method for classifying habitats which was produced by the UK Habitat Classification Working Group in 2018. This has now replaced the JNCC Phase 1 Survey method. UK Habitat Survey provides detailed interpretation of habitat types with a greater number of ‘codes’ which can be distinguished unambiguously in the field.
Visual amenity	The analysis of the potential visual impacts to the landscape and landscape views resulting from a proposed development or land management action.

Term	Definition
Visual impact assessment	The analysis of the potential visual impacts to the landscape and landscape views resulting from a proposed development or land management action.
Waste	Any substance or object which the waste producer or the person who is in possession of the waste discards or intends or is required to discard.
Waste Hierarchy	The Waste Hierarchy ranks waste management options according to what is best for the environment. It gives top priority to preventing waste in the first place. When waste is created, it gives priority to preparing it for re-use, then recycling, then recovery, and last of all disposal (e.g. landfill).
Waste Recovery Plan	A Waste Recovery Plan is required for an environmental permit to permanently deposit waste on land as a recovery activity. Waste recovery on land, or deposit for recovery, is when you use waste material in place of non-waste material you would have used to perform a function.
Water Framework Directive (WFD)	Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. The WFD sets out environmental objectives for water status based on ecological and chemical parameters, common monitoring and assessment strategies, arrangements for river basin administration and planning and a programme of measures in order to meet the objectives.
Wharf / Wharves	A platform of timber, stone, concrete, etc, built parallel to the waterfront at a harbour or navigable river for the docking, loading, and unloading of ships.
Written Scheme of Investigation (WSI)	A Written Scheme of Investigation outlines known and potential archaeological features and deposits or built heritage elements on a site and suggests a structure for exploring them.
Zone of Influence (ZOIs)	The area(s) over which environmental features may be affected by changes caused by the proposed project and associated activities.

Term	Definition
Zone of Theoretical Visibility (ZTV)	A map showing areas of land from which the development could theoretically be seen.



SURREY COUNTY COUNCIL

Environment Agency

The River Thames Scheme represents a new landscape-based approach to creating healthier, more resilient and more sustainable communities by reducing the risk of flooding and creating high quality natural environments.

River Thames
Scheme